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Jon Bing (ed)

F*KUS

**Knowledge based systems
for public administration**

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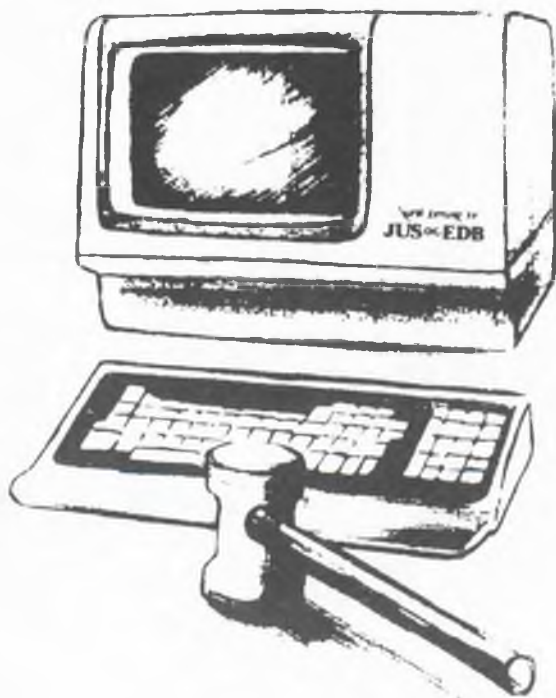


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Knowledge based
systems
for public administration

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FOREWORD

This report has been produced as a background document for the current work at the Norwegian Research Center for Computers and Law relating to developing knowledge based systems for the public administration. This work - known by the Norwegian acronym F*KUS - is closely related to the former activities within the research program NORIS. Initiated in 1970, this program has had as its objective to develop tools for lawyers based on information technology. Though one has been careful never to start polishing computer programs and other products into operational systems, we have had the satisfaction to see methods and ideas adopted in systems which today are operational.

The NORIS program has mainly been concerned with text retrieval systems. But since 1978, activities relating to computerized decision processes have had their place within the program. On this background, the NRCCL has developed its own approach to "AI and the law", using the term "deontic systems" to indicate the approach. This term, which was first used in a paper published in 1977, includes traditional systems computerizing parts of the decision processes in public administration as well as legal expert systems.

The tradition and perspective of the NRCCL is visible in this report. It is concerned with the interrelationship between text retrieval and knowledge based systems, it is concerned with legal decisions and the ideals usually summarized under the concept of "the rule of law", and it is concerned with the decisions within public administration, especially the social security and welfare administration which the NRCCL has used as example in a number of studies.

The papers in this report have been developed in 1986. Some of them were originally written in Norwegian, and the translation and production process has been prolonged. When the report is published, the F*KUS project has already been initiated under the directorship of Hans Chr Aakre.

We would like to take this opportunity to thank the authors, as well as those persons at the NRCCL responsible for the actual production, Gunnar Bach, Andreas Galtung, and Øyvind Kaasa. We would also like to thank the Ministry of Administration and Consumer Affairs, which has funded the development of this report.

We would also like to thank all those individuals and institutions which have taken an interest in the initiative. We hope that the F*KUS project will prove to be an adequate framework for cooperation in the future, both within Norway, and with some of our foreign associates.

There will be a number of forthcoming studies related to the F*KUS concept. Those who are interested, are invited to communicate with the NRCCL.

Skillebekk, April 1987

Jon Bing

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Jon Bing

THE F*KUS CONCEPT KNOWLEDGE BASED SYSTEMS FOR PUBLIC ADMINISTRATION

I: THE BACKGROUND

1. The problem

1.1 The legal decision situation

In this report, we are concerned with enhanced computer-assisted systems for lawyers. By "lawyers" we are not only - or mainly - including those with a formal legal education, but anybody making a decision according to legal rules. As an exponent of our lawyer, we may choose an employee in one of the large public administrative organizations - like the tax administration, the social security administration etc. Actually many of our examples are drawn from the social security administration, as the Norwegian Research Center for Computers and Law has conducted studies within this sector.

The legal decision situation has several characteristics. The information needed is traditionally bisected - the "facts of the case" and the "law applying to the case". Superficially speaking a solution is reached by identifying the (or one) applicable rule from the possible volume of valid legal rules.

We will detail this superficial approach somewhat. A legal rule or norm is based on interpretation of legal sources. For the purpose of our discussion, the legal sources may be seen as a volume of texts - typically statutes, regulations, administrative instructions, court cases, administrative precedents etc.

In traditional Norwegian legal theory types of legal sources have been identified that are not texts, but rather customary law and concrete arguments often described as "the considerations relevant to a desirable result". We do not want to neglect these types of legal sources, but for the sake of simplicity, we will confine ourselves to the textual types. A discussion of the justification of this limitation may be found for instance in Bing et al 1984:13-17.

The texts of the legal sources are obviously of a syntactic nature; while the norms to be applied to a case are of a semantic nature. The distinction is roughly identical to the distinction commonly made in computer science between data and information.

The link between the sources and the norms are arguments of interpretation. In its most simple form it is only a matter of "reading" a certain provision in the statutes or regulations, but the interpretation will frequently pose problems which have to be solved by the application of legal methods. In our context, we will not dwell on which methods are to be applied, but only take note of the fact that such interpretation will often require advanced legal skills and be a complicated process where the result may be disputed or in doubt. Legal reasoning includes the possibility that two lawyers agreeing upon facts, and even agreeing upon which legal sources are relevant, may arrive at different applicable norms.

The norms and their representation are of central interest for this report. At this stage it is sufficient to note that a norm traditionally is represented by two segments - an antecedent and a consequent. These are commonly represented as an "if-then"-statement, parallel to the conditional statements found in programming languages.

If (S) then (C)

The antecedent qualifies to which cases the norm applies. These criteria are typically of a certain generality, and a higher generality than the facts of the case. If the facts meet the test of qualification, the case is subsumed under that norm.

If a person dies, a number of norms may be qualified. But one of these (inheritance act sect 1) may be represented as

If (a person dies) then (inheritance process)

This norm specifies that if a person dies, then the estate of that person is to be divided according to a certain process here named "inheritance process". In the actual case, the facts will be that a certain identified individual has died. The problems of subsumption are trivial, as both the qualification of "person" and "died" are self-evident with the exception of very rare and marginal cases.

Based on this knowledge of the legal decision situation, we may venture a rough division of the decision process in some critical phases, and offer some preliminary comments to each phase.¹

1.2 Discovering the facts

The basis for a legal decision is always certain facts of the case. The discovery and proof of facts are in many jurisdictions subject to a well-developed law of evidence, while in Norway there are few explicit rules apart from the objective of having all relevant facts made known to the lawyer. For public administration, this principle is stated in the public administrative procedure act sect 17, for social security the same principle is stated in sect 14-1(2) of the social security act.

The decision-maker will rarely have any prior knowledge of the facts of the case. All facts have to be collected as part of the decision process. Taking public administration as an example, the lawyer will have three main sources for his factual information.

(1) *The applicant.* The applicant will in the application make certain claims with respect to his or her situation. Often these claims will be substantiated by documents or other types of proof, for instance a doctor's certificate, a written contract, letters etc. The applicant also is part of the situation, and it may be presumed that the applicant will be able to supplement the initial information on request.

Legal decision processes have been analyzed in greater detail in other studies by the NRCCL, for instance Bing et al 1984:6-140. Therefore, this structure should be regarded as abbreviated for the purposes of the present discussion.

(2) *Investigative procedures.* To a certain extent, investigative procedures may be initiated by the decision-maker. This is typical, of course, for criminal procedure, but more rare for more mundane forms of public administration. But in social security cases, the decision-maker may require an examination of the situation of the applicant by a social worker, whose report will be part of the material taken into account. Or a medical examination may be required.

(3) *Previously collected information.* To some extent, information on possible applicants is collected prior to the case. This is typical for old age pension, where information on the income situation has been collected over the years for all Norwegian citizens, and is available when the person applies for social security. In this case, information systems for this type of factual information have been established to facilitate the decisions.

This type of factual information systems has been established only for types of facts which routinely will be required for a large number of persons. But there are also sources for ad hoc information on individuals within public administration. One example may be a previous case with respect to the same applicant. Or the public authority may even choose to access the files of other public authorities through a request. An example may be a request to the police with respect to a case in which one is considering taking the custody of a child away from its mother.

With respect to the previously collected information a distinction should be made between the information routinely accessed with respect to a certain type of decisions, and the one accessed ad hoc. The routines will mainly rely on systems established within the agency itself, but computerization may promote routine use of files held by other agencies. Therefore the routine use should be distinguished further into use of internally and externally held information. The use of external systems raises several issues, the most obvious one being that of data protection, but equally important will be the quality and adequacy of the data compared to the reuse by the agency making the decision.

For previously collected information, one may therefore arrive at a four-square diagram:

	Routine use	Ad hoc use
Internal systems		
External systems		

One will see that most information sources have to be accessed ad hoc as part of the case. This should not, however, be overstated. For routine cases in mass administration the sufficient facts will be available through the applicant and through the factual information systems established by the administration itself.

What kind of information which is actually required, is obviously defined by the legal norms. One has to have sufficient information to decide which legal norms to be applied. For each distinction made by the norms, another aspect of the case has to be investigated.

The norms may be seen as projecting a classification scheme onto the domain of life regulated by the same norms, and all cases within this domain have to be described according to this scheme.

1.3 The retrieval process

At the initial stage, the decision-maker is in principle unaware of the requirements of the norms. But in principle the applicant will have made some initial classification by addressing his application to a certain authority, and claiming some benefit or requiring action. Also, the decision-maker will typically be specialized with a background knowledge of the normative structure which gives a fair understanding of which facts are required.

Nevertheless, in principle the decision-maker will have to retrieve the possibly relevant legal sources, and interpret these for arriving at the applicable norms.

For the retrieval, the decision-maker will use the knowledge of the case. The typical retrieval strategy will be to use some generalized aspect of the case as a search argument, and match that with an index. Confronted with an application for invalidity pension, one may define the search term "invalid", match this with the index to the statutes in force, and arrive at a reference to the relevant chapter in the social security act.

The decision-maker will in principle have the choice between using some generalized fact of the case, or a tentative legal classification based on his or her background knowledge as a search argument. The choice will obviously be influenced by which retrieval tools are at hand. In Norway, these tools are generally indexes. Alphabetical indexes are typically fact oriented, while systematic indexes (for instance exploiting the structure of an act as a classification scheme) are typically oriented towards the law.

In this context it is not appropriate to discuss which retrieval tools are available. But the case for text retrieval systems mainly rests on the argument that such systems greatly facilitate the retrieval process. This has been analyzed and discussed by other reports from the NRCCL, and will not be further pursued in this context. We will, however, return to text retrieval systems in the perspective of F*KUS below.

1.4 The process of interpretation

Above we have seen how the decision-maker is served by two types of information and communication systems: One designed to bring the factual information of the case to his attention, the other designed to retrieve possible relevant legal sources. As illustrated by the introduction, the objective of the decision-maker is to identify a norm with a sufficient basis in the legal source material under which the case may be subsumed.

This combination is made in the process of interpretation. The process is governed by norms, often quite vague or unformulated norms, known as principles of legal reasoning or something similar. These are metanorms (governing the argument for and use of substantive legal norms), and have mainly emerged as some sort of consensus in the legal community - though they may occasionally be embedded more or less explicitly in statutory or case law.

The problems of interpretation have several causes. Again these have been discussed in greater detail in other reports from the NRCCL, and in this context we will limit ourselves to a brief note on some of the main problems.

(1) Fragmentation. The legal sources are fragmented. This is evident in the case law environment, where each case contributes to the construction of the norm. If a relevant source is missed, the result may be a misconstruction of the norm and a false result - one has overlooked a possible distinction which might be made on the basis of the facts of the case.

But even when the source material is less distributed, it is always fragmented to some degree. For instance the Norwegian social security act is a comprehensive codification of social security law. It is supplemented by a large number of regulations. The case law of the appeal agency, the Social Security Tribunal, will often be relevant for the interpretation of these texts. In addition there are legislative histories, legal literature, administrative precedents etc, where possible relevant arguments may be found.

(2) *Vagueness*. The traditional way of representing legal norms relies upon natural language. The criteria of natural language are typically vague - a vagueness resulting from the nature of language itself.

One may see a continuum from strict to vague criteria. Natural language has few categories of strict criteria, but some may be mentioned. One category contains measurements of some sort - of money, volume, speed, age and other quantifiable properties. Another category are physical properties - like sex or chemical composition which may be definitively decided by some sort of well-defined test. And a third category is status awarded to a person or object - like admitting a person to the bar, licensing a medical doctor, calling a lawyer to the bench etc.

Though strict criteria are important, the vague criteria are in majority - criteria like "illness", "forest", "building" etc.

A special case of vague criteria are those which qualify that a expert judgement is to take place. A expert judgement is governed by special legal norms. Rather than "understanding" a vague word with the knowledge of natural language, the decision-maker has to identify the relevant legal sub-norms which govern the discretionary process.²

The vague criteria have to be tackled by the background knowledge of the decision-maker. First the decision-maker has to identify a criterion in the natural language text as a vague rather than a strict criterion - something which is generally trivial, but occasionally more difficult (an example may be the word "domicile" which is a reference to a expert judgement rather than a reference to

NRCCCL has given expert judgements special attention in a number of studies, and Johannes Hansen has developed a special program, SARA, for the analysis of such decisions of a binary nature. This type of judgements may be seen discussed in Hansen 1981 and Bing 1985. In many earlier works, this type of judgement has been discussed as "discretionary decisions". A change in terminology has been recommended better to reflect the original meaning of the Norwegian term "skjønn", of which "expert judgement" is an approximate translation.

the actual address of the applicant). Secondly, the decision-maker has to identify by which type of reasoning the vagueness may be resolved. And thirdly, the sub-norms for resolving the vagueness may have to be identified through a secondary information retrieval.

These are only two of the major problems confronting the decision maker. To cope with them, the decision-maker mainly has to rely on his or her own background knowledge.

The conventional way of assisting the decision-maker in coping with the problems is to produce an integrated presentation of the normative structure, either in the form of a textbook, a commentary or - as is the case in the social security administration - as administrative instructions.

In addition to an integration, the material will help in solving the vagueness. Several strategies may be used for this. With respect to vague criteria in general, examples may be given, typically drawn from prior decisions, but often supplemented by hypothetical cases. These examples will help the understanding of how the distinctions are made.

For expert judgments, the sub-norms may be made explicit, and again examples based on actual or hypothetical cases may be cited.

In mass administration, this material commonly becomes the most frequently used reference work for the decision-maker. There are several reasons for this one being that it is an integrated presentation, another being the fact that often the instructions are issued by superior agencies and carry the weight of their authority. But these are not the only reasons. For instance, this material will often be the material most easily accessible to the decision-maker, and user research has shown that the user will give preference to such material regardless of more ideal "information needs".

In our perspective, this material is interesting. One may claim that it is used very much as one would expect an expert system to be used, but - as we will revert to below - it is in many ways inferior to such a system.

Two problems with this solution should be mentioned at this early stage.

First, the material in the form of a written documentation has a certain rigidity. It is difficult and often expensive to update.

To make the documentation flexible, the material often takes the form of loose-leaf compilations - and a rather ambitious example is maintained within the social security administration. Updates have then to be printed in sufficient numbers to reach each decision-maker. Decision-makers have locally to update their compilations, and user research demonstrates that this is a critical element where failure often occurs.

Another possibility is to print the material as one volume for instance annually. This also is expensive, and changes within the period have to be communicated on separate documents not easily fitted into the bound volume.

As a result, the material often does not reflect the dynamics of a living legal system. In principle, it still has to be supplemented by other legal sources, though in practice this does not take place very often.

Also, the very nature of the problems involved in vague criteria makes the material less than complete. The examples have to be limited. The sub-norms governing a expert judgment have to be only an incomplete set of instances. By the very nature of natural language and discretionary decisions, these norms are references to information derived from the world outside the legal sources. And this open end can only be indicated by the material.

As a result, the decision-maker or administrative agency often constructs more or less "home made rules", which are of a more restricted nature than the legal sources may support. The vague criteria of the original legislation are replaced by a limited set of strict criteria through the material supplied by the administration itself.

A third limitation should also be emphasized: the trivial problems of producing a practical tool for a large number of decision-makers. Obviously this material should be easy to research, which will limit the volume of material. This will necessarily limit the extent of discussing very exceptional cases, and it will limit the exemplification with respect to vague criteria. This limitation mainly flows from the technology traditionally used: The large editions of paperbased compilations where each copy cannot be too cumbersome to handle or use.

1.5 Technology as solutions

Taking this limited view of the legal decision process, it is easy to see that technology so far has been used in two of the phases of the decision process.

First, the administration has introduced factual information systems, typically in the form of data bases where the facts are rather well structured. In the social security administration, there are data bases identifying all individuals in the population (their PIN, which includes their age, their relations by birth or marriage, their address etc), data bases containing information on their income and estate, data bases on current and previous employers, and other data bases giving some basic information of probable relevance to the social security agencies. These information systems do not contain all the facts necessary to

decide any type case, but they give a fair starting point. It may also be maintained that there is a tendency towards growth of such factual information systems, which implies that a growing fraction of the relevant facts may be retrieved through them.

Second, legal information services have been introduced. In Norway, the Lawdata foundation is supplying a general legal information service which provides the current text of all statutes and regulations in force, headnotes for court cases from the Supreme Court and a few other types of legal sources.

This general service does not currently meet the information needs of mass administrative organizations like the Tax or Social Security Administration. But the systems may easily be extended to cope with the volume of specialized texts on which decision-makers within these organizations are supposed to base their decisions. And there is a development towards such more specialized systems, with the administrations using the Lawdata system to cater for their more specialized needs.

This does not, however, solve the problems of interpretation. The use of a text retrieval system basic for a legal information service relies currently on the background knowledge of the user. User research has established beyond doubt that even for the professional lawyer these systems are not sufficiently user-friendly. For the non-professional lawyer, of which the public administration abounds, these systems give inadequate support.

A step in the direction of helping out in the interpretation would be to document also the integrated material of a secondary nature. This would help to some extent making updating easier and more secure, as central updating would replace local maintenance of, for instance, loose-leaf systems. Also, costs would not be proportional to volume in the same way, as issues for each user would not have to be printed. Therefore rare problems could be included, examples increased etc.

A simple strategy for extending some help to the non-professional decision-maker would therefore be to make text retrieval systems considerably more user-friendly, and to computerize the secondary material.

Still, however, many problems remain unsolved. The material would still be in the unstructured form of texts. The decision-maker would have to rely upon his background knowledge to acknowledge a case as exceptional, to look for further examples etc. The combination of the facts and the norms would still have to be done by the user.

Based on this realization, a project of constructing knowledge-based systems oriented towards public administration has been proposed.³

These systems would draw on the assets of text retrieval and the results produced by the research on "artificial intelligence", especially the construction of expert systems. This report sets out a strategy for developing a F*KUS-type system starting by lowering the ambitions to solutions within the reach of current methods and resources, but keeping in mind the basic problems still to be investigated, and the challenge of the vision offered by a fully developed F*KUS system.

It is also believed that this is an interesting strategy in the more general perspective of the development of knowledgebased systems.

Expert systems are rule-based systems. The legal decision situation is governed by rules often of a complex nature - and types of rules not readily represented in expert systems, but nevertheless rules. These are already represented in a somewhat formalized way - as the natural language text of a limited set of documents.

The domain to be represented by the expert system is therefore at the outset already to some extent circumscribed and formalized. It may be claimed that it is easier to develop expert systems for this domain than for a domain which is identified as part of the real world, where knowledge of relations (the rules) is not formalized apart from the discussion in relevant literature, and where the circumscription may be controversial.

Also, the success of a legal expert system can be more readily measured. An expert lawyer may compare the rule structure as represented by the expert system with the expert understanding of the law. Such an opinion may be subjective, but the argument on success or failure is quite open to discussion: The source material and the expert system are both available for a direct examination by all interested experts. One would not have to rely upon empirical data to argue the validity of the system.

By taking the problems of mass administrative law, it is also believed that it is the more trivial problems of law that will be tackled, especially the problem of fragmentation. This is a problem perhaps of a lower level of ambition than the problem of modelling legal decisions where more subtle forms of legal analysis

In Norwegian, this is described as "forvaltningsorienterte, kunnskapsbaserte systemer", and the acronym F*KUS has been coined for the rather awkward phrase.

and interpretation are the issues. In this the F*KUS proposal differs from, for instance, the research carried out by McCarty. It is believed that there are still sufficient problems to be solved, and that a satisfactory solution of these is a prerequisite for escalating the ambition to a higher level.

Therefore, we argue that the F*KUS project combine two desirable properties. It has a short-term objective with possible advantages with respect to the current computerization of public administration; and it has long-term objectives related to the basic research which necessarily has to be carried out in order to construct future legal expert systems.

2 Text as a representation of knowledge

2.1 Text retrieval systems

Since 1970 the NRCCL has been involved in the design, assessment and development of text retrieval systems. Computerized systems offered themselves as a possibility for increasing the performance of traditional information systems, and the development of text retrieval has actually, from the start in 1960, to a large degree been influenced by the lawyer and the lawyer's needs. The typical application of text retrieval systems is still that of a legal information service.

It should also be realized that the justification of developing text retrieval systems is not limited to those arguments derived from a consideration of efficiency (in cost-benefit terms). The legal system of any country is associated with a number of ideals generally characterized by phrases like "the rule of law", "justice", "equity" etc. This presumes efficient access to the textual sources.

This indicates why text retrieval systems have seen such a remarkable success within the legal field - buoyed by the twin arguments of "efficiency" and "rule of law".

The information or knowledge represented by this large volume of text is diversified and detailed. In many cases it is also ambiguous, unclear or uncertain. To translate a large fraction of this knowledge into an alternative representation which could readily be exploited by an expert system or another form of a knowledge-based system, would still require large resources. And even if this was feasible, one would still be left with the question of whether it would be legal for a lawyer to base his decisions on information extracted from a knowledge-based

system. Obviously he would be entitled to give advice on this basis - as on the basis of a textbook but a court would certainly have to have a firsthand knowledge of the statutory instruments, the cases etc.

Consequently, for both practical and basic reasons, lawyers will in the foreseeable future have to work with the natural language texts of their traditional legal sources. But these sources will increasingly be accessed through computerized legal information services based on text retrieval systems.

The first text retrieval system was demonstrated by professor John Harty of Pittsburgh University for the American Bar Association in 1960. Since then, the fundamental design of such systems has been remarkably stable. Basically, it consists of a file generator which creates two files - the text file containing the original text with an explicit structure (flags for end of document, end of paragraph, end of sentence and end of word and similar structural information on the text embedded in the file according to a certain scheme); and the search file (also known as the "inverted file" or the "concordance file") consisting of the words of the original text (though some frequently occurring vehicular words are excluded, commonly known as "stop words") sorted alphabetically and assigned addresses allowing the system to identify the location or locations in the original text where the word occurs.

The retrieval is based on Boolean arguments. In order to retrieve documents discussing certain problems, the lawyer characterizes these by specifying which words or combination of words a relevant document probably will contain. The system matches search terms with the search file, using the addresses to determine whether the Boolean conditions are satisfied. If the user wants to inspect the document, the addresses are used to access the text file and displaying documents.

These three main components in a text retrieval system have hardly changed throughout the 25 years of their existence - the text file, the search file and the Boolean retrieval module are still characteristic of such systems, though file structures have improved and - most important - the introduction of on-line systems has made the user situation radically different: The reconstructing of search requests based on initial feedback is today an important and vital element of the search strategies employed for text retrieval.

2.2 User acceptance

User research has, however, disclosed a lack of acceptance of these systems by users. There may be several reasons for this lack of acceptance, and some may be indicated by key terms:

(1) *Insufficient coverage.* Users will accept only a system which is "useful", implying a sufficient coverage to generally satisfy information needs - this is acknowledged by service providers, and most systems today have quite extensive coverage.

(2) *Physical availability.* The impact of physical availability is surprisingly high, most users are reluctant to employ a service which literally is not within arm's length. It is believed that the development towards work stations on the lawyers' desk will promote the use of text retrieval systems radically.

(3) *Telecommunication.* The tariff structures in many jurisdictions are not promoting the type of use represented by text retrieval, which implies the transmission of rather large packages of data. Also, the actual procedure of connecting to the service provider, and the quality of communication links, are problems within many jurisdictions.

(4) *Service costs.* Many users find the service charges too high compared to the improvement. This obviously is relevant both to the services and to user categories, for instance as to whether the users can transfer increased costs to clients.

(5) *User interface.* The command and search languages of the system are not sufficiently user-friendly.

From this enumeration, one will see that the four first categories are irrelevant to the text retrieval system itself. Some problems - like physical availability and telecommunication cost and quality - are currently shared with other information services.

The last item, however, relates directly to the text retrieval system. Recent user research has disclosed that text retrieval systems by users are often found less

han user- friendly - actually, one of the studies has coined the term "user hostility" to characterize the user attitude towards these systems (Lloyd 1986).

This is perhaps something of a surprise. The systems have been designed for ease of use, and it is commonly thought that they are very easy to learn - a matter of hours is generally thought sufficient. However, user research, including statistical analysis of actual terminal dialogues, proves beyond doubt that the systems are not operated properly by the general user - the user makes a number of elementary mistakes in using command and search languages, and fails to exploit the possibilities of the system, ending with naive search requests of a low performance.

It may actually be argued that the relative user-friendliness of text retrieval systems have been eroded. When the systems first became commonly available to end users in the middle of the 1970s, they compared favourably to other computer systems which might be operated from a terminal, which at that time were often based on an extensive use of codes and special formats. But after the introduction of microcomputers and office systems, user interfaces have become considerably more friendly, based on menus (often pull-down menus), selfexplaining commands, graphics etc. The text retrieval systems still have their mid-seventies interface, partly due to a lack of innovation, partly due to restrictions of the telecommunication protocols used for communicating with the user.

Consequently, the relative user-friendliness of the system has been eroded.

This has an exceptionally grave impact on the use by non- expert lawyers. As has been discussed above, users in public administration often will have a lack of general legal background knowledge. On the other hand, they will have a detailed specialist knowledge of the exact area of law to which their function is related. This knowledge is, however, often dissociated from the general legal knowledge. Text retrieval systems presume such a general background knowledge. For the decision-maker in public administration it may often be difficult to relate the general legal sources to the special problems of the case. For this the decision-maker relies on the administrative instructions the manuals mentioned above. And as the general text retrieval systems fail in offering similar "tutorial" tools for relating the special case to the sources formulated in general natural language, the decision-maker has problems in employing the information system.

It may therefore be argued that the general problems of user friendliness become emphasized in the user situation of the decision-maker within public mass administration.

2.3 Strategies for improving text retrieval

At the NRCCL, the observations above have been seen to form a conclusion:

Alternatives to text retrieval systems will not be around for a long time for coping with the needs of a lawyer. But the acceptance of text retrieval systems is not satisfactory. To achieve a higher degree of user acceptance, a new and increased level of availability must be reached. This leap will depend on a number of elements (see the exemplification above), but an important one will be the improvement of the user interface. And to achieve the necessary user friendliness in the user interface, techniques lifted from computational linguistics and the work on knowledge-based systems must be exploited.

In this report, three possibilities will be sketched below.

The first addresses the possibility of having "intervention functions" developed based on linguistic information.

The second addresses the possibility of expanding search requests by new techniques, especially the strategy called "norm-based thesaurus".

Third, the curse of Boolean algebra will be discussed, with suggestions of alternatives.

In conclusion, the integration of these functions in a pre-processor or monitor is indicated.

3 Deontic systems

3.1 Representing norms

A deontic system is a computerized system of which the programs partly represent legal norms.

The term "deontic systems" is used because the systems vary from very simple to very ambitious systems.

An example of a very simple system would be a personnel administrative system where the programs deduct tax from salaries, calculate the contribution of the employer to the social security system, etc. These operations are governed by legal rules in statutes, regulations or contracts (often the collective bargaining

agreements between the organizations of employers and employees). These norms are formulated so as to be easily transferable to calculation routines, mainly using strict criteria based on the gross income.

An example of a very ambitious system would be the experimental TAXMAN system of McCarty, developed to simulate the subtle legal arguments in taxation of corporate reorganization under US law.

The practical problems with respect to different types of deontic systems are correspondingly different. The TAXMAN effort is in the cutting edge of research in artificial intelligence. The personnel system is a bread-and-butter system where the problems of representation of knowledge or legal norms hardly are an issue felt to be relevant by the system designer or programmer. Nevertheless, it should be realized that these two extremes really are related in the sense that they both represent legal norms by computer programs.

Programming language is a formalism different from natural languages. There are a number of differences, but the major difference is the fact that the programming language has definite and well-defined semantics. A certain statement in a programming language has one - and only one - interpretation, and that interpretation can be demonstrated by having the computer execute the statement.

One should not be confused by the fact that the same programming language may have different implementations by different hardware vendors. It is the definitions embedded in the compiler or interpreter which define the semantics of the programming language - changing the compiler or interpreter may imply some change in the semantics (and consequently an interpretation) of the statement.

Legal normative systems may be regarded as containing two elements. Firstly, the structural element, secondly, the criteria embedded in the structure. One may take a very rough approximation of some of the norms governing invalidity pension in Norway:

Sect 8-3(1):

- aa If (older than 16 years)
- ab and (earning ability reduced)
- ac and (reduction more than 50 percent)
- ad and (reduction permanent)
- ae and (reduction caused by illness)
- af or (reduction caused by injury)
- ag or (reduction caused by defect)
- ah and (rehabilitation has been tried)
- ai or (therapy has been tried)
- aj or (training has been tried)
- ak or (other similar efforts have been made)
- then
- al (entitled to invalidity pension)

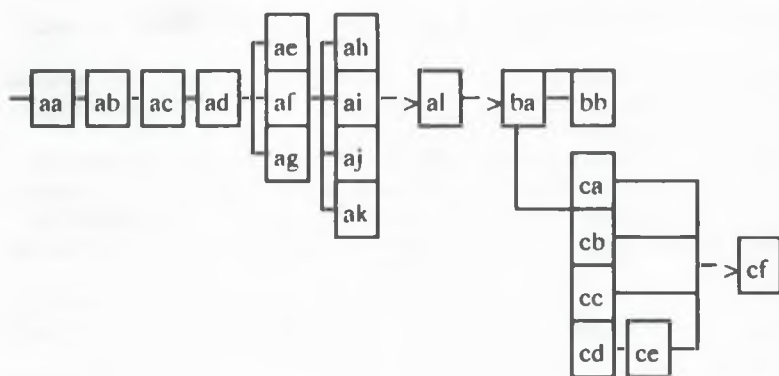
Sect 8-4 No 1 and first alternative No 2:

- al If (entitled to invalidity pension)
- ba then (entitled to basic pension)
- bb and (entitled to supplementary pension)

Sect 7-2 No 2:

- ba If (entitled to basic pension)
- ca and (not married)
- cb or (spouse does not receive old age pension)
- cc or (spouse does not receive invalidity pension)
- cd or (spouse does receive rehabilitation benefit)
- ce and (not expecting invalidity pension)
- cf then (pension equals basic amount)

This is an incomplete representation of some of the norms represented by the social insurance act sect 8-3, 8-4 cfr 7-2. It is easy to see that they may come together as parts in a structure, which tentatively may be drawn as an arrow diagram:



In this, the two elements become quite visible. Here conjunctions of criteria are placed in horizontal lines, disjunctions in vertical columns, and the exit to a consequence (the "then" element) is illustrated by ">".

3.2 Criteria and their specification

We also see that the criteria - here identified by pairs of letters - are of a very different nature. Some are evidently quite strict, like aa: "older than 16 years" or cf: "pension equals basic amount". Others are typically vague, like ae: "reduction caused by illness" and the alternative criteria af and ag.

In designing the deontic system, the structure has to be made explicit in the program. The criteria are not parts of the program itself, but variables which have to be given values in one way or the other.

Actually, only two possibilities of setting the values are practical. Firstly, the values may be retrieved from some factual information system established prior to the application, and maintained either by the social security administration or another administration to which the social security administration has access. The example offers two instances of this.

Whether a person is older than 16 years (criteria aa) is determined simply by doing a calculation based on the population register. The 5 first digits of the PIN determine day, month and year of birth (and the 7th determines the century for persons more than 100 years old). The calculation of the value of the variable

aa becomes very simple, and may automatically be decided by the computerized system.

Likewise the basic amount (criteria cf) is readily accessible. This is a rate determined by statute, and most Norwegian pensions are expressed as multiples or fractions of this basic amount.

Other elements may also be determined, for instance whether the applicant is married or not (criteria ca) and the social security status of the spouse (cb-cf).

In this way, it is possible to demonstrate that a number of the required values for the relevant criteria can be resolved as a reference to existing factual information systems.

But this is not true for all criteria. Some have to be resolved according to the second alternative strategy for collection of facts: Ad hoc collection related to the individual application. This will be true for instance for the criterion ae: "reduction caused by illness". The operative term - "illness" - must be based on an individual assessment, generally based on an individual examination documented by a medical certificate.

At this stage, one may make the rather trivial observation that the feasibility of establishing prior factual information systems is related to whether the criteria are strict or not. For vague criteria, it is uncertain what details of a factual nature are necessary to make the decision.

This again, is related to the level of generality of the criterion. Again, a rule of a thumb would be that the greater the generality, the greater the vagueness. Often in natural language statutory texts it would be tedious to list illnesses on a specific level. This might make it possible to match the diagnosis in the medical certificate with the items in the list, and from this matching decide whether the norm applied or whether this was doubtful and required further specification. The different natures of a computerized and paper based system may be very relevant to the choice of norm representation: while a list in the paper based system would fill a whole book with more or less rare diseases, and confuse the decision-maker with exceptional and specialized data; the computerized system could contain all this and only make it visible to the decision-maker on the relevant occasions.

For instance "illness" might be expanded to the standard catalogue of possible diagnoses drawn up by the World Health Organization. One might have a norm of the structure:

If (diagnosis) then (illness) or (further requirements)

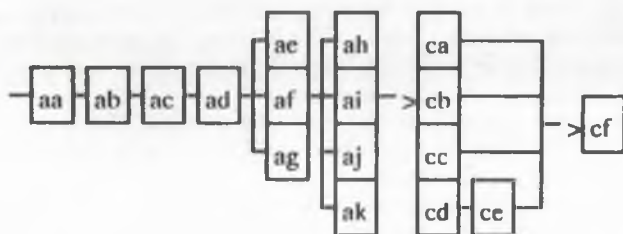
The choice of consequents would be decided by the actual diagnosis specified, and be specifically decided for each possible category. If the cause for instance was given as "cancer", the first alternative would be selected. If the cause was given as "alcoholism", the second alternative would be selected.

Again, the criterion "further requirements" could be detailed. For "alcoholism" one might check whether the applicant was "old", for instance more than 65 years. In that case "alcoholism" would be qualified as an illness, and an exit be made to the first alternative. Or it would be checked whether the alcoholism was concurrent with another somatic ailment, and whether the abuse of alcohol was the cause of this ailment - or the other way around. Again, different exits could be made for each constellation of specific facts.

One will realize that this strategy of reducing the level of generality - "extension to the left", as it may be called with reference to the arrow diagram - also is a strategy to make the criteria less vague. The assessment of whether the applicant has an illness is reduced towards the matching of the diagnosis read from the medical certificate with the computerized representation of norms. And if we presume integration with a health information system, that diagnosis may already be accessible to the social security deontic system. In that case we would have arrived at a situation very similar to those discussed above with respect to "age" or "basic amount", where all obvious cases would be automatically decided and only a few predefined doubtful diagnoses left to the decision-maker for consideration.

Actually another instance of the "extension towards the left" may be found in our example above. One will find that in the integrated arrow diagram, the consequent of one norm becomes the antecedent of another. The most typical example is the consequent al: "invalidity pension", which has as a consequent the conjunction of ba: "basic pension" and bb: "supplementary pension", of which ba again becomes part of the antecedent leading to cf and the calculation of the basic pension.

It is evident that such phrases in the natural language text only have the function of linking fragments of text, and thereby the fragments of norms represented by these textual fragments. Such "links" are for instance "invalidity pension" and "basic amount" in the example above. It is easy to see that the structure actually may be redrawn by excluding these links, and without amending the semantics of the diagram (excluding the "bb" representing "supplementary pension").



Entering the arrow structure at the level of generality of "invalidity pension", this may be explained by the prior elements in the structure, tracing the arrow diagrams from right to left.

In this way, we have demonstrated how vague criteria and links may be extended towards the left, and thereby "explained" in the sense that the decision-maker is given more specific instructions as to when the condition indicated by the criterion is valid.

A last example may be a criterion which is a reference to an underlying *expert judgement*. The NRCCL has used the theory of legal norms developed by Sundby 1974 and Eckhoff/Sundby 1976. This makes it possible to model this decision, at least as an approximation. The strategy is to identify which more specific elements may contribute to the assessment, and to assign weights to each of these elements for each of the result they may favour.

In our example, we have at least one such reference to a expert judgement, the criterion ab: "earning ability reduced". "Earning ability" ("erhvervsevne") is a crucial element in the assessment of whether the applicant is entitled to invalidity pension. As part of the assessment, the medical handicap certainly is very important. But likewise it is easily demonstrated that with an equal medical handicap the influence on the earning ability of a young and old person is different, or of a person living in a rural area or in a city. Disregarding the medical component, we may indicate some of the other elements:

education (va, vb) (wa, wb)
 training (va, vb) (wa, wb)
 job opportunities in area (va, vb) (wa, wb)
 age (va, vb) (wa, wb)
 sex (va, vb) (wa, wb)

These five examples indicate five elements which may be relevant to the expert judgement of whether the earning ability is reduced or not. For each of the elements, alternative values are indicated *va* denoting that earning abilities are not reduced, *vb* that they are. Likewise, alternative weights are indicated, *wa* indicating the weight of the alternative favouring the result that earning abilities are not reduced, *wb* favouring the result that the earning abilities are reduced.

It will be acknowledged that this is only an example indicating the principle of designing a model of a expert judgement.⁴

The theory on which this modelling is based, also identifies limitations of the models. These are of two categories: First, the models operate with a finite number of possible relevant elements, while in theory the number of possible relevant elements is unlimited. Second, the models have to assign some definite weights to the elements, while in theory these weights will be relative to the presence of other elements and their values, to time and perhaps to the pragmatics of the problem. But even if the limitations of the models are emphasized, it will be easily appreciated that this specification may help the decision-maker. The help is more structured than the help offered by a textbook or administrative instructions. Trivial expert judgments will be identified, and more difficult decisions may be given a closer scrutiny.

3.3 Structure

The structure of a norm is generally less open to doubt than the criteria embedded in that structure. But the structure also is part of the interpretation of the text, and there are numerous examples of how a natural language text is ambiguous in logical terms.

Our example offers one such instance, though perhaps not of the most explicit nature. As have been demonstrated, to be entitled to invalid pension, the applicant will have to undergo some sort of training or therapy with the objective of making the applicant able to cope with working life. In the statute, four alternatives are specified - *ah*: "rehabilitation", *ai*: "therapy", *aj*: "training" and

There are several reports of the NRCCL discussing expert judgments and models of such decisions of a binary nature, for instance Borchgrevink/Hansen 1980, Hansen 1981 and 1985 and Bing 1985. In these reports, also the limitations and possibilities are discussed at greater length.

ak: "similar effort" (the last obviously being a very vague criterion which might be treated as such through an "extension to the left").

Our point in this context is that these are seen as disjunctive criteria. But this is by not necessarily true in a strict logical sense. In a specific case, therapy may have been tried without success. This implies that the medical defect has not been overcome by therapy alone. But the applicant may be in a position - due to the nature of the medical handicap, his or her education or otherwise - to respond very favourably to rehabilitation. The issue would then be whether the applicant could maintain that as long as the primary therapy has failed, the applicant is under no compulsion to accept rehabilitation the test is positive, and the applicant is entitled to invalidity pension.

This would seem contrary to the objective of the statutory provision. It may therefore be ventured that the disjunctions of the statutory language should not be interpreted in a strictly logical sense. It is not sufficient that one and only one alternative has been tried so long as one of the other alternatives offers a real possibility of bringing the applicant into a situation where the earning ability is retained. In the example, this may perhaps be represented by restructuring ah-ak:

- ah and (rehabilitation has been tried)
- ai or (therapy has been tried)
- aj or (training has been tried)
- ak and (other similar efforts have been made)

In this restructured segment of the norm, ak: "similar efforts" are seen as conjunctive to the elements ah-aj rather than disjunctive. This implies that the applicant would have failed to respond in a positive way to one of the strategies indicated by criteria ah-aj, and also has failed with respect to other possible strategies, where these other strategies include those two of the three strategies ah-aj which initially have not been tried.

It is rather obvious that to the extent that the natural language text includes structural ambiguity, this has to be resolved in the deontic system. This type of uncertainty may be expected as lesser than the uncertainty associated with criteria. Nevertheless, it should be appreciated that the structural ambiguity would not make its presence felt most strongly within the context of a single statutory provision (as in our example), but within the context of normative fragments relating to quite different provisions within the statute, or even provisions in different statutes. Therefore the limited context of the example may be misleading as to the nature of this problem.

3.4 Deontic categories

So far, the problem of representing norms has glossed over the fact that the norms may have quite different deontic categories. One norm may state that given a certain antecedent, this results in a certain *permission*. Another norm may state that given a certain antecedent, this results in a certain *obligation*. The number of necessary deontic categories may be a matter of dispute, but it should be made very clear that the categories used in first order logic true and not true - are insufficient to represent the logic of norms.

The logic of norms, or deontic logic, is itself a science with traditions. These traditions have so far not been successfully integrated and absorbed by those working on deontic systems. Obviously, those concerned with the trivial deontic systems may with considerable justification maintain that the ideas of deontic logic are of little consequence for their bread-and-butter problems. But for a serious attack on the problems of deontic systems, the deontic categories have also to be taken into account.

This would imply firstly that the number and nature of deontic categories have to be decided, secondly that the strategy for their incorporation in the programs has to be resolved. So far, McCarty has been the one researcher most directly trying to bridge the gap between the traditions of AI-programming and deontic logic. In one of the appended reports, Andrew Jones suggests another approach, commenting upon the strategy of McCarty. It is suggested that this dialogue promises a better understanding of the incorporation of deontic categories.

It is believed that only with an understanding of the deontic categories may the normative structures be sorted into the appropriate hierarchical systems. This would seem necessary for more ambitious attempts of handling normative structures which govern the decision situations also of mass administration.

3.5 Primitives

In this section, we have been concerned with criteria used in norms, types of norms, structures of norms and deontic categories. The combinations which these different factors may fuse into, probably represent a very large number. But there is still the underlying belief that by analysis and categorization, it is possible to determine a finite set of elements. There are indications in the discussions above of such categorization:

As far as criteria are concerned, the distinction between vague and strict criteria has been discussed; the criteria referring to an underlying expert judgement have been mentioned, and criteria functioning as links have been exemplified.

As far as types of norms are concerned, a distinction is made between rules and expert judgements, where the sub-norms of the expert judgement is of a nature different from other rules. Legal theory will include different distinctions which have not been discussed above. In the appended report by Malt, this issue is analyzed in some depth, though the analysis is still tentative.

As far as structures are concerned, we have used arrow diagrams to demonstrate the structure of some examples. No attempt has been made above to suggest types of structures. Fiedler 1980 and Barthel 1980 have both made references to structures of computer programs in discussing the possible structures of legal norms and this possibility should be pursued. The formalism SMARN, discussed by Hansen in the appended report, does also have an implied structure of norms.

As far as deontic categories are concerned, this has only been mentioned above. There is still considerable uncertainty as to what extent it is necessary or desirable to incorporate deontic categories in the representation, and how this should be done. In the appended report by Jones, however, a strategy is suggested for approaching this issue. Together these contributions make it possible to maintain as a hypothesis that it should be possible to develop a finite set of primitives from which any representation of a norm could be built. The primitives would themselves be simple, but could be stuck together to systems of incidental complexity to represent any norm structure.

But even if this was achieved, it should be pointed out that this would only model the law. That would still leave the task of modelling the facts appropriate to the legal domain represented. A similar problem would face the system designer in

his respect - which basic elements, and relations between elements should be modelled? How to take time into account?

As far as facts are concerned, the perspective of F*KUS represents a imitation and a and a reference to a domain where facts already have been identified and their possible relations explored. It will probably be easier to solve the problem of factual representation in this perspective than in the gnereal perspective. The emphasis of the F*KUS project will not be on this issue.

But, nevertheless, to achieve a F*KUS system, both law and facts have to be represented - and represented in such a way that stored facts can be classified by the criteria of the represented norms, thereby starting the process which brings his "law machine" into operation.

II THE F*KUS WORK STATION

In Part I, the different theoretical issues basic to the F*KUS concept were introduced. In this second part, we will introduce the different elements of what may be seen as a F*KUS work station. This is an integrated work station where the different elements described can be handled. It should at this stage be considered as a purely theoretical or conceptual work station - there being no implications of choice between powerful personal computers netted to central facilities, or a more centralized solution. Obviously, the work station implies considerable computer power to the assistance of the user as well as communication facilities.

We presume that the work station will also have other functions than those essential for the F*KUS concept - for instance word processing, electronic mail or teleconferencing, spreadsheet programs etc. It may be desirable to integrate such functions in the work station, but we have in our discussion only sketched those elements which are essential for the F*KUS concept.

4. Forms and form processing

Forms have become a symbol of a bureaucracy. In a sense, the forms specify at which level of generality facts should be collected, and which categories of facts are relevant. The structure of the form is obviously related to the underlying legal norms, and based on the interpretation of these norms by the designer of the forms.

Forms therefore have legal relevance, though they have rarely been studied in a systematic way by lawyers.⁵

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5. The NRCCL has initiated a project analyzing the forms used in the social security administration for old age pension. The objective of this project is to analyze and
- Continued on next page

The justification of using forms, is mainly that of efficiency. By adopting the standardized structure of the forms, it is easier for different persons to cooperate within the frames of one case. Also, forms furnish information to the one filling in the form - though this information typically is terse and incomplete. The form also is some sort of minimum guarantee for the indicated issues to be considered with respect to each case.

Forms are filled in partly by an applicant, partly by the civil servants in the public administration. The forms will generally be filled in by several persons - for instance by a civil servant conducting the interview of the applicant at the counter, partly by the decision-maker (who may be a different person) and partly by persons doing calculations etc (for instance related to computerized processes). In our sketch, we make no clear distinctions between different "form fillers", but this would have to be looked into for each application.

As the basis for our discussion, we take the situation where an applicant appears at the counter of the public agency. Behind the counter is a civil servant with the appropriate authority to make decisions - at least preliminary decisions - in the case of the applicant.

The type of cases has been structured as forms. These forms are computerized, and appear as screen images on the work station of the civil servant. In principle there are no differences between the form as seen on the screen and the form as seen on a printed paper, though the functions will be different. The form is still a set of empty boxes with textual explanations or indications.

The dialogue between the applicant and the civil servant will start by the applicant identifying himself or herself. In Norway, this will imply that the applicant specifies the personal identification number (PIN) which is a unique personal identifier.⁶

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describe the forms in a legal perspective, identify the changes in the forms taking place from the start of the current scheme in 1967 up to date, trace the causes of these changes as well as characterize these changes in an appropriate way (for instance replacement of expert judgments by strict criteria).

The differences compared to a system without PINs are minor. But where in the Norwegian case the identification is reduced to a question of authentication (the applicant has the identity claimed, proven if necessary by an instrument for identification, like driving license or passport), in another system one might also

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When appropriate identification is entered into the system, the system will make an automatic access to the factual information systems available. For instance address may automatically be added to the form, age, marital status, children, income information etc. The form will be filled in with all the factual information available through systems in the agency, or to which the agency has access. The civil servant does not have to ask the applicant for this information, unless it is desirable to verify the information or inform the applicant of the facts, making it possible for the applicant to challenge them and making the applicant aware of the amount of background information available.

Rarely all information will be available. The system will now guide the civil servant to the facts of the highest priority. These will be facts which, when specified, may be combined with other facts and further complete the form. Or it may be facts which represent absolute conditions for a positive response to the application made.

This then will be an automatic and guided filling in of the form. It is quite close to what takes place in current computerized systems, though the guidance should be emphasized and seen in relation to the explanation feature discussed below.

The explanation feature is related to those found in expert systems. The user may at any time ask "why?" to the system, and will then be presented with an explanation. This explanation would initially be given in a window opened in the form, giving a prepared brief statement on why the fact is necessary and its function in the decision.

This would make it easy for the user to offer explanations to the applicant at the terminal, also in exceptional cases.

The explanation function could be amplified by a "pretrial" feature. The system traces the values given to the different specified facts. If facts are sufficient to decide the case, the user is advised. For instance, the income of the applicant may be too high for the applicant to be eligible for a certain benefit - the system would then advise the civil servant of this at the earliest opportunity, and the civil servant could advise the applicant. This would perhaps not only cut down on case handling time, but also make the applicant aware - at the earliest possible time - of facts which might be challenged. "Pre-trial" advice could also identify critical

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have to verify who he or she is out of several persons with the same name and date of birth.

elements in the decision - for instance that the outcome would rely on certain unknown variables (for instance the result of a medical examination) or the result of a non-computerized discretionary decision.

It should be emphasized that this "pre-trial" advice is by no means a decision, but only a guide for the civil servant, giving assistance in understanding the case and identifying the critical issues which it may be appropriate to bring to the attention of the applicant. It should also be pointed out that this explanation function has three levels of complexity. The first level giving prepared explanations of the function of elements in the form - is rather trivial, and presumes only that such explanations are actually written and linked to the relevant elements in the form. The second level is the monitor of values specified for variables, which may identify that certain threshold values are reached (too high income for the benefit in question). These are also quite trivial, though the threshold levels have to be identified and maintained. The third level actually makes "pre-trial" interferences of the specified facts. This presumes that some sort of model of the norms in the domain of that type of case is available and exploited for this purpose. This is related to the advice or expert system discussed below at 5.

Explanations should, however, be taken one step further - be amplified. It is presumed that the system has access to a data base of relevant legal sources. The coverage of this data base will perhaps never be total, but it should clearly include all primary legal sources (statutes, regulations, administrative instructions, published case law).

The explanations are explicitly linked with the texts in this data base. If the civil servant - or the applicant - desires further information than the brief statement given initially, these links will guide the user into the full source material. The user will be able to cite statutory provisions, examples from case law etc. It may be seen as a lengthy process, but it should also be taken into account that the civil servant will have considerable background knowledge, which will make it possible for the civil servant to avail himself of the textual information.

These links will have to be explicitly forged and maintained. The maintenance should not be underestimated, and may be a practical obstacle to realizing this concept. Therefore means for more automatic maintenance should be considered, and the concept of a norm-based thesaurus - discussed below at 7 - may offer this potential.

In this respect another aspect of the system should be emphasized. Above, it has been indicated how current systems as aids only offer a limited book of administrative introductions of standard case procedure to the civil servant. In this situation, a wealth of material is provided. The civil servant has the possibility

really to investigate a case, there are no limitations to the possibility of understanding the law of the case apart from the limitations in the source material itself. The system can be compared to a computer-aided instruction (CAI) scheme, where the user is offered the full support of the information available in the legal system on that particular topic - not only a limited selection of material and examples made by one author.

The desirability of such a situation seems obvious, both in a "rule of law"⁷ perspective, and in the perspective of job satisfaction. If, however, there is some theory of "management by information deprivation" implied in the current situation, this development may be seen as a problem.

As a support in the decision situation when filling in the form, the user is therefore offered a range of help features. The form is filled in as far as possible by utilizing accessible files. The system guides the user to the next item which has the highest priority with respect to the result. The system alerts the user when "pre-trial" results seem obvious, and tentative "pre-trial" results can at all times be obtained - listing the critical elements missing before a result can be reached. Explanations are available, partly as a trace through the normative model of the domain, partly as textual explanations leading from a brief explanation on the surface level through links to the legal source material itself.

A last feature should be mentioned - a case management feature. When an application is filed, a decision can rarely be made on the spot. Further facts have to be collected. The case is moved from one civil servant to another, passed between agencies etc.

The system should incorporate possibilities for case management.

Facts routinely collected from files held by other agencies are collected in much the same way as from files held by the agency itself. The system would generate requests for data and retrieve these from the appropriate files, for incorporation in the form. As there may be a time delay, these facts would only appear after a lapse of time, and not necessarily be available to the civil servant in the initial session.

Likewise, the system would generate requests for information held by other agencies in non-computerized form. These requests could be forwarded through a computer-communication system as electronic mail, or be printed out at the agency

7. An insufficient translation of the Norwegian term "rettssikkerhet", corresponding til the German term "Rechtssicherheit".

is a conventional postal request. In the latter case, data would have to be recorded when an answer is received.

In all the situations involving requests to outside agencies, it may be desirable for authentication routines - some requests for information are only forwarded when necessary, and this decision should be left to the responsible person within the relevant agency.

The case administration system would therefore list possible requests to the decision-maker, and forward these only when authorized. In this situation also, the decision-maker may have further information on why a request is made. The case should be traced. This implies that any inquiries relating to the case, can be routed to the agency or the person currently responsible for the handling of the case.

If accessed, the case should be able to declare its current status, the time spent at the different stages and what is the next step for reaching a decision.

The case management system should be able to generate statistics on live cases, sorted for instance on time elapsed since application, priority assigned to types of cases, etc. Examination of case management features in systems for the administration of justice may be appropriate (for instance Inslaw PROMIS system for public prosecutors).

These case management features may in practice be of great importance to an administrative agency, but within the F*KUS project it may perhaps be less appropriate to concentrate on this aspect of the concept.

5. Expert system

Above a deontic system has already been outlined with respect to giving advice when filling in a form. As far as the decision-making is related to forms, this feature will incorporate the expert system with the decision-making system itself, where especially the features of identifying critical elements in the decision, assigning priorities to which facts should be collected, and calculation of "pre-trial" results are related to expert systems.

One may, however, need an expert system outside the context of actual decision-making. A typical example, which shall be considered in this section, is where a potential applicant approaches the agency for advice - for instance related to individual planning.

In this case, many of the same elements can be exploited as those mentioned with respect to the form-related system. The structuring of the domain in case types, and the structuring of each case type into facts (corresponding to the criteria of the relevant norms) and the normative relations between the facts, would be the same.

It is taken for granted that the expert system would have a conventional structure of on one hand the facts and on the other hand the rules and interference mechanisms, ie a deontic system.

Typically, the facts within the domain has either to be based on a model and specified by the user during the session with the expert system. In this case the model of the live deontic system can be adapted for giving advice. Or, if advice is to be given to a certain, identified individual, the system can draw on live data files and assign values to all variables available through the systems of the agency itself. This possibility to exploit data of an individual nature collected prior to the session, is an interesting possibility not typical for expert systems.

Also, the facts collected from the applicant can obviously be collected through an interview in the session with the expert system. Also, as the context is that of advice rather than decision, the verification procedures of these facts can be relaxed at the risk of the applicant.

But several elements cannot be resolved in this way. The facts to be collected from other agencies, and based on investigatory reports. Here assumptions will have to be made, assumptions mainly based on response from the applicant. As the premisses are laid open, this will be acceptable. But the possibility to follow alternative routes should also be maintained.

Not only do facts have to be resolved. The decision system will certainly incorporate manual sub-processes which will have to be simulated. This is partly classification of facts according to vague criteria, partly discretionary decisions. In both cases models can be established to simulate the process involved vague criteria can be resolved in a combination of more specific and less vague criteria, and discretionary decisions can be represented as a combination of weighted sub-rules (a SARA node). Obviously this will introduce uncertainty, but this uncertainty will be tagged on to the tentative result arrived at with the help of the expert system. Such tags will then describe the presumptions and uncertainty associated with the result, and help the civil servant to explain to the applicant how to interpret the result, to what extent one may rely on the result etc.

Expert systems can be data or goal-driven. The description above is of a data-driven expert system, where the result is the conclusion of an application of rules to data specified as an antecedent leads to a consequent. It is possible to identify

critical elements in this network of normative relations, and alternative runs may be made with a different presumption.

It is obvious that the data-driven mode is necessary and useful. In legal decisions, a number of facts cannot take on alternative values with respect to the applicant. Goal-driven expert systems are only interesting where there is some freedom for manipulation of the facts. For instance, the expert system may be used to give advice on some future situation, and as facts still have not manifested themselves - but are only reported probabilities - it may be meaningful to have information on how to exploit this freedom in order to arrive at a desired goal.

This is very evident in individual tax planning, where the goal may be to minimize tax on a certain income. Here the expert system may advise the user on exploitation of investment schemes with favourable deductions associated to them and similar means of bringing down the taxable income. This would be advice to use the freedom to make future decisions to arrive at a set of facts at some future date which would secure the desired goal.

Also in other areas, for instance social security, similar goal-driven applications may be desirable - though the time horizon often will be longer than with respect to tax planning, involving retirement age, relations to spouse and children etc.

Consequently, the expert system should be allowed to function in both a data and a goal-driven mode.

So far it has been presumed that the expert system is being used by the civil servant to give advice to some applicant. This is often a presumption emphasized with respect to expert systems, as many of the decisions to be made when using the expert system need the expert knowledge of the civil servant as an expert within the domain.

In this respect, however, it may be indicated that also the applicant himself or herself may have sufficient background to use an expert system at least in the simplest versions. One may, for instance, look to an expert system explaining the calculation of old age pension at alternative retirement ages, coordination of social security with employer benefits, different family situations and - perhaps - different choices of country of residence. Approaching the lower threshold for old age pension, an applicant might want to have detailed instructions regarding the probable pension and how this is calculated. The legal rules involved are generally based on strict criteria, but are of a detailed and complex nature which makes explanation by a civil servant perhaps somewhat tedious. In an expert system, the applicant could see in detail how the pension was calculated as a product of different coordinated contributions, how choice of retirement age would influence the pension, etc.

A point in this respect is that old age pensioners, in contrast to many other categories of social security clients, have personal resources probably corresponding to the average in the population. Therefore there may be a substantial fraction of those approaching old age which have a background making them quite able to handle a computerized expert system, being used to computers and able to grasp the necessary legal information presented through the session.

Therefore, though applicant-oriented expert systems may not in general be a good idea, there may be categories for which this would work and be a welcome additional resource for the social security local office.

In an appended report, Hansen considers in some detail how an expert system for old age pension could be realized, and which role the formalism SMARN developed at the NRCCCL could play with respect to such a development. It should be emphasized that the F*KUS project in this respect should be oriented towards exploring different approaches to designing expert systems for mass administrative applications. The SMARN formalism is therefore only one of several alternative formalisms for creating the underlying deontic system. It would, for instance, be tempting to explore the possibility of using PROLOG as a formalism, drawing on some of the experiences at Imperial College in creating expert systems for the Department of Health and Social Security in the United Kingdom, see for instance Sergot et al 1986. It should also be borne in mind that to realize a deontic system, the basic problems of such systems discussed above must be considered - the need for deontic categories, the categories of primitive types and structures of norms. The development of expert systems in this area therefore presumes the continued interaction between law, logic and informatics. While some ad hoc programs probably rather easily may be established for a given application, the more general understanding of which elements appropriately should be established as primitives for such systems is a more long-term and ambitious objective.

It is our belief that this more ambitious long-term objective would profit from less ambitious and more ad hoc implementations of examples. It is therefore seen as desirable that an area of law such as old age pension is explored and described in a rather exhaustive way. This description would then also be a specification of the legal domain to be modelled. It is suggested that this may be a background both for in-depth studies on which primitives to define, and for experiments with and design of ad hoc systems.

One should be careful within the F*KUS project not to define as an objective the development of an operative expert system for any mass administrative application. If this is seen as desirable, such development should take place outside the F*KUS project. It is, of course, hoped that the F*KUS project will stimulate

o such initiatives. Therefore the project organization should take into account that the project ought to be open for participation both for external research groups and for public agencies.

6. Text retrieval - enhanced user interface

In the F*KUS concept, the texts of legal sources are available through a text retrieval system. Above it has been discussed how the texts are linked through the form-related system, making it possible to retrieve texts discussing the issues basic to the elements of the form.

In addition, there has to be access to the text through an independent user interface. This is achieved by making the texts available through a general text retrieval system like, for instance, NOVA*STATUS (currently used by the Lawdata foundation) or - more desirable - SIFT.

There are at least two reasons for this independent access to the sources.

First, the rather obvious fact that the user may want to explore a legal issue not related to an actual case, and therefore not related to a form. It would be a nuisance to go through the procedure of filling in a dummy form for accessing the legal sources.

Second, and more important, the relation between the information in the sources and in the domains defined by forms and deontic systems. Obviously, the sources will cover issues not contained within this domain. It is the nature of law to have relations crisscrossing the whole legal system. Working with social security law you may want to access labour law, look at family law or the law of damages, cases on insurance law etc. The F*KUS work station is linked to the general legal information retrieval service, and gives access to the whole range of legal information embedded in the legal sources. The domain circumscribed by the deontic system is supplemented by the - in principle - unlimited domain of the texts.

6.1 Linguistic and related strategies for construction of search requests

As many other end-user oriented computer systems, the error messages and help functions are essential in order to assist the user and correct improper use of the functions of text retrieval systems. But the current systems are insufficient in this respect.

A classic problem in text retrieval is *misspellings* - not so much in the material, as service providers like the Lawdata foundation enforce quite admirable standards of data quality - but in the search requests themselves. Empirical indications of a rate of 8-10 per cent misspellings in the requests illustrate that this is a grave problem (Fjeldvig 1985). Of course, not all misspellings are caused by the user directly, but may be caused by dirty telephone lines, local editing that results in search terms including carriage returns or other special characters, etc. Such causes should be satisfactorily solved by proper design of the F*KUS work station and the interfaces to communication systems.

In a Boolean argument where a misspelled word is AND'ed with other search terms, the result will be an empty set - and the system will return with the neutral statement of NO DOCUMENTS RETRIEVED. The user is simply not told that one of the terms did not occur in the search file.

This is a simple and obvious example of defects in help functions, which may easily be corrected by the system returning with information of the non-occurrence of the term in the search file, and perhaps a suggestion of checking the spelling of the word.

But this is only one example of exploiting some of the most simple and naive information on the words contained in the data base. Other examples may be given.

One main example will be the identification of "*noise words*". When constructing the data base, certain words will be excluded as a type of words not adequate for characterizing the content of any documents - words like conjunctions ("and", "or", "but", etc), pronouns ("he", "it", etc), modal verbs ("is", "has", etc) and so on. The number of words qualified as stop-words on the input stage is, however, quite small - generally between 50-200 different words, which between them, however, make up some 40 per cent of the total number of words in the texts (statutory and case law alike).

There are, however, other words which are meaningful in certain contexts, but less meaningful in other contexts. Words evenly distributed throughout the data base will not by themselves be adequate for distinguishing relevant from non-relevant words, though they may be important as elements in phrases. "Judge" may not be a very adequate search term in a case law data base, but combined with a certain surname, or in a request specifying that it should occur in the same sentence as the word "negligent", it may be quite adequate.

Exploiting words statistics available within the system, it is quite possible to identify such "noise words" and warn the user of their inclusion in the search request. Traditionally text retrieval systems incorporate warnings only for words associated with a very high number of addresses, which would indicate a high frequency word form.

There is obviously a positive correlation between high frequency and even distribution, but this is true only in general. The warning of high frequency is generally given for the user to abort search requests implying high costs or long processing time, not to secure retrieval performance.

The review of arguments to identify noise words becomes important also when the user truncates a word, which any experienced user will do as a matter of course. Such *truncation* will ensure that variable endings of a word form may be included. But frequently it has the effect of including noise words among those terms specified by the truncated term. Using linguistic statistics and rules, the result of the truncation should be reviewed, and the user should be alerted to the inclusion of noise words.

With respect to truncated terms one should, however, also give additional information. In languages with *compounded words*, one may employ linguistic rules to identify which of the terms specified are compounded terms (cf. Fjeldvig 1987). Meaning often varies when words are compounded, the user should be alerted to the possible inclusion of compounded terms and have the option of displaying them for editing this extension of the search request. The same linguistic rules may be used to identify compounded terms part of the search request, and give the user the option of expanding the requests to include the elementary words as synonyms of the compounded word. This would especially be important if the user specified his request by other means than Boolean requests, for instance in natural language requests. Truncation is an efficient and simple method for expanding search requests. Statistical analysis of actual requests shows, however, that the method is not used properly by the majority of users - words are truncated at inappropriate places, or not truncated where this would clearly be appropriate. It is suggested that the system should include *automatic truncation*. Based on a linguistic analysis of the words of the search request, these are automatically truncated at that

location in the word which is statistically indicated to be most appropriate. The better strategy may be to discard the traditional truncation in favour of identifying the lemmata (linguistic basic forms) of the word, and using the lemmata as the basis of truncation (cfr Fjeldvig/Golden 1984).

In addition, compounded words in the search request are split, and the elements also truncated. Irregular nouns and verbs in the request are identified (based on rules supplemented by look-up tables), and the irregular forms are included. The resulting terms are reviewed for exclusion of noise words, and the final request is processed in the traditional way.

One will notice that these suggestions are basically simple, though some of the linguistic methods are non-standard and not readily available. They also have to be developed for each language in question, though once developed, the rules may be applied to any use of that language.

It will also be noticed that all these methods rely on a processing of the search request and utilization of statistics of the words in the data base. There may be several advantages in actually processing the words when creating the files of the text retrieval system, for instance identifying compounded words in the inverted file, indicating the lemmata for each word form etc. This has, however, several drawbacks. One is the simple practical point that this implies the recreation of the existing files, which in many cases may be associated with prohibitive costs. Also, the method does not presume the creation of thesauri or other preconstructed extensive lists of words which have to be manually maintained.

In any case, one should take care not to introduce some method that reduces the available information in the inverted files.

In some cases the word forms in the inverted files have been reduced to basic forms in order to make automatic inclusion of plurals and the different forms of a verb. This has for instance been done in LEXIS, where plurals etc will always be included even without truncation. This may be appropriate in some instances, but information is lost. Where there are reasons for distinguishing between the singular and the plural, this is not possible (between "people" meaning persons and "peoples" meaning inhabitants of several countries), or where the linguistic processing has been insufficient (the noun "goods" being taken as a plural of the adjective "good", which would have been avoided if one had relied on an identification of the proper lemmata).

5.2 *From help to intervention*

The exploitation of linguistic and related information is generally used to strengthen the help functions of the system. Moving to a more general point, it should be emphasized that there are indications of conventional help functions not being used as the designers have hoped. Users often find help functions too general, being a compact and computerized general manual to the system rather than a function zooming in on the particular point where the user has encountered problems. If the help function is particularized, there is nevertheless only a look-up function: The user is given instructions on the point in the program where he is engaged, but the help program does not analyse the actual search session for finding indications of what may have gone wrong.

These shortcomings of the help program may be dealt with, but more critical is the fact that the user does not ask for help when he clearly is not coping properly with the system. It would seem that it is not sufficient to rely on the user to require help, the passive help function must be replaced by the active intervention of assisting offers and suggestions for improvement.

One may find this too intrusive in the user's dialog, and this may well be the case for experienced users. This would, however, be an argument only for implementing a switch of the interventions - and the default would be a program actively intervening and advising the user.

Obviously such interventions will demand a high degree of quality in the program. Passive help functions may be sloppily designed, they will not be exploited unless explicitly activated by the user. But interventions will come unasked for, and must therefore be to the point and allow flexible response. The design of such intervention functions will therefore be a major step towards creating an "intelligent" text retrieval system.

6.3 Natural language search requests

Text retrieval systems are traditionally based on formulating search requests based on Boolean logic. The search terms are combined with logical operators - mainly conjunctions and disjunctions (with "distance operators" as a strong version of conjunctions, working on smaller documentary units than "one document"). The documents retrieved will be that set satisfying the requirements of the Boolean arguments using the vocabulary of the documents as the relevant properties for forming sets.

User research demonstrates beyond doubt that lawyers and civil servants as average end users cannot handle this type of requests properly. What may seem simple in an abstract demonstration becomes obviously cumbersome when in an attempt to translate a problem into a search request. The result is a rather large fraction of improper arguments (where the logic is mixed up), and a strong inclination to use simple requests - simple meaning either only one word or two or more words combined with AND.

This is often emphasized by recommendations from the service providers, advising the users to cut the answer set "down to size".

Using a simple request consisting of only one word, the user may often retrieve a large number of documents - easily more than 100. The user will then commence by adding AND-requirements to the request until the answer set is sufficiently small to handle.

One of the reasons for the survival of this search strategy is the belief that it is "simple". As mentioned, it is not simple in the sense that users do not always successfully cope with the logic. And it is not simple in the sense that the strategy makes it difficult to formulate search requests resulting in high recall ratios.

The second reason is the attitude of the users, who maintain that they are "satisfied" by the result. This, again, is mainly based on an illusion.

If a large answer set is the result of an initial request, this may have one of two causes.

Either the search request is too general compared with the problem of the user. In that case it is quite proper to constrict the request by additional conditions for retrieval, for instance in sub-questions, until the proper level of specificity is reached.

Or the problem is of such a general nature that a rather large number of the documents in the data base is potentially relevant. In such a case, additional

requirements are improper. If the additional conditions are related to the problem, it will improve the probability of the documents of the answer set being relevant. But it will also exclude relevant documents from the initial answer set. It is actually some sort of Boolean lottery, where the user is presented with an incidental document of somewhat higher probability of relevance.

As the user actually retrieves a relevant document, he is quite satisfied. And, moreover, as he has no alternative research method to disclose the low performance of his search, dissatisfaction is not generated through this.

Recent user research based on controlled experiments has actually confirmed this hypothesis, the experimenters finding the retrieval performance rather low while the users reported that they found this to be high.

It may therefore be maintained that the current Boolean logic is a curse of text retrieval systems, forcing them to operate on a too low level of performance without any good reasons. This has been pointed out by several researchers in the past (not least Gerald Salton).

Alternatives should be introduced.

An alternative developed by the NRCCL (though parallels may be found in the literature) is what is known as the *conceptor-based method*.

This presumes that the user imposes some structure on his problem. Unlike the Boolean structure, the user is not invited to think in terms of conjunctions or disjunctions (which nevertheless are introduced by the system), but rather to identify the elements of which his problem is composed. There may be as many elements as he thinks are appropriate, or only one element. And there are no real adverse effects of adding an extra element, having blurred distinctions between elements etc.

The user is prompted by the system to describe his elements by words or phrases. In this way, classes of synonyms are actually formed within the context of the problem. Due to the structure offered by the system, the user is encouraged to use as many words as possible.

When all classes are described, the system will retrieve all documents containing at least one of the specified terms in one of the classes. Then the documents will be ranked, using class frequency as a primary rank criterion (those documents with words from the largest number of classes being the top rank set), and word frequency as a secondary rank criterion (placing on top the document in the top rank set with the largest number of occurrences of words from the request). The result is presented to the user as a list of ranked documents with cutoff levels representing rank sets corresponding to class frequencies, and within each rank set, cutoff levels indicating word frequencies.

Actually, the rank sets may be represented as Boolean arguments. A class (C) will consist of search terms (s), making the Boolean definition of a class:

$$C = s1 \text{ OR } s2 \text{ OR } \dots \text{ OR } sn$$

Presuming three classes, the top rank set will be represented by the Boolean argument:

$$C1 \text{ AND } C2 \text{ AND } C3$$

There are, however, a number of important differences from the Boolean strategy:

- the user is encouraged to think in terms of "elements of the problem" rather than logical relations, which are more appropriate at least for legal applications
- the user is encouraged to specify synonyms
- the performance is enhanced

It should be emphasized that the performance is enhanced because of the secondary ranking. In a recall-precision diagram, the result of the Boolean search is a point. The corresponding top rank set of conceptor-based retrieval will have as many points as there are secondary cutoff levels based on word frequency. The *average performance* of the top rank set and the corresponding Boolean argument are identical, but the conceptor-based retrieval smears the single point into a line - making the probability of the first document being relevant higher than the case would be with respect to Boolean retrieval.

Also, if the request is overstated with a too large number of classes, the top rank set may be empty. This will not result in no documents retrieved - the top document will simply belong to a lower rank set than would be possible in theory.

The user will start with the document of the highest relevance probability, but it will depend in the user's own judgement how far down the ranked list of document he or she will want to move. In some situations there is only a need for one or two relevant examples. In other situations one will have a need for exhaustive research. The system leaves this choice with the user, who obviously is the one to decide.

There are other forms of ranking methods suggested as alternatives to Boolean arguments. It may be possible to argue the case of the conceptor based method with respect to alternative ranking methods, but the important point is that text retrievable systems will not achieve a sufficient performance unless the

traditional Boolean arguments are abandoned. As the discussion of the concept-based method demonstrates, there is no *technical* argument in favor of Boolean strategies - the same process of retrieving and matching addresses is involved, and the extra processing for ranking is hardly an issue.

The introduction of concept-based retrieval also makes it possible to introduce even more user friendly alternatives for formulating a search request. At the NRCCL, methods for handling natural language search requests have been developed. These methods combine a number of the features discussed - in a natural language search request "noise words" are identified. Each of the remaining words are taken as the core of a concept, and the class of synonyms is constructed basically by automatic truncation or identifying of lemmata, and other means for automatic expansion at the system's disposal. The result is a ranked list of documents.

Experiments have proven that even this simple form of natural language processing is quite effective. Even though performance will not reach the level of a more structured request, one has nevertheless been able to offer a method which is extremely simple.

It may be easily seen that the natural language search request may benefit largely by some of the devices suggested, for instance a radical strengthening of system feedback and system-user interaction throughout the terminal session.

6.4 Implementation

In these sections, ideas already explored over the years in research projects at the NRCCL have been presented.

The concept-based retrieval strategy was developed and formalized in the beginning of the 1970's, and is currently implemented in the NOVA*STATUS and SIFT systems.

The strengthening of help functions has been achieved to a certain degree in the SIFT system, where the text retrieval system will leave the command driven mode and enter a prompt mode when the user indicates a lack of understanding of which parameters to specify. A further level of help is given by explaining each prompt.

The SIFT system lends itself easily to further enhancement, and work has been carried out by the Lawdata foundation in 1984-85, preparing a simplified user interface to SIFT. The interface - known as SIR, an acronym for "Shell for information retrieval" - was made operational in the Lawdata system autumn 1986.

The linguistic tools have been developed in two research projects at the NRCCL since 1979 (STANS and FORT, both projects within the NORIS research program) funded by the Norwegian Research Council for Science and Technology NORDINFO and other sources, in cooperation with the Lawdata foundation, and the Computer Center for Research in the Humanities at Bergen. These activities have been directed by Tove Fjedvig and Anne Golden at the NRCCL, and the different aspects have been reported in a number of publications. The final report, integrating all the aspects, is expected spring 1987.

This work has been carried out within the framework of the NRCCL laboratory for text retrieval (NOVA*STATUS with the extension VEXT). The programs have, however, an *ad hoc* nature. Therefore they should be considered at this stage "only" as a set of tested methods, not as programs readily incorporated in an existing text retrieval system.

Consequently there is currently available a number of possibilities for enhancing the general user interface for text retrieval systems which can be incorporated into the F*KUS concept with relatively modest resources compared to the radical change of text retrieval implied.

7. A norm based thesaurus

The last feature of the F*KUS work station will combine both the representation of norms in the deontic system, and the text retrieval feature. This may be seen as a supplement to the natural language retrieval strategy.

The idea of the norm based thesaurus is to:

- (1) Combine some of the features of an expert system with a text retrieval system, representing in a deontic system the normative structure of the information held in the unstrapped texts of the text retrieval system; and
- (2) propose a scheme of self-maintenance of synonym structures.

To explain the concept of the norm based thesaurus, one may start with the second of these aspects.

7.1 *Relevance feedback and thesauri*

The major problem in text retrieval is developing a search request with the sufficient number of alternative terms representing the problem. An idea may in natural language be expressed in a great many ways, and in the uncontrolled vocabulary of legal prose many are actually used. There are the hierarchical variations: Your problem may concern "domesticated animals", while the case employ phrases like "bull", "goat" or "stallion". And there are the vertical variations - from the obvious meaning of "domesticated animal" indicated above to peripheral and dubious examples as "pigeon", "fox" or "reindeer".

This problem is actually also present when documents are constructed from defined indexing terms, as empirical research has disclosed a lack of consistency in employing a controlled vocabulary.

It will be noted that a number of the aids suggested above have as their objective either to make the user aware of this problem in order for him to suggest alternatives to the specified search terms (as identifying non-occurring terms), or to automatically expand a search term with a number of alternatives (as truncation). There are, however, other possibilities available.

A popular remedy is the introduction of *relevance feedback*. This is based on utilizing the vocabulary of the documents themselves for expanding the search requests. The initial request is processed, and the documents identified as possibly relevant are retrieved. Then those parts (for instance paragraphs) of these documents containing the search terms are matched according to a certain scheme (for instance a clustering method), and the search request is expanded by those terms having a certain degree of positive correlation with the original terms. Best results have been obtained through screening the documents utilized in this way by having the user tentatively identify which of the retrieved documents are relevant.

This strategy is quite promising, and should be further pursued. It is easy to see the relevance feedback as an alternative for the more traditional method - the use of *thesauri*.

The more traditional function of the thesaurus is to control an indexing language. It would then also be quite obvious that the user, when retrieving documents indexes in this manner, would like to familiarize himself with the vocabulary and the defined use of the various terms. This traditional thesaurus is somewhat irrelevant with respect to text retrieval based on natural language documents, where no intellectual indexing based on a defined vocabulary takes place.

Nevertheless, a different type of thesaurus has been developed for texts retrieval systems in order to contribute to the solution of expanding search requests by synonyms. The problem is, however, that this actually implies defining the relationship between terms in natural language, where the usage - and no formal definitions - qualifies the meaning of the terms.

Usually a distinction is made between context sensitive and context independent synonyms. For instance "husband" and "wife" may both be synonymous to "spouse" in one context, but not synonymous in many other contexts. Among the context independent synonyms, one may treat as a special case different word forms due to conjugation of verbs, plurals and cases of nouns - and perhaps also compounded words and their elements.

As a synonym thesaurus traditionally is general at least for a data base, the context sensitive synonyms cannot be specified. But even when the thesaurus is limited to the context independent synonyms, one will have a formidable task trying to create the thesaurus. Context independence is rarely absolute. The usage defining the meaning of natural language will constantly develop - introducing new terms, chaining the meaning of old terms.

Consequently, the traditional synonym thesaurus will be a major project to create and maintain. The costs involved are considerable, and the improved performance is dubious. It should be borne in mind that the improved performance should be measured against the more simple strategy of truncation supplemented by linguistic methods for identifying lemmata, splitting compounded words etc. It should also be borne in mind that the whole sub-set of different word forms due to conjugation, plurals etc, and most of the other context independent synonyms are handled by these methods.

There is a strong case to be made against the traditional thesaurus. It will not be context sensitive (and consequently not address the problem area where the user has the strongest need for assistance). It will be expensive to create and maintain, also demanding constant manual attention and intervention for not deorienting. And it is dubious whether it actually improved performance more than what is achieved by simpler methods.

However, it should be noted that more limited synonym problems may be adequately addressed by "special purpose thesauri". These problems include at least two special cases. First the problem of abbreviations, which in many cases are not consistent even within law - for instance the different abbreviations of "section", the use of the punctuation mark ("USA" and "U.S.A."), the different forms of writing a date etc. Secondly, the hierarchical elements characterizing a geographic organization of a country or an organization. For instance making all the municipalities or cities of a region also synonymous with that region. The

criticism of general thesauri are not valid for such special cases, which may be seen as part of the problems dealt with above rather than those discussed in this section.

7.2 Criteria for adequate solution of the synonym problem

After this brief discussion, one may conclude that the traditional thesaurus is an unsatisfactory solution to the synonym problem in text retrieval systems. Still, this leaves us with the synonym problem, and one may try to indicate the properties of an adequate solution:

- (1) The solution should not require intellectual indexing of documents. Such a requirement would imply a reduced degree of automation, and considerable personnel costs.
- (2) The solution should be context sensitive, as the major problem of the user is associated with identifying alternative terms to describe an idea in the context of a problem.
- (3) The solution should be dynamic, designed to reflect the changes in the usage of natural language, but without requiring manual intervention.

7.4 Processing the search request

No existing device has these three properties. In searching for possibilities for creating such a device, the NRCCL has concentrated on one major source of information currently not systematically exploited by text retrieval systems: The search requests themselves. Obviously search requests represent information on terms and relations between terms thought adequate by the users. In an operational environment, a large number of search requests are each day submitted to the system - and by processing this information, one should perhaps be able to establish a learning mechanism which maintains some sort of synonym defining device.

It is indeed quite surprising that major providers of text retrieval services are not regularly processing the massive feedback which such requests represent. The reason would generally seem to be the privacy of the user, though one would believe that the provider of the service by other data security strategies should be

able to guarantee the confidentiality of the implied information contained in the search requests.

Actually, the Lawdata foundation has been licensed by the Data Inspectorate under the data protection legislation to retain the search requests and process these for research and statistics. Experiments are taking place in utilizing the information in the search request for a self-maintaining, context-sensitive synonym structure. These experiments are designed as a pilot project prior to the more ambitious project described above.

7.5 The norm based thesaurus

A sketch to a device exploiting this information has been suggested by the NRCCCL - the *norm based thesaurus*.

This thesaurus is based on describing or modelling an area of law according to a well-defined formalism. This modelling would, of course, imply a qualified effort by an expert of the same nature as would be expected in establishing a model of knowledge in an expert system. Within the context of the F*KUS concept, this modelling would parallel, if not be identical to, the modelling necessary for the help functions in the form processing module, and the expert system for advice and individual planning, both described above.

If presumed that it is possible to create such a formal model of the law within a domain, this description will consist of a network of legal norms with associated "facts". The "facts", the antecedents and consequents of the network, may be considered as "nodes".

7.5.1 The user interface

For the user, the normative network may be presented in a number of ways.

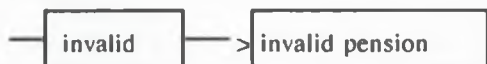
The "traditional" way to represent the normative structure of a domain, would be by adopting a formalism. This would make the presentation closely related to a program in a high level language. It would presume that the user is able to understand this formalism, and trace the relations through the description. We think it may be safely presumed that such a presentation is inadequate as a user interface - the user would have great problems in understanding the formalism, and would therefore not be helped in any way for access to the text of

the underlying legal sources. For experimental purposes, such an interface may be adopted in order to test other elements of the norm based thesaurus - but only with the clear understanding that a better user interface has to be established. The problem of designing a user interface should not be underestimated.

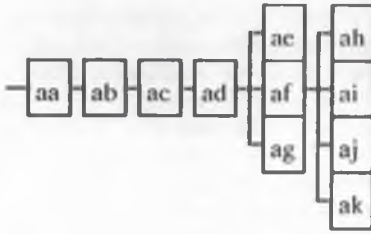
An alternative might be to present the normative structure as a normalized form of natural prose, along the lines suggested by Layman Allen. This may be appropriate in areas where the law is well codified, and the statutory texts themselves may be seen as a model to the more detailed and richer texts of regulations, case law etc. The statutory texts could be "translated" into normalized form, and by reading this, the user could defined where in the normative structure the problem at hand is lodged. Research has proven that statutory references represent an "indexing language" of surprisingly high performance measured in consistency. For users familiar with an area of law, it is probable that the normalized form of statutory texts is an adequate unique, stable and detailed description of the normative structure. However, also normalized statutory prose would be a lengthy and rather formal presentation, and it is doubtful whether this is sufficiently user friendly.

More promising is perhaps the possibility of presenting the structure in graphics, using the arrow diagrams also developed by Layman Allen, and utilized in the explanations above. The arrow diagrams are directly related to the normalized form of statutory texts, but may also be used to represent the formalism selected for the deontic system (SMARN, PROLOG etc).

An interesting aspect of arrow diagrams would be the possibility of imposing a hierarchical structure on the diagrams. For instance, the user may start by skimming the top of the normative structure, having displayed the arrow diagram



Zooming in on the antecedent, the user could then "open" this element, and access the more complex definition of the criterion "invalid".



Where the criterion "invalid" has been expanded according to the example introduced above.

In this expansion, some of the criterion may need further expansion - this has been discussed above for instance with respect to the criterion "illness". This would be disclosed if the user zoomed in on the "ae"-part of the structure above.

It is felt that the use of graphics has some promising features. It allows the use of window techniques and colors, and may make the user able to grasp the whole structure more at a glance.

Also, the arrow diagrams may be linked together - as have been exemplified above. This would make it possible to explore them both in length and depth, as some sort of three dimensional representations of the normative structure. Such a representation would seem to reflect the structure better than both the "raw" formalism or the normalized statutory prose.

So far, the possibility of a powerful graphic representation of the normative structure remains a promising aspect. Obviously, experimental results have to be obtained before this approach may be deemed feasible and user friendly.

It may, however, be rather stimulating to see the user zoom across the topography of arrow diagrams like the user of some sort of video game zooms across a landscape, see the user dive from one level of generality to the next at more specified level, without losing track of the position in the general landscape. Using a mouse or similar device, the user controls his flight in this landscape of abstractions, being able rather readily to translate the features and colors into legal concepts and relations.

7.5.2 The term links

So far the norm based thesaurus has much in common with the creation of an expert system, with the same involvement of expertise in specifying the necessary rules. This will obviously imply the considerable costs generally associated with such exercises - though the fact that the rules are not to be executed, only to be representative, is a reduction in the level of ambition which may also reduce cost to some degree. In the F*KUS concept, this simplification is only a footnote, as the normative structure also will support help functions, advice, individual planning, etc.

When the structure has been established, the nodes are then described as a set of terms. These terms are also initially specified manually as words or phrases in a natural language adequate to describe than node in the structure. As the structure is a context, the description of nodes will be context sensitive.

It should be emphasized that this description of the nodes really is quite simple in its initial form. The node of "invalidity" is described by all the words generally used for describing this condition in the natural language, drawing on the actual vocabulary of the texts to support this specification. There will be words like "lame", "handicapped", "loss of limbs" etc - a long list of terms and phrases which taken in the specified context all indicate the same concept of "invalidity".

The initial state of the norm based thesaurus is therefore a norm structure described according to a certain formalism and represented in such a way that the user may understand the normative structure rather easily (graphical representation based on arrow diagrams).

7.5.3 *Using the norm based thesaurus*

Changing the perspective, one may consider how the user will be assisted by the norm based thesaurus.

The user will specify his search request by one or more terms. The system will match these terms with all the node descriptions (using the text retrieval system for accessing the descriptions), and display for the user the part or parts of the normative structure or structures specified containing matching nodes.

In this way, the user will be able to identify the elements of the normative structure (and the associated criteria) to which his problem relates. These elements will then be selected by the user (for instance using a mouse).

The system will first identify the relations between the different identified nodes, using the normative structures for establishing the logical operators used in the search request (for instance ANDs for conjunctive structures and ORs for disjunctive structures). This will be an "empty" request, with the labels of the nodes representing the search terms. But these labels will be replaced by the list of words and phrases describing the relevant nodes. The result will be a search request reflecting the logic of the normative structure and the synonyms specified for each node.

This request is then displayed for the user, which may either just pass it along, or choose to edit the request. For the sake of the argument, it is presumed that in editing, the user either deletes or add terms to existing synonym groups.

7.5.4 *Self maintenance*

It will then be apparent that this strategy has the possibility of being self maintaining, at least to some degree. If users frequently delete synonyms from a group, the system may by itself make an amendment. Similarly, additions may result in an expansion of a synonym group. Further analysis of user response may result in further refinements or development of the normative structure itself. It may, for instance, easily be seen how user response may result in splitting of a node into a more specified - and more context sensitive - normative structure.

Some of these amendments may take place without human review, while others may require some expert consideration. The interesting aspect is, however,

that the heavier the use, the greater the possibility of improving and developing the normative structures.

7.5.5 Conclusions

Whether the idea of a norm based thesaurus is viable, is still to be seen. It has interesting possibilities, but whether it will be successful to users will depend on whether the normative structure may be represented in a form which make it readily and easily understandable by lawyers. The suggestion of presenting it as some sort of topographic map which the lawyer may traverse at will, seem hopeful - though it presumes different communication procedures and end user equipment than what is commonly in use today. In this, the idea will pose a hardware requirement to the F*KUS work station.

In conclusion, one should emphasize that the major point in this section is *not* the possibility of the norm based thesaurus, but the problem stated: The properties of the "missing link" of text retrieval systems which will make it possible to overcome the quite severe synonym problem.

The NRCCCL is currently working with the support of the Norwegian Research Council for Science and Technology to explore the feasibility to create such a norm based thesaurus. Experiments are taking place, in cooperation with the Lawdata foundation using the SIFT text retrieval system, which by its modular design is well suited for this type of approach. A further report on this issue is expected 1987.

8. Conclusion: The F*KUS work station

The different aspects of the F*KUS work station discussed in this part, will come together in one working environment. The concept includes:

- (1) A form processing module, with the possibility of offering advice and explanation with respect to any item in the form, tracing the legal relation between these items and accessing the legal sources through links with the items in the form. The system should at any stage be able to suggest "pre-trial" results, ie tentative results or identification of critical elements in the pending decision. The module also should have

case administrative properties, tracing the cases, ranking cases according to lapsed time or priorities.

- (2) An expert system, assisting the decision maker or an applicant to obtain an advice for individual planning within the legal domains described.
- (3) An enhanced text retrieval system with very simple user interface, accepting search requests in natural language.
- (4) A norm based thesaurus describing the legal domains in a way which makes it easy for the user to identify what part of the domain is relevant for his or her problem, and accessing the text retrieval systems through this structure.

As has been pointed out, the F*KUS concept incorporates elements which are within the reach of current methods - like parts of the form processing system and enhanced the text retrieval system. Other parts - like the expert system - requires a further development, but it would seem feasible to realize these elements on different levels of ambition.

It is proposed that an experimental environment is established within a well-described area of law, and that an *ad hoc* and partial version of the F*KUS work station is established. This will make it possible to (1) demonstrate in concrete terms what is implied by the rather abstract suggestions, and (2) have feed-back through experience and confrontation with real problems; and (3) explore alternative approaches for solving the same problem.

In part III, the project for developing the F*KUS concept is somewhat further described.

III PROJECT ORGANIZATION

Organization

The project is suggested organized within the framework of the Norwegian Research Center for Computers and Law, relying on its administrative structure. As the NRCCL is a small organization, one has to make the project largely self-supporting with respect to routine administration.

The project organization is suggested to consist of a reference group, international reference experts, a project group and project associates.

The reference group

The reference group should be composed of representatives of the organizations funding the project, or organizations participating through project associates. The reference group will have no formal authority with respect to the project group, but the reference group will meet at least twice annually to review the work and the current plans, and to make recommendations. As funding will be made available by annual grants (within a five year plan), the funding bodies will have the possibility of taking the recommendations of the reference group into consideration and to make further funding dependent upon the project taking recommendations into account.

In this way the reference group can be maintained open and informal, while at the same time the necessary control of the project can be enforced through the annual budget.

The reference group should be chaired by a representative of the NRCCL, and this institution is also responsible for convening the meetings of the reference group.

International reference experts

The F*KUS project will work within the area tentatively named "legal artificial intelligence" by some experts. The "state of the art" within this area is not readily available in general. It has been thought helpful to identify some internationally

recognized experts who agree to review the project and relate its result to this 'state of the art' in order to make funding bodies and the project group itself more sensitive to the international standards.

In this there will also be some degree of guarantee of the project not duplicating work done elsewhere, or pursuing approaches which are generally thought less than fruitful.

In preparing the project, one has had tentative commitments from two acknowledged experts within the field.

One is professor L Thorne McCarty of Rutgers University, New York, beyond doubt the leading authority on law and "artificial intelligence". His own research related to the TAXMAN projects are regarded as pioneer efforts. There has been cooperation between McCarty and the NRCCL for several years, and he has confirmed his willingness to review results from the F*KUS project.

The other is Marek Sergot of the Imperial College of Science and Technology, London. Mr Sergot is well known for his work in logic programming, based on PROLOG and related languages. He has himself become involved in developing legal expert systems for applications within the UK Social Security system. He has also confirmed his willingness to review results from the project.

The reference group will be invited to consider naming further international experts.

In order for this part of the project to work, it is presumed that progress reports or papers are prepared in English, and that funds will be available for occasional invitations of the experts to Norway to discuss the project with the reference and project group.

The project group

It is suggested that the project group be composed of three persons (full time) and a number of part-time persons.

Of these one has to be a candidate of law with an inclination for legal theory, the theory of norms, deontic logic etc. The main responsibility of this person would be to analyze the law, structure and describe the legal norms according to the selected formalisms. This person should also be available to project associates where a legal support is necessary.

One has to be a candidate of informatics or comparable background. The main responsibility of this person would be to design and specify the programs going into the F*KUS work station. Also this person would have to be available to project associates where alternative approaches to the main thrust of the project are tested, and have to be interfaced to the overall design.

The third person will have to be a project administrator. This person will have to take part in both the legal and computer related aspects of the project. The project director also will have to maintain links to other interested organizations, make the necessary arrangements for project associates to participate, have the responsibility of administration of part time personnel.

The part-time personnel will mainly be hired in for doing programming according to specification. A number of the elements in the F*KUS concept, especially in the initial stage, will not require more than routine efforts to establish - for instance establishment of screen layouts, establishment of sub-sets of live factual registers, down-loading and creation of textual data bases etc. The part time personnel is suggested hired on contracts and paid by the day or week.

Project associates

Several organizations will be invited to use the F*KUS environment to test out their own approaches to expert systems, logic programming, representation of legal norms, design of administrative work stations etc. Such organizations may be universities, where graduate work may be defined within the F*KUS concept; independent research institutions or public agencies, where developments related to the problems tackled in the F*KUS project are taking place.

It is foreseen that it may be of interest to associate persons with the project for limited periods of learning.

The objectives of project associates may not be identical with the objectives for the F*KUS project, but must obviously be sufficiently similar for a meaningful cooperation.

The cost of project associates has to be met by their respective parent organizations. It is, however, seen as desirable to encourage such inter-institutional cooperation. It will therefore be suggested that the costs for the use of the F*KUS facilities and the added administrative cost to the F*KUS project should be met by the project itself.

The project director will have to make formal contracts with all project associates and their parent organizations. Such contracts should, for instance, govern the intellectual property rights to the results of the cooperation.

The F*KUS facility

In addition to the personnel resources, the project will have to have access to a powerful computer facility. This could be based on an ND 500-series or a VAX 8000-series computer with basic software. In the choice, one should take into consideration the availability of compilers for the relevant programming languages, for instance SIMULA, PROLOG and LISP.

Only few terminals should be linked to this facility in order to secure considerable support of each work station.

It is further suggested that one of the work stations be constructed of a mock-up of an actual work station in a social security office, in order to take into account some of the pragmatics, and to facilitate role-playing etc in testing and demonstrating the F*KUS facility.

Project schedule

In this report from the pre-project, a number of activities have been sketched in some detail, perhaps in greater detail than is usual prior to initiation of a project.

It is thought appropriate to take the area of old age pension as the domain for the development of the F*KUS project. There are several reasons for this, the main one being that this is basic to the system of social security in Norway (the old age pension calculation is the motor in the calculation of other benefits); it is explored in other projects at the NRCCL; the area should be possible to circumscribe; norms are mainly based on strict criteria and the application is typical of mass administration, potentially bringing the whole population in contact with these norms.

The project is suggested for a period of five years. Obviously it will be impossible at the outset of this period to predict the end result in detail - how much of the F*KUS concept will have been realized, and which amendments in the basic concept will have been made during the project. The necessary control throughout the project period is effected through the reference group and the reports to funding bodies.

It is presumed that the project will report annually, and that in addition issues will be explored in separate reports when appropriate. These reports will be published in the CompLex series of the Norwegian University Press.

The first year will include the following activities:

- (1) Initiation, organizing of project group and reference group
- (2) Purchase and installation of the necessary facilities
- (3) Establishment of a simple form-processing system, based on screen handling and access to "dummy" registers designed to mirror the relevant registers of the social security administration
- (4) Downloading of a sub-set of the Lawdata foundation data base of legal sources in social security, supplemented by additional sources for old age pension not part of the Lawdata system, making these available under the text retrieval system SIFT
- (5) Enhancing SIFT with some linguistic tools and simplified user interface, including natural language search request strategies
- (6) Linking of forms to the textual data base
- (7) Tentative analysis and specification of old age pension for developing the deontic system to be used in three of the elements: the advice and "pre-trial" features of the form-processing system, the expert system for giving advice and individual planning, and the norm-based thesaurus
- (8) Establishment of cooperation with interested institutions, possibility of project associate contracts

Plans beyond this first year should not be specified, but are implied by the other elements of this report.

The costs for this first year would include the following elements

- (1) Project group, 3 years including social security contributions and at a salary level of senior research personnel
- (2) Funds for contracting part time personnel
- (3) Funds for buying or leasing the necessary hardware and licensing the necessary programs
- (4) Reference group meetings
- (5) Travel costs (international experts, also for project group)
- (6) Publication costs
- (7) Project administration (according to University of Oslo standards for externally financed projects, split between the University centrally and the NRCCCL)

The annual costs, excluding item (3) for purchasing or leasing the necessary facility, would gross approximately 1 million Norwegian crowns annually.

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TYPES OF NORMS

A note on the problems

1. Introduction

This paper discusses a classification in types (typology) of norms. By "norms" I mean primarily *legal norms*, and further especially those authoritatively *issued* legal norms - typically provisions (statutory rules) in the form of an act of parliament, and included in the compilation of statutes in force. However, it would seem evident that the theory of types of norms also should be applicable to a wider field, and ultimately to all norms, whether they are seen as legal norms or not, which are included in (govern) a legal decision process.

I presume a concept of *norms* similar to that used by Sundby (1974) and Eckhoff (Eckhoff & Sundby 1976). The core of this concept is a *normative proposition*, understood as a certain content of meaning, which in some way or other has become *actualized* as a norm (by issue of a norm sentence, by internalization or otherwise), and which later also may be represented linguistically. Such norms may also have associated with them different secondary properties, e.g. of *application*, understood as consequences of identification of the norm.

The language used in the original (primary) issue or expression of the norm (typically: the language used in the compilation of statutes in force) I will term the *primary language*. Language used later (in a secondary expression or representation), I will term the *system language* or *secondary language*.

2. What is the objective of a typology of norms?

2.0. Introduction

A prerequisite for a good theory on types of norms is a specification of the objective of the typology - one should specify what the types should distinguish, and criteria for the quality of the theory. In this chapter 2, I will discuss such problems.

I will first (sect 2.1, 2.2 and 2.3) discuss what is to be seen as a desired *result* of typology - what we want the typology clarify to us, based on ideas of to what purpose the typology should be used. In the last section, 2.4, I will indicate some more general criteria of the potential and quality of the typology.

I emphasize that I am not in this chapter including any independent discussion of which *criteria* are available, and which may be employed to identify different types of norms. This question will be discussed in the next chapter (3). As far as this question is concerned, this chapter 2 may thus be considered wishful thinking.

2.1 Semantic content

What first may be seen as the objective for a typology would perhaps be to clarify the differences between norms based on what we see as the core of the norms - their *content* or *meaning*, i.e. properties of different normative propositions as such.

An immediate objection here could be that the content as such may not be seen (cannot be immediately recognized, e.g. as given through a particular utterance) nor does it have any immediate practical function. This is a problem relating both to the question of how (on which criteria) we would like to identify the contents, and relating to the question of question of which secondary properties (consequences) we should assign to different norm types.

However this need not imply more than that we should not restrict ourselves to giving only unbacked *claims* of semantic types of norms. A way of justifying a typology based on semantic types of norms may be for instance that we see the content as representable in system language i.e. as identifiable and representable in a (secondary) natural or formal language, e.g. a programming language.

simultaneously as one maintains criteria for *when* a content may be identified in this way (the *identification criteria*) and specification of different consequences of such an identification (*consequences of identification*). The content is hereby given the status as an auxiliary concept - a "hold-station for the thought". The advantage by such an approach is the possibility of separating the content - and its system language representation - from a certain more or less incidental form of *actualization* and consequences of this, for instance by considering *one and the same* content as "contained" in different primary language expressions (*expression cumulation*), or different contents as (*may be potentially*) contained in one and the same primary language expression (*content cumulation*), or by - in the same way - assigning different or identical practical consequences (pragmatic properties) to different or identical contents.

Nevertheless, what is stated here seems to imply that a typology based on properties of content always in once sense should be (=should be made) operational. Or, formulated in a different way, one should always have to think of the content as an auxiliary concept, where one (in principle) is willing to indicate specific identification criteria and identification consequences. When I in the following mention a typology of norms based on their content, it is also with a view to the possibility of making them operational in such a way. With this qualification, contents would seem to be appropriate as a basis for a typology.

2.2 Properties of actualization

2.2.0 Another possible type of objective for a typology would be to give an exhaustive description and typology of different types of norms with respect to their properties of actualization. By this I think of different properties with respect to the background of the norms and their creation, their expression and communication, and other facts (often summarized under the term "legal sources", Including the existence of other norms), and arguments (for instance according to "principles of legal sources") employed to identify norms and normative propositions.

2.2.1 *Primary language expressions and other primary actualization properties*

Quite practical is the possibility to identify norms uniquely with respect to properties of their *primary language expression*. The distinction between "shall" and "may" -norms (as corresponding in intent to the distinction between norms of duty/prohibition and permissive norms) are often understood this way.

Another possibility is the classification of norms with respect to how they have been established, taking into account primary and secondary *legal sources*. The classification of statutory norms, regulatory norms, norms derived from court decisions, norms derived from the fact of the case itself (the "*Natur der Sache*") etc. may be understood this way.

A third possibility is classification of norms with respect to certain properties in their *communication*. A distinction between norms given through a computerized information system and norms published in a different way, would be such a classification.

So far the objective of the classification of norms have been related to their *primary language properties*, or otherwise related to their *primary actualization properties* i.e. properties of a previously (primarily, originally) given actualization of the norm.

2.2.2 *Secondary properties of actualization. Representation in system language*

One may also have a classification related to forms of secondary and future actualization. The design of *standard expressions* of norms with a specific content, as well as other *system language representation* of the contents, already presume this approach.

This may be a proper stage in the development of legislation designed for computerized administration systems. (Central word: Formalizeability.) In a similar manner one may see a typology related to the future publication of the norms etc.

2.2.3 It is a presumption for this paper that the typology should be designed for system language representation. But it is also evident that a classification of norms exclusively with respect to this or other actualization properties is not adequate. (And I remind that I here do not make comments relating to actualization properties as criteria, but as identification results.)

It is common to speak of "shall", "may" or "ought to"-norms, but this generally does not relate exclusively to the properties of expression or actualization of the norms. These properties are rather to be seen as expressions of (criteria of) a typical content. This would also hold true for the other examples of primary or secondary actualization properties mentioned above. Actualization properties will generally be used only as a tentative indication or criterion of other properties of the norm - typically properties of the content and/or pragmatic properties.

In this paper there will not be a systematic discussion of the choice of the most appropriate form of representation, nor of the degree of formalism in system language representation of different types of norms. Neither will I discuss how to name different types of norms.

2.3 Properties of application

2.3.0 A third type of objective of a typology of norms may be to specify different types of norms with respect to their different properties of application. By this is meant the different properties of norms more directly having to do with the application of an established norm - such as the system membership of a norm (whether it is a legal norm or not), its validity (internal or external to the system), the world (including other norms) to which the norm relate, the degree of compliance with the norm, its efficiency, sanctions when infringed or other consequences of the existence of the norm and its application.

It would seem evident that much of the purpose in a classification of norms would be directly or indirectly to indicate differences with respect to such properties of application. A basic standpoint in the following is also that the typology should serve to indicate application properties, at least indirectly. This is also a basic assumption in much of the existing theory of types of norms, for instance when it is maintained that a difference between norms of conduct (prescriptions) and norms of competence is related to the sanctions of violation, or

when the content of the norm is indicated as consisting in its function in establishing other norms. I will here make mention of some of the more interesting of such properties of application for a typology.

2.3.1 Properties relating to system membership, world connection or validity.

The classification of norms in legal norms, moral norms and political norms is a classification based on differences in the *system membership* of the norms. This is also basic for a classification in Norwegian versus foreign (Swedish etc.) legal norms. As I presume that the objective for the typology is related to Norwegian legal norms, I will not discuss these distinctions in more detail.

I will also exclude a classification of norms according to their *connection to worlds* (domain, pretended area of validity within a universe of discourse) in general. A classification of Swedish versus Norwegian legal norms may also be seen as an example of this property, and the same is true of a classification of norms according to whether they intend to apply to Norway or Sweden. More generally the norms may be classified according to their reference to a special spatial, temporal or phenomenal world presumed by the norms.

A third distinction which I will not pursue here is a distinction based on the *internal validity of the norms relative to a system* - for instance a characterization of norms as (formally, internal to the system) *valid* or not, as norms which have *entered into force* within the system in opposition to norms that have not entered into force, as norms of different levels (weight) within the system, or as norms which are *general rules* as opposed to *exceptions*, etc.

It would also be superfluous to mention that the three mentioned distinctions both in practice and in a theoretical analysis may be difficult not to confuse.

2.3.2 The semantic inference potential

An objective of a typology of norms would seem rather obvious, but have nevertheless been subject to surprisingly small explicit attention in the literature. This is to identify differences with respect to what I would term the semantic inference potential of norms. By this phrase is intended the sum of normative propositions (issued or otherwise existing as norms), and perhaps even other propositions which are considered wholly or partly given, presumed or otherwise follows by in a wide sense logical (semantic or pragmatic) argument from the norm primarily given.

A simple example is the instantiation of a universal norm, when we consider the result of the instantiation as an independent *consequence* of the universal norm (in this case through a simple inference from all to one). But there are a number of more complex and problematic examples, where we may also have to make use of modal logic or other rules of inference, and where we may have to say that one proposition is derived only partly from another. An example of the latter would be inductive generalization based on an instance in a court decision, or inference *modus tollens*.

As suggested, it is important to understand the concept of logical inference in a wide sense, including not only such inferences which are discussed in traditional formal logic, but also inferences of more pragmatic nature - as inferences of opposition, of analogy and other arguments of presupposition. It is however presumed that the inferences result in propositions understood as in some way *closely* related to the primary given proposition, in such a way that the derived statements may be described as *given together* with the primary proposition. I will not include in the semantic inference potential "inferences" to propositions that only as a matter of fact or typically or due to other norms are related more loosely to the primary argument as its consequence (as the propositions mentioned below under sect. 2.3.3).

This property is regarded as a "semantic" rather than "pragmatic" inference potential mainly because the result of inference is constituted by propositions of the same order as the primary proposition itself - i.e. consists in an identification of a semantic content. This in opposition to the arguments discussed below in sect 2.3.3 - where the point is rather to discuss actual or normative *consequences* as such of the statement. The distinction is however, not sharp.

As mentioned, the property discussed here - the different semantic inference potentials - is, and should be, in practice very important for a typology. Some characterizations of norms obviously also have the function to indicate such properties - the best example is perhaps the characterization already mentioned, of a norm as a universal norm. The same is true for other characterizations with respect to quantitative or connective properties (cf below at chapter 4). Such characterizations are primarily given as semantic characterizations, but the semantic characterization also contains a characterization of the semantic inference potential. (Cf for instance the answer in the following dialogue: "Is this norm valid for this case?" "Yes the norm is general.").

Even beyond such examples it would seem that the characterization of a certain content - for instance characterizing a norm as (semantically) a norm of competence or of conduct, as modally qualified by shall etc - indirectly at the same time functions as a characterization of the inference potential of the proposition. But both in these latter examples as with respect to more pragmatic inferences, it is not obvious intuitively to understand a characterization of semantic content at the same time as a characterization of a definite inference potential. This is I suppose mainly due to the fact that the inferences - and thereby also the semantic inference potential - are more problematic and undefined in such cases, i.e. there is not one intuitively and unambiguous relation between a certain characterization of content and a certain inference potential.

Which consequences should be drawn on this basis? One consequence may be that ambitions are reduced and thereby also the importance of the semantic inference potential as a basis (point of departure and result) of a typology of norms, for instance by restricting the use of such characteristics for the obvious cases.

One could also consider another possibility, insisting that the semantic inference potential is an important property to be represented by the typology, but also admitting a certain uncertainty with respect to the determination of it in particular cases. This might be achieved by developing a typology where the immediate properties are properties (represented by system language) of the semantic content - whereas the semantic inference potential is seen as a (wholly or partly) secondary property of this, and of the norm.

2.3.3 Other properties of consequence

In addition to the semantic inference potential, there are a number of other properties of application which in practice often has been seen as important to emphasize by a typology, and which may be summarized as "other properties of consequence". By this I imply different descriptively and normatively indicated consequences of the existence and application of the norm - especially consequences which are related to the factual compliance with or violation of the norm.

The properties of the norm in terms of actual and /or normative consequences of its compliance, may be termed the *compliance properties* of the norm. An example of a characterization of a norm with respect to such properties may be the characterization of a norm as "constitutive" or "qualifying" with respect to something. Also the term "norm of competence" may e.g. (and partly) be understood in this way, for instance as a characterization of the property that if one complies with the norm, a certain person has a certain authority or a certain decision *becomes* valid. But norms are not commonly characterized with respect to such properties.

More frequently norms are characterized with what I would term the *properties of violation*. By this I mean the properties of the norm which consist in factual and/or normative consequences ("*sanctions*") connected with the violation of the norm. (I will not here discuss what is to be considered a violation and what is to be considered as compliance): An example would be to maintain that a norm of conduct (prescription) *is* a norm characterized by the result of violation (typically etc) being punishment of the violator and/or damages. (And "is" here is not primarily to be understood as the specification of a condition for identification, but as a specification of identification consequences.)

Whether it is appropriate to choose a typology specifying such properties of the norms as here indicated, would probably mainly depend on how unambiguously the relation is seen between such properties and other (more basic) properties of the norms as such - especially their content (or this combined with special actualization properties). Thus the problem here would be identical with the problem discussed above with respect to typology and the semantic inference potential. If one has doubts with respect to an unambiguous relation between type identification and semantic inference potential, it obviously would be justified also to be doubtful in this case. In my mind, the doubt should be graver, as in this case we not "only" have to do with simultaneous inferences to other propositions - i.e. to phenomena of the same kind, which are understood as given at the same time as the primarily proposition, but of a kind of secondary inferences of even more secondary nature.

Much would seem to be in favor of looking at compliance and violation properties as being in principle incidental and secondary properties - even if there in practice or according to meta-norms always should be a certain relation between these and the type of norm in question.

2.4 Some other criteria of the quality of the typology

One obviously should demand that a typology is *complete*, in the sense that it embraces all individual norms in the system of norms in question (here: the Norwegian legal system, and especially the norms represented in the compilation of statutes in force).

There are of course, several ways of satisfying this demand, and also to circumvent the same demand. One way would be to include special properties of the norm in the definition of a norm - and thereby presume these properties when specifying what a norm (or a "complete" norm) would be. Of such attempts of definition there are several celebrated examples in the literature. The traditional example of this approach are those theories which so to say a priori demand that the norm contains (specify) certain subjects of the norm - for instance an actor - and that the norm specify an action, i.e. that the norm should be an action norm (cfr below at sect 4.3.1). In my mind it would be incorrect to seek refuge in such completeness demands in order to save the typology, contrary to our intuitive understanding of norms as they appear. Such theories have clearly strains of fiction incorporated in them.

The best way of avoiding such fiction would be to supplement the demand of completeness by a demand for *simplicity* or even with a demand of a maximal degree of *correspondence between the typology and our intuitive everyday* (though perhaps expertlike) *understanding and characterization of norms*. This would apply in the hand first with respect to the object of the typology - in the sense that we as far as possible try to choose as object for the typology the different norm sentences as they appear in a statutory text. But it also probably would apply to the selection of relevant criteria and properties of the types of norms. This may be perhaps expressed as a principle of recognizing the "*reality of the immediately given*".

The principle of the reality of the immediately given has also however another aspect, related to the *flexibility* of the typology. It may here be useful to compare a typology of norms to an imagined typology of statements (descriptive/declarative propositions): It would perhaps be seen as somewhat superfluous to ask how many categories of statements we have. The reason is probably that we presume that a

statement may contain and relate to *anything*, and that this "anything" could not be fully specified through a typology. But just in the same way one may reflect that it may be superfluous to establish a typology of norms by qualifying a certain number of types. It seems at least to be a reasonable condition of adequacy for such a typology that it have included or be supplemented with *possibilities of amendment* by addition of new categories not previously perceived. The need for such a mechanism increases obviously to the same degree that we give unambiguous - i.e. exclusive - definitions and determine the number of definitions.

If we want to use the categories in a *systematization of norms* we may also be looking for other properties than the ones we look for in cases where we also want more directly to *apply* the norms in practice.

3. Which criteria of identification may be employed in a typology of norms?

3.0 Introduction

Different from the question of what we want of norm typology - i.e. the question of which properties we want to specify (as a consequence) by a norm typology - is the question of which criteria to employ in identifying the different properties and types of norms.

An example: Even if we thought that the object for a typology is to specify differences with respect to the content of the norms, we may still want to use the actualization properties, for instance special properties of expression as a criterion of contents. While the previous question is related to the ideal objectives of the typology and the criteria of quality of it, and thereby also the consequences of an accomplished identification (consequences of identification), the question to be treated here is more a practical matter, i.e. what it is possible to achieve by a certain methodology.

In this chapter I will discuss a number of different criteria for identification and typology which we may want to employ.

3.1 *Semantic properties as a criterion for identification*

If we understand the content of meaning as such as something which by definition is invisible, and which also is not directly observable in other ways, it seems to imply that we also must refrain from using semantic criteria as primary criteria of identification in the establishing of our typology. The same holds good in using such structures which in the philosophy of language are discussed as "deep syntax" and other forms of "deep structure", as these structures should best be seen as semantic structures.

This does not imply that we must refrain from any reference to the content as part of the typology. Properties of contents may on the contrary be well suited as a *secondary* criterion - to the extent that we think that we, helped by other and observable criteria, would be able to identify the content as an intermediate concept.

One reason for such a criteria being well suited is (paradoxically) exactly the fact that it is considered as independent of specific superficial properties of norms. This means that we in a way have full control of the criterion, and that we thus also more easily may take it as an object of formalization. As long as we see the content in this way, it may perhaps be a matter of dispute whether we are using it as a criterion, or if we only are using it as a (tentative) result of identification. The simplest way to look at this is as two sides of the same coin, i.e. through some representation in system language of the content and types of norms the content is thought of *both* as a (secondary) criterion of identification *and* as a result of identification. With regard to the more detailed analysis of the content, with the distinction between modality and other content matter, see below at sect 4.2. and especially 4.3.

3.2 *Properties of application as identification criterion?*

3.2.0 *Introduction*

With respect to properties of application in general and such properties as a result of identification, see above at sect 2.3. In legal theory the discussion often offers examples of the use of properties of application, at least superficially, as criteria of identification. An example is the prevailing characterization of norms of conduct (prescriptions) and of competence as *based on* (and not only aiming at) their properties of violation. On reflection it is not evident that this is an adequate way of approaching a typology. In my mind it is evident that such properties cannot be used, at least not as primary criteria of identification in a typology of norms. This is given already in the fact that such properties are seen as properties of norms existing in advance - i.e. as secondary properties of the norms. An identification of norms only based on the properties of application would be as identifying paint based on its appearance in 20 years.

Below I will nevertheless discuss somewhat closer different properties of application and their application as criteria of identification.

3.2.1 *Properties with respect to validity, system membership and world connection as criteria of identification*

With respect to such properties in general, see above at sect 2.3.1. Even if it is difficult to imagine a typology of norms based exclusively on properties of application, we evidently often make secondary classifications of the norm based on "what happen to them", or based on other secondary properties. Some of the properties which in practice are of some importance are properties of system membership, world connection and validity. We may think of the assignment of such properties not just as result of identification, but also as a (secondary) criterion of identification with respect to still other results of identification.

For instance it would seem evident that we in practice make a continuous classification of norms as Norwegian versus foreign norms, norms which have entered in force versus those which have not, etc - with a view to decide whether we in a certain case of applying norms shall take such norms into consideration (i.e. with respect to identification of other consequential properties).

I will not make further mention of such criteria here.

3.2.2 *The semantic inference potential as criterion of identification*

Also the semantic inference potential of a norm may be used as a criterion of identification, - but again as a secondary criterion. Besides the specification of semantic inference potential as an identification of a set of propositions will be subject to same provisos as above (at sect 3.1) with respect to the question of applying the content of the primary norms as a criterion of identification - i.e. that also from this reason, and consequently in a double sense, it will have to be a secondary criterion. Taken as a whole, such properties would seem more adequate as consequences of identification than as criteria of identification.

3.2.3 *Other properties of consequence as criteria of identification*

Also other properties of consequence, e.g. properties of compliance and violation, are by some at least apparently used as primary criteria of identification in the typology of norms. This is especially true of *properties of violation*, i.e. specification of sanctions in case of violation of the norms.

There are even examples of such properties being used as criteria for the existence of norms as such. In this way should be understood an explanation of the difference between norms (normative propositions) and statements (declarative propositions) as a difference with respect to reactions when comparing and stating a conflict between proposition and reality in the following manner: While norms (normative propositions) are seen as characterized by the (continued) insistence, when revealing a conflict between norm and reality, of a change in the reality (or at least of sustaining the norm) statements are seen as characterized rather by a necessary revision of the statement itself in case of such a conflict. (cf e.g. Sundby 1974 p 35).

In my mind it should be apparent that this is no appropriate criterion for a typology, neither with respect to the definition of norms in general nor in a typology of norms, for instance for classification of norms in the basic types of norms of conduct (prescriptions) and norms of competence etc. The properties of consequence may be used as consequences of identification (cf above at 2.3.3), but not as criteria for identification. It is decisive that consequential properties are understood just as consequential properties, i.e. properties which both in time and

ogic are secondary to (are consequences of) the norm itself, and therefore in principle constitute an incidental property of the norm.

(There is perhaps no obstacle in principle to define a phenomenon as a combination of an x with certain consequences of x . I here only refuse the adequacy of such a criterion used in a typology of norms.)

3.3 *Properties of actualization as criteria of identification*

3.3.0 *Introduction*

What remains as a possible criterion of identification are the different properties of actualization (on this in general, see above at sect 2.2). The objective of a typology is obviously and primarily to make possible a specification of certain properties of application of norms (possibly through a specification of types of contents). Therefore it also would seem apparent that an identification of types of norms primarily should be based on the different properties of actualization of the norms (but perhaps also supported by a possible secondary specification of contents). Below I will discuss some practical types of such criteria.

3.3.1 *(Primary language) properties of expression as identification criterion*

A. The most important criterion of identification in any typology of norms would intuitively seem to be different properties of expression in primary language, of the norms. By properties of expression I primarily refer to properties of the primary and primary language expression of issued norms i.e. the expression through which the norm is conceived as given. In our case it would concern properties of expressions in Norwegian of norms as they are found in the compilation of statutes in force: Properties with respect to lexicon, sentence structure (syntax) and ("surface") grammar in general. In the theory of legal sources such properties generally are summarized as "the text of the statute" or "legal language"

B. Of these criteria it evidently is the use of certain *words* (and other *expressions* smaller than sentences) we primarily would examine and use as criteria of identification. If we for instance think as the result of identification the assignment of a category (expressed in system language) of content, like the *concepts* "can",

"shall", "right", "duty" etc. an obvious approach would be to specify as a criterion for the inclusion of these concepts in the content, the occurrences of these same words in primary language, ie "can", "shall", "right" and "duty". In practice it generally happens in this way: By understanding (interpretation) we determine certain elements (here concepts) in propositions given certain words and phrases of primary language. In this case, for instance, we assign the concepts "can", "shall", "right" and "duty" to the (primary language) words "can", "shall", "right" and "duty".

Most words part of an expression of norms are obviously words or phrases *which also may be included in the expressions of a statement* - ie in expressions of declarative propositions. It may be nouns or noun-phrases, verbs, propositions, adjectives, articles etc. The interpretation of such words may be a difficult task in itself, but the problems are of a general nature, ie they apply both to norms and statements. (Cfr on this below.)

In this context what is more interesting are words and phrases which are seen as typically normative like "right", "duty", "claim", "privilege", "shall", "can" etc. It is a traditional ideal in the theory of the typology of norms to seek achieving the most unambiguous possible inference from the use of such words to certain contents or complex of contents. It is also generally held that such words are appropriate as criteria in the distinction between and in the identification of special types of norms. It would seem obvious to demand from a theory on the types of norms that it should be able to utilize such criteria by suggesting a method for interpretation, ie a system language representation of such words.

Apart from this are certain words which are seen as expressions of certain logical properties of sentences and phrases. These are certain conjunctions and adverbs corresponding to the so called *logical connectives* (and, or, if-then, if-and-only-if, not) and different *quantitative* expressions (all, none, some, numbers). These are common to statements and norms, but have nevertheless important functions in representing the logical form of the norm. (Luckily the use of such words would seem rather well defined, the interpretation of them may be given in an unambiguous way. But there are also unclear cases.)

What has been said does not imply that one always should expect to have a typology assigning one and only one content to each expression. The statutory language, as part of everyday language (and perhaps as primary language in general), as well as the separate words and expressions in this language, may in different ways be ambiguous. One word may have different contents in different contexts or (by cumulation of contents) even in one particular occurrence, and different words may have the same content (by cumulation of expressions). The words may also be vague and shoddy in their interpretation. And these are not just

imperfections of the statutory language (which is part of everyday language) and which one should try to eliminate through a process of normalization. On the contrary, they are part of the perfection of language, for instance making possible its flexibility, which it is important to conserve. There are of course several unnecessary ambiguities in statutory language. Yet the point should not be to insist on having simple (simplified) translation procedures taking particular words or expression as point of departure. Rather one should admit and comply with the need for other supplementary criteria - associated with other properties of actualization.

2. What has been said of words and phrases as criteria of identification also holds for the *structure of normative sentences* (syntax) and *grammar* in general. Here is no room for a discussion of the more detailed distinction between one and the other category nor for the use of them as criteria. The point is that any normative expression appears as a whole, where the separate words partly have their contents determined also through the place and function they have in the sentence as a whole, through the use of propositions, suffixes etc.

3.3.2 Other properties of actualization. Legal sources and inferences as criteria of identification.

1. In the identification of norms (of a certain content) we make use of a number of other facts in addition to the primary norm expression (which besides only is present with respect to issued norms). Such facts are often lumped together under the heading "*legal sources*". As such legal sources we could for instance look to norms which already wholly or partly have been actualized in another way (as other issued norms and corresponding norm expressions, norms developed through court decisions or by the decisions of public administration, through customary law, as foreign law etc), different properties as to the background and creation of the norm, properties of the world from which the norm has sprung etc.

In addition we use a number of different *inferences* in the *establishment* of a norm (through a process of "legal argumentation") based on the legal sources. Some of these inferences have already been mentioned above in relation to what has been named the semantic inference potential. As a whole the set of such inferences generally is referred to as "*principles of legal sources*", as principles for legal argument, or as principles when "harmonizing" legal sources.

B. Some of these legal sources and arguments will not only be used to justify the establishing of norms of a certain content in general, but may also be used as possible criteria for identifying different types of norms.

Some obvious examples of a typology based on such properties are given in the distinction of norms with respect to their origin in "customary law", "statutory rules", "regulatory provisions" etc. or the distinction between "issued" (in Norwegian: "fastsatt rett") or "written" versus "non-issued" law. Such categories of types may for instance be the basis for secondary characterizations of the norms with respect to the validity within the system (for instance as *lex superior*).

There are also examples in legal theory of such criteria used as primary or supplementary criteria of semantic types of norms, for instance based on the view that norms created in a certain way also have a typical content, or that they cannot have a certain content etc.

Whatever one may maintain to prove with respect to the adequacy of such properties as criteria of certain types of norms, clearly the actualization properties here mentioned *must always be taken into consideration* as supplementary criteria. As the establishing of any norm, also of an issued norm, always presumes the harmonization of different legal sources, *it is not possible to imagine that types of norms are identified until after such a harmonization*. This is, however, not as mystical or loose as may appear at first hand. Harmonization may also be seen as a series of inferences based on an imagined set of originally or primarily given sentences (= the rest of the system of propositions), where the norm we are considering (and are to qualify with respect to type) is the result.

(A problem in this respect may be what has been termed "the hermeneutical circle", with the fact that all parts of the normative system may be determined by the others.)

3.3.3 Properties of communication

Also properties of communication of norms may be used as a criterion when determining the types of norms. In the following this possibility will not be further considered.

3.4 *Some common methodological problems in choosing criteria of identification*

The criterion of identification must have a certain logical priority as a condition with respect to the determination of the type in question.

Other selection criteria would be: Simplicity, clarity, unambiguity and operationality, (the criterion should be present for all norms, it should be easy to identify and give an unambiguous answer to the problem of type qualification, etc).

4. Some special questions and problems with respect to type qualification of norms

4.1 *Some preliminary questions*

4.1.1 *Are all norms norms?*

This question has several aspects.

A question already mentioned in passing above is *what should be the condition to accept something as a norm at all* - especially with respect to the completeness of content of meaning. As mentioned, I think one should be rather liberal in this respect, i.e. one should as far as possible recognize issued norms in the form they actually occur, i.e. accept their wording as a norm expression. A condition should be, however, that the expression in question, possibly after interpretation, is understood as the carrier of a whole *proposition* at all - i.e. in practice that the expression consists in a whole *sentence* with at least one noun phrase plus a verb phrase.

Another question is *whether really all sentences* which from their context appear to be norms - in this case by being contained as independent sentences in a statute - *also are norms and should be represented as such*. (On the semantic analysis of normative propositions and normative modality, cf below at sect 4.1.6.) In principle it is obviously possible to imagine a text consisting partly of sentences understood as norm sentences and partly of sentences understood as statement sentences, or possibly even of sentences of a different type (interrogative sentences etc).

By considering common Norwegian statutes it is easy to find examples of sentences which by their wording intuitively seem declarative - for instance by only containing a main verb or the auxiliary verb "to be" in indicative (and also present tense) form. Are all such sentences really expressions of normative propositions? The usual answer is affirmative. But especially with respect to propositions which are known as norms of qualification or performative (constitutive) rules - propositions which both express something which should be and at the same time something which by the presentation of the norm *is* - it is possible that a representation of them exclusively as norms similar to prescriptions is not able to express their whole content.

But even if this is not so, and even if we in principle hold that all statutory sentences express norms, one may raise another radical question: Is it necessary to represent norms *as norms*, i.e. in a way fundamentally different from the representation of for instance declarative propositions?

The answer is dependent on how radical we perceive the question to be. In one sense our perception of norms as norms is and must be decisive to our representation and use of them - to the same degree as we hold that norms relate to other (normative or not) propositions in a certain way - i.e. that the norms have a special logic. To the same degree which we hold that norms have a special function in the system of represented propositions we also should represent them in a special way to clarify this. But this does not have to imply that we consider and represent norms as a wholly separate system. A number of inferences based on propositions are common for normative and declarative propositions. This is e.g. the case with some core of the basic principles of propositional logic and of theory of quantification. And it would be unnecessarily complicated to create one logic for declarative propositions and another for normative propositions.

The most adequate would then perhaps be to establish a common system language and a form of system language representation where norms are represented as a special type of propositions associated with *certain* special properties *in addition to* the properties of other propositions, which partly have other special properties, and partly also may have the same properties.

4.1.2 What is one norm?

This question is related to the one above. How should norms be individualized? A simple answer to the question might be that a norm simply is what corresponds to a certain norm expression in system language - i.e. that each difference with respect to system language representation also is seen as a difference between the represented norms.

This may be supplemented as indicated above by a theory of the semantic inference potential, which implies that a norm at the same time may contain as embedded other norms, for instance as in the instantiation of universal norms.

The fragmentary nature of the normative system should also be taken into consideration.

4.1.3 Basic versus complex norms

It is an important realization that norms just as other propositions may be complex. This may be evident from the fact that the primary norm expression consists of a number of coordinated or subordinated sentences. But it may also happen that a norm expression which at first glance appears as simple, at closer analysis is understood as an expression of a complex proposition. It is an important objective in the representation of norms, and also of a typology of norms, that the representation should facilitate or at least make it possible to split such norms further - or that it facilitate an inference to the semantic inference potential contained in the norm.

A traditional example is the analysis of the concepts of *right* and *claim* as a complex of functions and as constituted through a mass of more basic norms. Another example analysis of norms of competence (see below).

But is it implied that *complex norms must be represented as such*? One may envisage two ways of approaching this problem. One possibility would be to insist that complex norms always should be represented as complex, i.e. that they in system language are represented as a complex of elements. Another possibility is to choose an immediate system language representation through a single concept (which would more or less correspond to the complex concepts of the primary language), but supplement this with a number of inference rules which may be

used *subsequently* in analysis and application of the norm. This is discussed further in sect 4.4.

4.1.4 Is the number of types of norms smaller than the number of types of statements?

A basic view held in the following is that a priori there is no reason to believe that the number of types of norms is smaller than the number of types of declarative statements. Nevertheless the opposite view seems to be prevailing in traditional theories of norms. Before discussing this question, one should decide what to compare. A way of interpreting the theories of the limited number of types of norms is for instance to understand the types as indications of special forms of (normative) modal qualification. In this case what one should compare with is rather the different forms of modal qualification of statements - and this number will also be found to be limited.

Below at sect 4.2 and 4.3 some forms of "reductionism" will be mentioned. The point of departure will be that a limitation of the number of types of norms within a set of norms only can be accepted to the extent that a corresponding limitation of declarative propositions may be accepted. In practice, however, the classification will be somewhat different for norms compared to statements - we are for instance thematically/practically looking for different substantial properties of the norms, for instance their relation to actions.

4.1.5 Are the types of norms universal?

To which extent there are universal categories of language is a controversial issue in modern linguistic theory - i.e. to which extent there are expressional, semantic and/or pragmatic categories common to all languages, which are universally valid.

In a weak version this question implies whether within each or a certain primary language or a system language there may be established an expression corresponding to each linguistic expression within the other languages, i.e. whether all linguistic properties may be thematized. At least with respect to a system language such a thesis of universality may seem plausible, and it will be presumed for this paper.

A stronger thesis would be that there exist certain (positive, and not trivial) structures and properties of primary language common to all languages. I will not

discuss this issue further. The question only becomes critical in a possible simultaneous representation of norms in system language which are expressed in different primary languages, aiming at the establishment of common logic, decision procedure or other common structures. In this paper it is presumed that we only deal with norms represented in Norwegian as the primary language.

4.1.6 Introduction to the sections below, and on the propositional structure of norms

In the sections 4.2-4 below a more specific discussion of different classifications of norms will follow. The views discussed above in sect 2 and 3 will be presumed, respectively on the different objectives of a typology and on the possible criteria of a typology. As indicated and corresponding with the traditional view, the basis for the classification will in the first hand be *semantic* properties of the norms - i.e. different properties and structures of the established normative propositions. But I will presume that the different qualifications of norms both in general and with respect to the case in question may be assigned the norm by a reference to for instance the norm expression and other factors of actualization (legal sources). I will also presume that the objective of the typology and thereby also a reason for identifying some of the semantic properties in preference to others, is to clarify differences with respect to the semantic inference potential and possibly other application properties.

The structure of the normative proposition (the content of the norm) is obviously in itself a question which may be discussed. Common to most theories of norms is probably that the norms are seen characterized in contrast to other propositions by a basic normative modality, the linguistic symbol of which is a normative "operator". This normativity is however often seen as more specific than just a normative quality in general - for instance by at the same time qualifying the rest of the subject matter of the norm as an action (and thereby the whole norm as a norm of conduct), or as a duty. Sundby (1974) distinguishes apparently between two basic normative operators - but writes elsewhere that these have something in common. My own view, which probably will become apparent in the following, is that any attempt to make the normativity concrete beyond a characterization of the normativity as such implies an undesired form of reductionism. This implies again that would I view the proposition as divided into "character" and "subject matter" in a different way than Sundby, as *the character* is only understood as a kind of pure *normative* as opposed to a declarative character.

Whether the norm is a norm of conduct (a prescription) or of qualification is to me not obviously something contained in the character of the norm, but in its additional *subject matter*.

One may, however, imagine further classifications of this subject matter, for instance making a distinction between, on the one hand a (secondary) *modality*, corresponding to the categories of necessity, possibility, reality, that are to be found with respect to declarative statements and the symbol of which is a modal operator, and on the other hand the rest of the subject matter. In the same way as with respect to declarative propositions this rest of subject matter may also be further analyzed for instance with respect to connective or quantitative structures (cf sect 4.2), with which phenomena the norm is concerned, with time structures, etc - and one may consider different combinations of such categories.

In the following I will pose some questions and indicate some possibilities with respect to such a further analysis of the content of norms beyond their basic normativity.

4.2 *Some questions of connective and quantitative types of norms*

4.2.0 *Introduction*

By a *connective* type of norm I mean a type of norm qualified by connective properties of the norm, i.e. based on which logical connectives (not, and, or, if-then, if-and-only-if-then) that are included in a system language ("logical") representation of the content of the norm. By a *quantitative* type of norm I mean correspondingly a type of norm qualified by which logical quantifiers (all, some, none) or more specific quantitative specifications that will have to be employed in the system language representation of the contents of the norm.

Based on an unprejudiced view of norms one should not believe that such properties on norms are less complex than those of statements. Nevertheless it is a widely held view that norms have specific connective and quantitative structures.

4.2.1 *Do all norms have a conditional form? On connective types of norms.*

A. It is a common view that all norms are of a conditional form. Is this correct?

It would seem evident that at least in principle, i.e. logically, it is possible to recognize unconditional norms - and that there therefore is no reason to imply a particular conditional structure in the definition of norms.

Another question is whether norms as a matter of fact are of conditional form. Also this question has a weaker and a stronger version.

In a weaker sense there evidently exists unconditional norms, i.e. in the sense that there are norms which in primary language appear as unconditional. Examples are *legio* - there probably is no Norwegian statute not including unconditional norms in this sense.

A more restrictive question is whether there are norms which even through a closer logical analysis do not appear as conditional (i.e. norms which cannot be represented as having the form $(x) (Fx \rightarrow Gx)$). It is difficult to find examples of this. At least it would seem that all universal/general norms should be considered conditional in this sense.

A possible exception is, however, individual and existential norms like the one contained in the Housing Bank Act sect 2(1): The Bank has a basic fund of twenty million crowns.

B. With respect to *other connective properties* we may obviously imagine - and will also find practical examples of - many different combinations, e.g. norms where the condition and/or consequence are represented as containing a negation (not), conjunction (and), and/or disjunction (or).

4.2.2 *Are all norms general? On quantitative types.*

Another traditional view is that all norms are general - i.e. that they may be represented as universally quantified. Clearly most norms should be understood and represented in this way. It should, however, also be clear that there is no reason to imply such a property in the definition of a norm a priori, this regardless how amoral or illegitimate the exceptional non universal norms are viewed.

To my mind there are obvious examples of norms which at least as part of its structure include *existential* quantifications (and thereby also in general an unconditioned, conjunctive structure), i.e. norms which have the logical form $(\exists x)(Fx \ \& \ Gx)$. Several examples may be found in the Housing Bank Act.

The same Act also includes several examples of what may be termed *individual* norms - i.e. norms which refer to as subject or object a certain, individualized phenomenon - for instance a certain legal person.

A third exception is what I will term *probabilistic* norms, i.e. norms of a quantitative structure corresponding to statements of probability. - On this subject, cf Malt 1985.

4.3 Basic substantive types of norms

4.3.0 Introduction

It is a traditional view that there are certain basic types of norms, qualified with respect to their substance i.e. their (semantic) content or subject matter apart from the primary modality (the character) and of connective and quantitative structure, - what I will term substantive types of norms. In this section, I will pose some questions relating to the possibility of identifying such basic types of norms, and other basic properties of contents.

With respect to conditional norms, one generally bases the classification of type on properties of the *consequent* of the norm.

As mentioned above, I presume a possibility within the subject matter discussed and further within the consequent to distinguish between what may be termed the *secondary modalities* - i.e. modalities dominated by the primary (basic) normativity - and the *additional subject matter*. In practice it may be difficult to distinguish between these different elements of the proposition, and it may be that the distinction itself between for instance primary and secondary modality or between modality and other semantic properties or properties of actualization is unclear. I do not intend to take a final position with respect to such questions, but will only indicate some analytical angles and consequences. Also: Though I in the analysis of the different types of norms in the last resort take my basis in such a theory of the semantic structure of norms, it will not restrict the possibility to digress into discussions of the different actualization or application properties of the norms - cfr what has been discussed previously. Nor does what is to be said imply that particular theorists on norms with distinctions similar to mine have taken the same view as to the basis for the distinctions.

4.3.1. *Norms of conduct (prescriptions, directives, norms of action, obligations, norms of duty.)*

4. *Are all norms norms of conduct?*

One of the more stubborn myths about norms is the view that all norms are norms of conduct - understood as norms which *prescribe*, prohibit or permit, i.e. regulate (positively or negatively as a duty), certain *actions*. (Such norms are also called directives (Ross), norms of duty (Sundby), norms of action (Strømberg), obligations, prescriptions etc).

Is this a correct or good view? The answer obviously relies primarily on what is meant by the claim that the norms "are" of this nature (and what in a more detailed sense is understood by norms of conduct - on this, cf below). Obviously not all representations of norms clearly *express* obligations in this sense. And if one according to the principle of the reality of the immediately given recognizes such formulations of norms as expressions of independent norms, one easily may respond to the question negatively.

But the question may be understood in a more basic sense, as a question of whether all norms ultimately may be understood or translated (in system language) to norms of conduct.

Partly this will be a question of whether the *content* of all norms may be *expanded* into being the content of norms which govern *actions*. In a way such an extension seems plausible. Take for instance a norm as the Housing Bank Act sect 4(1): "The main office of the Bank lies in Oslo." Clearly this norm in some way presupposes a duty for instance for the Board of Directors of the bank, the Council or others to make sure that the Bank is given a main office in Oslo. And in this sense it may be maintained that such a prescription of an act is implied by or otherwise is part of the semantic inference potential of sect 4(1) of the Act. But does this imply that the norm is a norm of conduct? The answer must I guess depend on how unambiguously or automatically one may infer from the provision to one or more norms of conduct. Only if the specified set of norms of conduct is inferred in some strict sense, immediately and "automatically" on issuing the primary provisions, would it be justified to term this latter also as a norm of conduct. But posing the question in this way makes it clear that the answer will be negative. It is not difficult to exemplify norms (and the Housing Bank Act sect 4(1) is perhaps already an example) which not immediately may be expanded in this

way. The reason may be that we do not know, when reading the norm, who are intended to be the subjects of the norm - and that we have to read the rest of the statute (or the rest of some other set of norms) or the preparatory works to discover this. But there may also be cases where the legislator has not decided who is to realize the norm and by which methods. The legislator may even consciously have considered this lack of specificity and refrained from making the norm more specific with respect to subjects or forms of action. If we in the definition of a norm imply that it has to be norm of conduct, it would seem difficult to represent such inspecific regulations as regulations.

Another aspect of the question is whether all normative modalities (cf below) can be *translated* into categories of *prescription* (duty) concerning actions. Within deontic logic a common view is that a reduction (inter-definability) of other modalities of norms can be maintained, for instance taking "prohibited p" to be synonymous to "prescribed not-p", taking "permitted p" as synonymous to "not prohibited p", ie "not prescribed not-p", etc. Attempts have also been made to reduce norms of competence to categories of duty in this way, for instance by supposing that the proposition "A has competence to (a decision) B" is understood as a proposition to the effect that other persons (x, y etc) has a duty to comply with or recognize as valid, B.

Norms of qualifications, such as legal definitions, could in the same manner be understood as obligations for (certain) persons applying the norms to consider or treat certain phenomena in a certain way. Neither in this way the theory of norms of conduct as an absolute theory can be acceptable.

B. Do we at all need a category norm of conduct/prescriptions?

A radical different question than the one whether all norms are norms of conduct/prescription would be the question whether a category of norms of conduct, understood as prescriptive norms is needed at all. Obviously there in fact are norm *expressions* which do employ the word duty or other typical expressions for obligations like "shall (do)", "prescribed", "prohibited" etc. The question therefore is whether these categories cannot be semantically reduced (and thus are primitives) or whether, for some other reason there is a special reason to prefer these categories to other normative or general expressional or semantic categories. The answer is probably (doubly) affirmative - especially as the use of these categories would seem to rely on a certain semantic inference potential which in practice is important to our consideration of norms.

C. *Prescriptive norms or norms of conduct?*

I have so far presumed that all norms of conduct also are *prescriptive* norms, i.e. that they prescribe/prohibit or in some other way qualify normatively certain actions. Whether we in this case use the term "prescriptive norm" or "norm of conduct" as the primary (system language) category, would rely on what to us is perceived as important with respect to that category - is this the fact that the norm concerns actions, or is it the *way* of regulating those actions as a prescription (or is it something else or more than this)? In my view it is obvious that to regulate an action to be a duty through a prescription is a special way of governing actions - i.e. that the concept of a norm of conduct is not sufficiently specific as a primitive concept. By a more detailed analysis it appears that the very identification of norms of prescription and norms of conduct turns out to be difficult.

If norms of prescription are also characterized by regulating in a certain *way*, through prescriptions/prohibitions, it seems to imply that one can imagine norms of conduct which are not norms of prescription. Also certain norms of competence would probably intuitively appear as norms of conduct, without this necessarily making them norms of prescription.

One may also ask whether it is necessary to perceive of all norms of prescription as norms of conduct - this is further discussed at sect 4.3.4 below. Tentatively in this section 4.3.1 is presumed that all norms of prescription are norms of conduct.

D. *One or more basic prescriptive categories?*

The thesis of the inter-definability of deontic modalities imply that it is sufficient with one basic category of prescription as applied to norms of conduct - for instance "prescription" (= duty to, obligation). Other categories (prohibitions, permissions) could then be regarded as definable from the basic category.

Even if such a reduction should be possible in principle or by a pure formal approach, it is not obvious that one also exhaust the practical contents or semantic inference potential of actual categories by such an approach. Especially problematic is a reduction with respect to external negations as would be the case with respect to permissions, cf. below. In principle it could also be possible to imagine a number of primitive prescriptive operators, for instance defining prescription, prohibition and permission separately.

E. How should the basic category "duty" (prescription) be defined?

Duties and prescriptions may not be defined only by reference to the occurrence of certain words or expressions as actualization properties - like shall, shall (do), duty, obligated to, prescribed etc. As mentioned above it can neither be correct to define duty exclusively by reference to the properties of violation.

The decisive criterion must relate to the content of the norm and secondarily to its semantic inference potential, as the occurrences of certain typical expressions of prescriptive norms are seen as more or less incidental (or as suggestions for system language expressions).

Through a more detailed semantic analysis some *modal structure* would seem decisive, implying that the subject of the norm in question is under some sort of *compulsion* or necessity (lack of freedom) to act with respect to the sender of the norm.

F. Other categories of prescriptive norms: Prohibition, permission.

Prohibition may easily be understood as prescription to refrain - i.e. as a secondary inferable category with respect to duties.

But what about *permissions*? This is one of the most widely discussed concepts in the theory of types of norms. One reason is probably that the concept of norm of competence also has been drawn into the discussion (on this cf below at sect 4.3.2), but even without such a wide scope the concept of permission is problematic. The difficulties are primarily two:

First one may ask whether we understand or ought to understand permission as a lack of prohibition with respect to something, or (also) as a combination of a lack of prohibition with a lack of prescription. This is partly a question of correct analysis (interpretation) of actual occurrences of permissions in the legislation, partly a question of what is appropriate in the terminology of system language.

Second, one may ask what is meant by "lack of" prohibition/prescription in such cases. Or put in another way, which status does the negation added to a prescription/prohibition (as as "external" negation) have when arriving at a permission. Obviously, such an external negation cannot be construed just as a (declarative) statement of the actual absence of a prescription/prohibition, consequently it contains an element of normativity. But in which way? Perhaps we have in such cases to imagine an external norm which in turn either prescribes or otherwise stipulates (e.g. through some kind of qualification given through a norm of qualification - see below) that there should not be any prescription/prohibition etc?

There have been attempts to solve both the problems mentioned by a distinction between "strong" and "weak" permissions.

Another possibility is to understand permission as a positive concept which specifies a positive *freedom* with respect to a certain act.

4.3.2 Norms of competence (authorities; power conferring norms)

A. Tentative explanation.

Today norms of competence (authorities, power conferring rules) are commonly seen as a special category of norm in addition to prescriptions/norms of conduct. The norms of competence are then, and intuitively, understood as norms which not (or not only) specify an action as prescribed, prohibited or permitted, but which specify that a person has *authority*, *competence*, *power to decide something* with an effect for others (heteronomous authority) or himself (autonomous authority). I have above suggested that norms of competence may not adequately be reduced to norms of prescription. Today most legal philosophers (in contrast to deontic logicians and perhaps moral philosophers) does not seem to recommend such a reduction (on the subject cf Sundby 1974 and Strömberg 1983).

Norms of competence may admittedly often be partly understood as permissive norms, but clearly there is more to them than this, and also more than only a permission combined with a prescription that others should comply with the decisions issued according to the authority. The general view is that the concept of competence should be understood as containing a reference (which cannot be reduced?) to a regulation of validity, for instance through a qualification which states that violation of the norm of competence has invalidity as a consequence.

One may ask whether we at all need a category for norms of competence in practice in addition to prescription. The answer is probably affirmative, and the reason may be found in the special properties of application (the semantic inference potential and the properties of violation) of such norms compared to prescriptions. The very fact that norms of competence to a large extent are used in practical, legal reasoning is probably also an indication of the need for such a category.

B. Which norms are comprised by the concept of norms of competence?

The norms comprised by the concept of norms of competence are of two types which may be termed norms of competent action and status norms. A *norm of competent action* is a norm which directly specifies that a person *may decide something* etc. A status norm is a norm that directly only specifies that a person (meeting certain conditions) has a certain status, but which evidently presumes that persons having such a status on this basis may make certain decisions. While norms of competent action are a form of dynamic norms of conduct, the status norms in the first hand appear rather as static situation (qualification) norms. To a mixed group would belong norms which specify that a person *has* a certain *authority* (power, competence) to decide something. Common to these types is, however, that they directly or indirectly govern the validity of the decisions which are made by the person of authority in a specified way.

C. How is the concept of competence to be understood?

Norms of competence are not characterized by certain properties of actualization - they are established in the usual way through interpretation and other forms of establishment on the basis of actualization factors (legal sources).

As discussed under litra B, the norms of competence neither are characterized by a special non-modal subject matter apart from the fact (which actually is decisive) that they directly or indirectly refer to a special communicative action stating a norm typically to be termed a "regulation" or a "decision".

One way of looking at norms of competence is to see them as meta-norms governing the creation and validity of these norms. But not all norms governing the creation or validity of norms, nor all norms regulating the action of creating norms as such should be regarded norms of competence.

And perhaps norms of competence are more than meta-norms of validity. As they themselves not always describe an action, it would not be completely correct to qualify them as norms of conduct - but nevertheless they clearly may also be such norms? One may for instance through a representation of norms of competence consider them as norms of cumulative contents, e.g. a combination of a meta-norm and one or more prescriptions (for instance a permission).

Both in primary and secondary language the norms of competence most often are represented by the modal verb "can", in the same way as ordinary permissive norms of conduct. But otherwise there should be no problem in imagining norms of competence which at the same time (i.e. using the same

deontic operators) are prescriptions, for instance a norm specifying that a person *shall* decide *whether* .. (a or b).

D. Is competence a complex category?

Above, it has been given certain arguments in favor of looking at competence and norms of competence not just as a simple category. One might admittedly imagine looking for and establishing a certain semantic (modal) category in system language: "authority-to" or similarly, which then was to be considered as a primitive. Such an approach might have certain advantages for a logical representation, and would at the same time not make it impossible to make a secondary identification of the semantic inference potential and of properties of violation.

But it would seem difficult to find an adequate candidate for a concept for this important function. There seems to be no basic modality of competence in the same way as we perceive a basic modality of prescription, and which includes all the typical properties of competence. This probably leads us to consider the category of competence as complex - in the same way as the concepts "right", "claim" etc. Saying this, it would however be possible to accept splitting up the concept in a way which conserves all the functions of the concept. A possible analysis thus is to consider competence as a combination (by content cumulation) of a prescription - typically a permissive norm - having as its object an action creating a norm, and a qualification of the result of this action. This qualification of the result of the action (decision) can either be seen as a qualification *sui generis* or as an example of a normative qualification of the types discussed below.

4.3.3 Norms of qualification

A. Tentative explanation

Strömberg (1966) and in more detail Sundby (1974) have argued for the introduction of another (or third) type of norms in addition to norms of prescription (norms of conduct) and norms of competence - a type termed "qualifications" (or "norm of qualification"). These are characterized by specifying that something shall be or count as something - and in such a way that they directly may be said to qualify or create the subject matter they describe.

Qualifications would correspond to what Austin originally referred to as performatives and also to the common concept of *constitutive* rules as explained e.g. in Searle (1969). Examples of norms of qualifications are primarily the different kinds of legal definitions. But also norms of status and perhaps any norms of competence may be seen as an effect of such a qualification.

B. Do we need such a category?

In my view the response is affirmative. Neither prescriptions nor norms of competence exhaust practically the content of this type of norms.

C. How should norms of qualification be understood?

Norms of qualification are characterized typically, but not necessarily, by certain expressions (as: regard as, count as, view as, is).

A way of understanding them is perhaps, as Sundby suggests, to look at qualification as a special normative modality. For instance one could understand them as corresponding to a normative counterpart to the modality *real* in opposition to necessary/possible.

4.3.4 Other substantive types of norms? Situation norms.

Are all norms either norms of conduct or norms of qualification (with norms of competence understood as a special combination of norm of conduct and qualification)? If we by norms of conduct only include those certain prescriptive, prohibitive and /or permissive norms, norms which directly govern *action* in a certain way, the answer clearly is negative.

First there may be norms of action which cannot be considered norms of conduct in the way explained above. But also one may imagine norms concerning other subject matter than action, and which are not norms of qualification (or norms of competence).

Common to such other types of norms would probably be that they in one way or the other demand a certain standard of or otherwise govern a *situation* - and we may not therefore use the term *situation norms*. Examples are not difficult to find. The provision in the Housing Bank Act sect 3(1) offers an example: "The bank shall have a risk fund of ten million crowns." Also the provision already mentioned in the Housing Bank Act sect 4(1): "The main office of the Bank shall

be in Oslo" may be understood the same way. A third example is this offered by the Work Environment Act sect 7(1): The work environment in the institutions should be fully adequate ..."

An alternative to the analysis of such norms here suggested would be to consider prescription and other categories of prescriptive norms as more extensive normative modalities which do not presume a direct governing of an action. These may in a possibly analogy to the modality of prescription be termed as shall modalities, can modalities etc. A consequence of this would however be a diluting of the concept of norms conduct or prescription - and much of the semantic inference potential and probably especially the properties of violation having to do with sanctions with respect to persons would disappear.

4.3.5 Some notes on temporal structures

A. Introduction

An important element in any proposition is its temporal properties. By this is intended a number of different ways to qualify subject matter with respect to time. What may be in question can be the basic time horizon (time-deixis), different absolute and relative temporal determinations of the action and of the situation of the norm, or properties of the verb or other expressions with respect to the so called "aspect" or "Aktionsart". In addition there are special (application related) questions with respect to the temporal area of application of the norm itself - with respect to temporal extensions of validity, time of entering in to force etc.

All these different temporal properties of the norm may be used for classification of norms to clarify differences with respect to the semantic inference potential etc. Some such semantic and pragmatic temporal properties (of actualization and application) have been subject for studies within a special logical discipline - temporal logic. (Cf also Frändberg 1984.) I will not discuss this in more detail in the present paper.

B. Interpretation of norm sentences in indicative of present tense.

I want to mention in passing however a practical problem which has its roots in the temporal properties of the norms - i.e. the question of interpretation of norm expressions (sentences) which do not contain modal (and normative) auxiliary verbs, but only contain a main verb or the verb "to be" in indicative of present tense. The interpretation of such norms gives rise to at least two problems.

First, one may ask whether it is evident that such expressions should be interpreted as expressions of norms at all. (I presume here that possibly other criteria of normativity - for instance the inclusion of the normative sentence as part of an act of parliament, indicate that a norm is in question.) This question was discussed above at sect 4.1.1, and an affirmative response was there suggested.

But there remains the question of how such norms should be represented. Which normative modality or substantive type of norm is represented in such cases? A solution may be to consider such norms as a type of norms *sui generis*, or perhaps as a special type of situation norms or norm of conduct in addition to those norms which explicitly are qualified by the use of "shall", "can" or "ought". But this would be to circumvent the problem. In many cases it clearly appears incidental whether one or the other phrase is employed, and the semantic inference potential with respect to such norms seems to correspond to the semantic inference potential with respect to certain "can" or "shall" -norms.

At the same time however, occasionally it appears to be differences in detail in the contents of one or the other of the expressions and it appears that one not out of hand can identify such norms as "shall" or "can" - norms.

Possibly there is no clear solution to the problem - such that one is forced to make an interpretation and establishing the normative expression in question on the available actualization factors for the case in question.

4.4 Complex types of norms

4.4.0 Introduction

As is the case with other propositions, normative propositions - and therefore also norms - may be complex, in the sense that a detailed analysis yields understanding of the proposition as composed of several coordinated or hierarchically ordered subpropositions. The sub-propositions may be independent propositions, for instance what emerges when two main sentences are connected with "and", one may be dependent upon the other etc. It is an important task for a theory of types of norms to facilitate an effective and adequate analysis of complex types of norms, and much of modern normative theory has been concerned just with finding adequate ways for the resolution of complex types of norms.

One type of complex norms has already been mentioned above at sect 4.3.2 - norms of competence. These norms were understood as a special type of norms concerning other norms - *meta-norms* of existence and validity. In this section additional comments will be offered for such norms as a subset of what I will term *proposition embedding norms* - especially such concepts as "right", "claim" etc.

4.4.1 Proposition embedding norms, especially on meta-norms

Propositions may concern, refer to, other propositions. In such cases one may say that the proposition referred to is embedded in the "main" proposition. The embedded proposition may be described as a sub-proposition, while the embedding proposition may be described as a meta-proposition.

In cases where both the sub- and meta-propositions are normative propositions, the meta-proposition may be described as a *meta-norm* (in fact: a normative meta-proposition - I here presume that the proposition also has been actualized as a norm), while the sub-proposition correspondingly may be described as a normative sub-proposition - a sub-norm.

Probably the *norms of competence* may be considered as a special type of complex of meta-norms and sub norms. This at least holds for what I above termed the norms of competent action, as these explicitly indicate competence (permission

etc) to create norms. (This is not as obvious with the status norms. Such norms must probably first be expanded as norms presupposing norms - as discussed below - to make the embedded norms apparent.)

One may also imagine other meta-norms than norms of competence. A practical category are pure *qualification norms* on validity, actualization etc. (Hart's secondary rules probably would belong to this category.)

It is an important task for the typology of norms to clarify the semantic inference potential with respect to different forms of embedding. Especially important is probably the possibility for inference with respect to existence and validity of the sub-norms implied by qualification norms.

A third type of norms which may be analyzed in this way is what Sundby (1974) terms *discretionary norms* understood as a certain kind of assessment (decision) norms. (Cf sect 4.5.)

4.4.2 Other normpresupposing norms - especially on complex legal concepts and other norm markers.

The concept of "*right*" is a traditional example of a concept working as a "linking concept" in the sense that it functions as a reference to a more or less defined set of propositions indicating concept conditions and concept consequences where the condition propositions and consequential propositions generally may be seen as *norms*. As these related norms may be seen as presupposed by the concept, norms containing such concepts presupposing other norms themselves may be described as *normpresupposing norms*. Since Bentham and Hohfeld much of legal theory has been concerned with the analysis of, i.e. to demonstrate the semantic inference potential, contained in, such more or less "basic legal concepts". Other complex concepts are *claim*, *competence*, *authority*, *power* etc. In Nordic legal theory Ekelof, Strahl, Ross (1953) Olivecrona (1966, 1971) and Lindahl (1977) have for instance made important contributions to such analyses, and it is not necessary for me to discuss this. I here only would like to emphasize the need for a uniform typological system, where the value of the basic typology discussed in sect 4.3 is also measured against its ability to be building brick in the establishment/analysis of such complex concepts.

Also such phrases which Eckhoff/Sundby mention as *discretionary markers* ("*avveiningsmarkører*") may be analyzed in this way. Ultimately this also holds for a number of other *legal characterizations* which, when used, may be said to presuppose the existence of condition indicating and consequence indicating norms. Cf Eckhoff/Sundby 1976 ch 8 II.)

4.5 Other type classification of norms

4.5.1 Strong versus weak norms

A distinction different from the distinctions above is the distinction between weak and strong norms. This has to do with the fact that norms may be weak or strong in a number of different ways. In a representation and a typology of norms it is obviously a need for making this distinction topical - possibly by developing different kinds of weakness, with correspondingly different criteria and consequences. Such a discussion is necessary already from the reason that in statutory provisions one finds a number of different expressions which evidently have the function of qualifying the norm with respect to strength/weakness. Such expressions in norwegian are for instance "ought to" ("bør"), "in general" or "preferably". This has as a consequence that the norms have different functions in a process of application. For an attempt of a typology explicitly with respect to such different forms of weakness and strength see Malt 1986.

4.5.2 Other topical classifications

One may imagine a number of other classifications of norms in addition to the types mentioned above in this chapter.

Both as part of a systematic discussion of legal disciplines or legal issues, as well as in practical dealing with norms it might for instance be useful to classify norms with respect to their *subject matter*. An example is the distinction between *procedural* and *substantive* norms, between *primary* norms and *sanction* norms (penal provisions) etc, between *personal*, *procedural* and *substantial* norms of competence.

One may also classify norms with respect to their (types of) *subjects* - with respect to who is to carry out the action in an obligation, with respect to who has the authority, with respect to who sanctions the norms, etc. To the extent that such characteristics are useful in the application or retrieval of norms it would also be a task for a typology and representation to make them explicit.

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Andrew J I Jones

DEONTIC LOGIC AND ITS IMPLEMENTATION: SOME PRELIMINARY COMMENTS

The second international conference on the theme "Logica, Informatica, Diritto" (Logic, Computer Science and the Law) was held in Florence in September, 1985, under the auspices of the Italian National Research Council (Dept. of Legal Documentation). During the conference some sixty or so papers were presented, among them contributions from leading figures in the design of legal expert systems and in deontic logic. The latter area, which is the main subject for these notes, is concerned with the analysis of our reasoning about obligations, rights and permissions - and related notions; it has been a quite active field of research among formally inclined moral and legal philosophers, particularly since the 1950's, when the development of possible-worlds semantics gave a whole new lease of life to the logical study of modalities. It should be noted at the outset, however, that hardly any of this research has been motivated by an interest in the construction of knowledge-bases for legal expert systems; most deontic logicians have formulated their theories without giving a thought to the issue of their computational viability; that factor has seldom been considered among the constraints on adequate theory-formulation.

The Florence conference was interesting in regard to this point, since it provided some grounds for believing that the study of computationally viable forms of deontic logic will shortly be assuming a central role in research on legal expert systems; there seemed to be an acceptance - among a number of computer scientists - of the following kind of view:

the most critical task in the development of an intelligent information system, either for document retrieval or for expert advice, is the construction of a conceptual model of the relevant legal domain. (McCarty (1984), p. 126)

Obviously, a conceptual model for any legal domain will have to incorporate a semantical representation of the concepts of obligation and permission (among others), in which an account of the logical inter-relationships of these concepts will be embedded. The recent literature in deontic logic offers a range of approaches to the construction of semantical models.¹ The time is ripe, then, for some potentially fruitful cooperation between deontic logicians and computer scientists working in this field.

Whether or not the impression I gained in Florence, concerning current attitudes of computer scientists, is correct, it does seem clear that a move in the direction of increased conceptual sensitivity is much to be desired. Interesting (albeit rather different) attempts to cope with underlying semantical issues are already to be found in this area in the work of Thorne McCarty (see, e.g., McCarty (1983)) and Ronald Stamper (see, e.g., Stamper (1985)); but one recent survey of the state of the art in legal expert systems research (Susskind (1986)) reports that - with some few exceptions² - too few designers have paid sufficient attention to jurisprudential theory, and to the ways in which implicit assumptions of a jurisprudential kind determine key features of the models they propose. There is little doubt that the semantical models developed in modern deontic logic may help in the task of explicating some of these assumptions; (and I assert this even though I am also prepared to accept that deductive models of reasoning may perhaps

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1. For papers of both introductory and more advanced kinds, see Hilpinen (1971), (1981). A more recent collection of papers in the field is to be found in *Synthese* vol.65, no.2, November 1985.
 2. In his footnote 45, Susskind mentions the Norwegian Research Centre for Computers and Law as an important exception, which has carried out "... exemplary interdisciplinary inquiries into the computer/law interface ... showing ... an acute awareness of the complexities of jurisprudence and its intimate involvement with the task of designing systems to assist in legal reasoning."

supply only part of the analysis of the nature of legal reasoning.)³ Some deontic logicians have indeed been explicitly concerned with the task of formally articulating aspects of legal theory (see, e.g., Lindahl (1977), Pörn (1970)).

My conjecture - that the study of deontic logic will come to occupy a significant place in legal expert system research - finds some further support from trends in other areas of AI research - where the formal analysis of "commonsense" reasoning about beliefs, knowledge, planning and acting is currently a central area of concern. The papers collected in Hobbs & Moore (1985) provide an illustration of this; several contributions to the logic of knowledge and belief were also offered at the 1985 Los Angeles Joint Conference on AI. Modal-logical models, using possible-worlds semantics, are still very much in the picture (see, e.g. Moore (1985), which incorporates what is essentially the logic of knowledge proposed by the philosopher and logician Jaakko Hintikka back in 1962; see also Turner (1984), ch. 2 for some introductory background). They are not, of course, without their critics, especially now that considerations of computational viability are of paramount importance (see, e.g., Konolige (1985)), and it will be crucial to investigate the issue of the extent to which the (alleged) defects of possible-worlds models of knowledge and belief might find counterparts within possible-worlds analyses of the deontic notions. My main point, for the moment, is simply to indicate that there is a growing acceptance among some AI researchers of the need to justify their formalisms from a semantic perspective by developing precise semantic theories (cf. Turner (1984), closing section). AI work on applications in the legal domain should follow suit.

McCarty (1983) is the outstanding example of semantic model-building in the AI-and-Law field, and the Norwegian Research Centre for Computers and Law has benefitted greatly from his visits as guest lecturer. His model incorporates a subtle analysis of the deontic notions, in an (apparently) computationally viable form, and it is thus reasonable to require, since I wish to advocate an alternative approach, that I offer some grounds, at least, for thinking that the pursuit of an alternative strategy might be worthwhile. Accordingly, I enclose with this report a copy (with updated references) of my paper from Hansen (1985), which raises some questions about McCarty's deontics - particularly in relation to Standard Deontic Logic and

For some further discussion of this issue, in relation to legal expert systems, see the closing pages of Susskind (1986).

its so-called paradoxes - and sketches an alternative possible-worlds semantics for deontic logic, which is the result of my work with Ingmar Pörn. The details of that system are provided in Jones & Pörn (1985).

There is a range of possible approaches to the semantics of deontic notions, and although one may be fairly confident that some of them - for instance those of the Standard Deontic Logic type - can justly be deemed inadequate, in most cases it simply is not possible, in our present state of knowledge/ignorance, to pass any decisive judgement. This is a familiar situation within social theory: the descriptive discretion (Runciman (1972)) open to the social scientist confronted with the task of formulating characterizations of his/her domain of study is usually considerable; in view of this, a pragmatic policy is, at the outset, the only reasonable one to adopt: some patterns of description may cope well with some phenomena, less well with others; although the goal is, in the end, to achieve a single, uniform model, various lines of approach will have to be explored *en route*.

In the case at hand, for instance, it seems clear to me that McCarty has a more subtle and interesting treatment of permission than we (Jones & Pörn) have produced (our work on permission is not yet complete); but then, on the other hand, we are not convinced that it is essential to construct deontic logic on the base of an action logic, and we have given a rather detailed account of how the paradoxes of Standard Deontic Logic (SDL) may be avoided in our system. As is indicated in the Enclosure an account of this matter is missing in McCarty (1983). So, as things stand, it would seem that McCarty's approach fares better in some respects, ours in others; and we differ on the issue of the necessity of an action-logic "base".

In conversation, McCarty has indicated how the most significant of the SDL paradoxes - the Chisholm paradox - can be dealt with in his system; interestingly, something corresponding to Jones & Pörn's distinction between ideal and sub-ideal situations emerges in McCarty's system, in connection with his treatment of this problem. However, it remains unclear whether the challenge presented by the Belzer extension (Jones & Pörn (1985)), to the Chisholm puzzle can be handled adequately by McCarty; furthermore, I am yet to be convinced that McCarty's account of deontic semantics is as versatile as ours with respect to the description of the broader class of situations to which Chisholm intended to point: situations in which, as a result of some violation of an obligation, other obligations cease to exist and/or new obligations come into force. One confronts here the issue of the defeasibility of obligations, a topic which has a considerable history of discussion

in the philosophical literature: an adequate analysis of the deontic concepts must be able to cope with it. I should also like to draw the reader's attention to the potential relevance of these issues in deontic semantics to a wide range of problems pertaining to the control of computer systems. (See p. 5 of the Enclosure and the reference there mentioned to the work of Nafily Minsky, to whom thanks for interesting discussion of these matters.)

The question remains, of course, as to whether the issues of computational viability and implementation might decide the matter in favour of a system which did not employ possible-world semantics - or at least not a possible-world semantics as complicated as that described in Jones & Pörn (1985). The rest of these notes will be addressed primarily to the matter of implementation; by "implementation" of a deontic logic I shall here mean the translation of the sentences of that logic into some programming language, for which procedures for testing for validity and inconsistency may be specified.

My proposal will be to attempt to follow the strategy advocated in the following passage:

When the time comes to install our commonsense knowledge in machines, a *possible* strategy is to design them essentially as theorem provers over first-order sentences ... If the representational formalism we used in the first phase of the design process, the one in which we put down what we all know, isn't the first-order predicate calculus, then we must translate or compile that representation into a first-order theory. Reasons for pursuing this as an implementation technique are that we already have a good deal of experience designing and building first-order theorem provers, ... ; there is this nice uniform method - resolution - available, etc., etc. Many of these "practical" advantages of standard first-order logic are equally advantages over (e.g.) quantified first-order modal logics - which are also complete - and (e.g.) higher-order intensional logics à la Montague - which are not. So in a sense, I am urging that we may want to think *of the first-order predicate calculus as a universal machine-language for Knowledge Representation*. (Israel (1985), p. 445).

In the present context, the kind of knowledge we are interested in "installing in a machine" pertains to the obligations, permissions and entitlements described in some normative system, or fragment thereof. And the argument of the first pages of these comments urged the need for employing a semantically characterized

deontic logic as a part of the "representational formalism" to be used "in the first phase of the design process". In order to carry out Israel's strategy, then, the next phase of the design process will call for the translation of the deontic-logical sentences into first-order logic. How can this be done?

An answer to this question is supplied in Moore (1985) - see especially Sections 2.2, 3.1, 3.2. Moore there adopts a possible-worlds analysis of sentences of the type "a knows that p" which is essentially the same as that proposed in Hintikka (1962): the semantical model is a version of that for the alethic modal system S4. In barest outline, an S4-model is a triple $\langle \underline{W}, \underline{R}, \underline{V} \rangle$, where $\underline{W}$ is a set of possible worlds, $\underline{R}$ is a relation - a so-called accessibility relation - defined over $\underline{W}$, and $\underline{V}$ is a valuation function which assigns truth-conditions to sentences at possible worlds. It is a defining characteristic of an S4-model that its accessibility relation is assigned the properties of reflexivity and transitivity. It is a further characteristic of the epistemic interpretation of S4 that the accessibility relation is relativised to agents - those whose knowledge states the logic describes. The valuation function $\underline{V}$ assigns the following truth condition to sentences of the form " $\underline{K}_a \underline{p}$ ": At any given world $\underline{w}$, " $\underline{K}_a \underline{p}$ " is true if and only if " $\underline{p}$ " itself is true at all those worlds $\underline{w}_j$ such that $\langle \underline{w}, \underline{w}_j \rangle \in \underline{R}^K_a$. Here, " $\underline{R}^K_a$ " designates the relation of epistemic accessibility, relative to agent $\underline{a}$. Its intuitive interpretation is irrelevant to our present concerns (the interested reader is referred to Hintikka (1962) or Moore (1985)). What is crucial is that we can now see how to translate sentences in the epistemic logic into purely first-order sentences; for an assertion to the effect that a knows that p at w is equivalent to the following universally quantified sentence:

$$\forall \underline{w}_j (\langle \underline{w}, \underline{w}_j \rangle \in \underline{R}^K_a \rightarrow T \langle \underline{w}_j, \underline{p} \rangle) \text{ (call this formula A).}$$

The consequent of the conditional here says that it is true at $\underline{w}_j$ that p. Moore provides a clear account of the characterization of T as a first-order relation: a preliminary report of this kind is not the place to go through all the details, I feel - they are to be found in the Moore paper, in the sections already indicated. The main points I need to communicate here are the following:

1) Moore has shown how the possible-worlds analysis of knowledge may be formalized completely within first-order logic: in a first-order language that talks about possible worlds (the metalanguage), he axiomatizes a truth definition for sentences of the modal logic of knowledge (i.e., for sentences of the object language).

2) Exactly the same strategy may be applied to the possible-worlds analysis of the deontic concepts provided by SDL, or that provided in Jones & Pörn (1985).

Formally speaking, the structure of an SDL-model is very much like that of an S4-model, as outlined above, except that the accessibility relation in SDL is neither reflexive nor (in most presentations) transitive, but *is* required to be serial. Where R^0 is the SDL accessibility relation, the seriality condition gets the following first-order characterization:

$$\forall \underline{w} (\underline{w} \in W \rightarrow \exists \underline{w}_1 (\underline{w}_1 \in W \ \& \ \langle \underline{w}, \underline{w}_1 \rangle \in R^0)).$$

The structure of the truth condition assigned, in SDL, to sentences of the form "Op" is entirely parallel to that specified above for epistemic sentences of the form " K_{ap} ", so the first-order translation of "Op is true at $\underline{w}$ " is achieved simply by replacing, in formula A, the epistemic relation R^K_a by the deontic accessibility relation R^0 .⁴

A model for our new system of deontic logic, or DL-model, is formed by adding to an SDL-model a further accessibility relation, $R^{0'}$, intuitively interpreted as a relation of sub-ideality between possible-worlds - see Jones & Pörn (1985) for details. This new relation is also serial; DL-models also require that two conditions be met pertaining to the relation between the two accessibility relations; these are specified set-theoretically as C1 and C2 at p. 278 *op.cit.*: their reformulation in first-order terms is an entirely straightforward matter.

Finally, given the way in which sentences of the type "'Ought_p' is true at $\underline{w}$ " are interpreted in DL, their first-order translation will look like this:

$$\forall \underline{w}_j (\langle \underline{w}, \underline{w}_j \rangle \in R^0 \rightarrow T \langle \underline{w}_j, p \rangle) \ \& \ \exists \underline{w}_k (\langle \underline{w}, \underline{w}_k \rangle \in R^{0'} \ \& \ T \langle \underline{w}_k, p \rangle)$$

Hopefully, these comments suffice to indicate the strategy, derived from Moore, which I am suggesting should be followed. The further question as to *which programming language* to employ for the implementation is as yet unanswered. The first serious attempt will probably be made in PROLOG, which I am currently learning; but I have until now received several conflicting reports from computer scientists about the suitability of PROLOG for a task of this sort: the reasons for the conflict remain unclear to me, however. On the other hand, and more

⁴ See Jones & Pörn (1985) for the intuitive interpretation of R^0 in terms of the notion of deontic ideality.

importantly, I have yet to come across any good grounds for supposing that Moore's basic strategy is misguided.

As regards the issues of decidability, soundness and completeness, the reader is referred to Chellas (1980), especially chapters 4 and 5; a range of modal systems is there discussed, including systems of type KD in Chellas' classification; SDL is of type KD. It will be a matter for further investigation to determine whether the results which can be proved for SDL can also be shown to hold for the new system DL; in the meantime, under the influence of the arguments propounded in Israel (1985), which I find *so far* rather persuasive, I am inclined to accept his advice that one should not, in this field of research, worry *unduly* about completeness.⁵

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5. "... with respect to the first phase ... what counts is a uniform, general symbolism with a clear semantic account and this requirement can be met without a completeness result in the offing. As to the second phase, where control (=computation) issues are of the essence: even if complete proof procedures are available for first-order logic, must - or should - our robot use one ? Can't we, shouldn't we, - *mustn't we really* - allow some legitimate and potentially useful derivations to go forever unmade ? Indeed, to be forever unmakeable." (Israel (1985), p. 445). Despite the cavalier attitude of my closing paragraph, and despite my belief that Israel's point is an interesting one also in relation to the construction of knowledge bases for legal expert systems, I have no intention of *disregarding* the metalogical investigation of DL.

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ENCLOSURE

Andrew J.I. Jones

DYNAMIC LOGIC AND DEONTIC LOGIC. COMMENTS ON McCARTY (1983), WITH COMPARISONS TO AN ALTERNATIVE.

McCarty's paper represents an important contribution to deontic logic for at least two reasons: (a) it contains original insights into the analysis of the concepts "obligatory", "permitted" and "forbidden" and their inter-relations; (b) unlike most of the earlier contributions to the area, McCarty's is motivated by a desire to produce a formal semantics which is amenable to programming. His definition of the basic deontic notions is constructed in terms of a language describing actions, and the semantics of this language is in turn formulated along lines similar to those employed in the so-called "modal logic of programs", or "dynamic logic". (See Harel, 1979, referred to in McCarty's paper, and for other, fairly introductory sources see Pratt, 1980 and Segerberg, 1980, the latter includes some remarks on deontic concepts.)

McCarty makes it clear (Section I) that his use of action descriptions as the basis for the analysis of the deontic concepts marks a significant point of difference from the approach taken in standard deontic logic (SDL), where one applies operators to propositions, yielding formulæ which express, e.g., that such-and-such a state of affairs ought to obtain, or is permitted. As he himself points out, McCarty is not the first in this field to insist that the proper objects of obligations and permissions are *actions* designed to change or preserve some state of affairs; indeed, logics of act-descriptions have been devised using techniques of modal logic (see, e.g.,

Pörn, 1970, 1977), and have been incorporated in the formal description of norms and normative relations (Pörn, *op.cit.*, and Jones 1983). But while it is of course desirable that a fully developed deontic or normative logic should include an explicit representation of actions, it is by no means certain that the well-known paradoxes of SDL derive from failure to take the action factor properly into account. In Jones and Pörn (1985, 1986), for example, we offer an analysis of and solution to Ross's paradox and Chisholm's paradox which does not turn on matters essentially concerned with the nature of act-descriptions. (More on this below.)

The issue of how precisely to articulate the semantics of act-descriptions is also of course still very much an open one. Despite the richness of McCarty's semantical framework, he does not, for example, construct *negative* actions within his language L_A , for "both technical and philosophical reasons" (section IIC l.c.) which one would certainly like to see clarified. The task of describing and classifying negative actions is rather complex, as lawyers are no doubt fully aware. (For a penetrating discussion of these issues, see Walton, 1980.) But it can at least be said in favour of the modal-logical approach to the analysis of act-descriptions that it seems able to cope with some of these problems rather straightforwardly; for instance, where a formula of type " E_{ap} " is read as "agent a brings it about that p ," (strictly: "agent a brings it about that the state of affairs described by " p " obtains"), one can articulate a key aspect of the distinction between a 's omitting to bring it about that p , and a 's *refraining* from bringing it about that p , in terms of the difference between " $\sim E_{ap}$ " and " $E_a \sim E_{ap}$ ", respectively (where " $\sim$ " is truth functional negation). My point here is not so much to criticize McCarty as to indicate the need for comparative work on the relative merits of his own approach to the semantics of act-descriptions and those of the modal logical analysis.

It seems to me that there should be scope for a number of interesting comparisons here, particularly in virtue of the structural similarities of the modal logician's possible world semantics and the semantics of Pratt-Harel dynamic logic; the latter represents in part an attempt to exploit the analogy between the modal logician's notion of a set of inter-related possible worlds, and the computer scientist's notion of a set of inter-related states of a machine.

It might be argued that if one admits that the scope of a deontic operator is properly speaking an act-description, then this lends support to McCarty's suggestion that formulae containing iterations of deontic operators are anomalous. But an argument of that sort seems to me mistaken. For one might concede that the right-most expression in a deontic sentence must be an act description, but at

the same time deny that the class of deontic concepts can be exhaustively characterized in terms of single operators standing for "permitted", "obligatory" and "forbidden" (and their internal and external negations). Perhaps *some* deontic concepts are *compound*, in the sense that it is natural to represent them by means of sequences of the standard deontic operators. "Andrew ought to be permitted to have a beer", seems to be a compound deontic expression in this sense, pertaining to Andrew's act of having a beer. I nevertheless agree with McCarty in as much as the discussion, in the existing accounts of *SDL*, of iterated deontic operators has been rather arid and unenlightening; one tends there to find by and large unconvincing arguments concerning, e.g., whether " Op " entails " OOp ", and concerning whether " $O(Op \rightarrow p)$ " should be deemed valid. The semantical framework of *SDL* is perhaps too impoverished to enable much of interest to be said about iteration of deontic operators, and if *that* is McCarty's main point here, then all well and good. However, the alternative approach to deontic logic presented in Jones & Pörn (1985, 1986) makes extensive use of iteration, not least in the account of Chisholm's paradox and in the analysis of the concepts of defeasibility. But then we start from a stock of basic deontic concepts which is richer than that employed in *SDL*, as will be indicated presently.

Much of the recent work in deontic logic has been motivated by the need to produce systems which solve or circumvent the paradoxes of *SDL*. McCarty too claims that "the familiar paradoxes of deontic logic do not arise in our system" (Section III, introductory paragraph). But is that so? The Ross paradox, for example, is that, in *SDL*, " $O(p \vee q)$ " may be derived from " Op "; so it appears that if one ought to post the letter then one may deduce that one ought to post the letter or burn it, which is odd. However, McCarty's proof of the truth of his formula (1), in this discussion of disjunctive obligation in section IIIA, surely indicates that the counterpart in this system to the problematic Ross formula is indeed valid. (His exclusive interpretation of disjunctive act-descriptions does not alter matters here.) On the other hand, although he does not discuss Ross's paradox, McCarty does (in section I) mention the problem of analyzing disjunctive permissions, and his results in section IIIB (formula (3)) seem intuitively very attractive; for it does seem reasonable to maintain that one's being permitted to do p or q amounts to permission to do p and permission to do q , one being free to choose between the disjuncts. This feature of his account of permission seems to mark a clear improvement on *SDL*.

The following sentences, (i)-(iv), represent what may be called the "Chisholm set":

- (i) It ought to be the case that a certain man goes to help his neighbour.
- (ii) It ought to be the case that, if he does go, he tells him (his neighbour) that he is coming.
- (iii) It ought to be the case that, if he does not go, he ought not to tell his neighbour that he is coming.
- (iv) He does not (in fact) go.

The problem Chisholm posed was that of finding a way of formalizing sentences (i)-(iv) so that the resulting set was consistent, and its members logically independent of one another. Furthermore it seems reasonable to require that (v) can be deduced from the conjunction of (iii) and (iv), and that, had (iv') rather than (iv) been the case, it would have been possible to deduce (v') from the conjunction of (ii) and (iv'):¹

- (iv') He does (in fact) go.
- (v) He ought not to tell his neighbour that he is coming.
- (v') He ought to tell his neighbour that he is coming.

It would have been very interesting to see how McCarty's system copes with the Chisholm puzzle, for there are good reasons for supposing that this is the most interesting of the familiar paradoxes of deontic logic. A good case can be made, in fact, for the claim that the descriptive resources available in SDL are just not adequate to the task of formalizing the Chisholm set properly. The problem is not only that of finding an appropriate way of analyzing deontic conditional sentences. The deeper issue to which Chisholm was pointing is the challenge of constructing a deontic logic which can consistently accommodate the fact that, in ordinary, every-day life, the result of the violation of an obligation may be that other, new obligations come into force, which themselves cancel, or even reverse, the obligations which *would* have been operative had the original violation *not* occurred. In other words the task is that of analyzing the notions of the defeasibility and reversibility of obligations, and of capturing the difference between *prima facie* and actual obligations. It is probably impossible to produce such analyses within the confines of SDL. It would have been interesting to see

1. For a more detailed presentation of the Chisholm paradox and of the criteria to be satisfied by an adequate solution, see Jones & Pörn (1985).

how McCarty's system handles them, not merely because he claims to have coped with the traditional paradoxes of deontic logic, but also because the issues we are here concerned with seem to form the core of some current, rather urgent problems in designing programs for the control of computer systems (see, e.g., Minsky & Lockman, 1985); it is clear that computer systems will need to be equipped to deal with "sub-ideal" situations of the kind which may arise when, e.g., a user violates the obligations he has *qua* user. But a program which can exercise the appropriate forms of control will presumably need to be grounded upon a rather sophisticated semantical analysis of the above-mentioned deontic concepts and distinctions.

Semantics for SDL is ordinarily constructed on the supposition that a formula of type "Op" is true at a given world $\underline{w}$ if and only if "p" itself is true in every deontically ideal or perfect version of $\underline{w}$. Since, in SDL, "Pp" is defined as " $\sim O\sim p$ ", it follows that "Pp" is true at a given world $\underline{w}$ if and only if there is *some* ideal version of $\underline{w}$ where "p" is true. In Jones & Pörn (1985), we question the sufficiency of SDL's semantical characterization of the modality "it ought to be the case that ...". We do not question its necessity: that is, we accept that "Ought p" entails "Op", where the latter is interpreted as in SDL. Thus, if "Ought p" is true at $\underline{w}$ then "p" is true in all deontically ideal versions of $\underline{w}$; but, crucially for our analysis, consideration of ideal versions of $\underline{w}$ does not exhaust the matter. We *also*, from the outset, take into account versions of $\underline{w}$ which represent some degree of violation of the obligations which hold at $\underline{w}$; our semantical model contains both ideal worlds and "states of sin". We fix truth conditions for a formula of the type "Op" by requiring that it is true at a given world $\underline{w}$ if and only if "p" is true in all sub-ideal versions of $\underline{w}$; the dual formula "Pp" is true at $\underline{w}$ if and only if "p" is true in at least one sub-ideal version of $\underline{w}$. For the truth of "Ought p" at $\underline{w}$, we require not merely that "p" be true in all ideal versions of $\underline{w}$, but *also* that "p" be *false* in at least one sub-ideal version of $\underline{w}$. That is,

$$\text{Ought } p =_{df} (Op \ \& \ P\sim p)$$

Expressed a little differently, this amounts to insisting that, if "p" is to be reckoned to be obligatory, then at least *one way* of "sinning" must have as a consequence that the state of affairs described by "p" fails to obtain.

In Jones & Pörn (1985) we set out the formal semantics in detail; here I simply wanted to give an indication of the basic intuitions. The descriptive framework we have developed is potentially rather rich, as regards various kinds of deontic

notions and distinctions. For example, it readily affords the following characterization of a *defeasible* obligation: "Ought p " is defeasible at w if, at w ,

$$\text{Ought } p \ \& \ P \sim \text{Ought } p,$$

according to which the defeasibility of the obligation amounts to its cancellation in at least one sub-ideal outcome. We are also in a position to define "Must", i.e., absolute obligation, as an obligation which holds *no matter what*, that is, in *all* ideal versions *and* in *all* sub-ideal versions of a given world. We indicate in detail how considerations of these sorts are relevant to the assessment of Chisholm's puzzle, and we offer solutions to the other paradoxes of SDL as well.

Can these aspects of the deontic notions be incorporated within the kind of frame McCarty is proposing? That question needs further investigation.

I want, in conclusion, to say a little about the most striking contrast between McCarty's account of "obligatory", "forbidden" and "permitted", and that ordinarily found in deontic logic. I have in mind particularly the account of the relation between these concepts. Given one (very plausible) additional assumption to those embodied in his basic semantical conditions, "obligatory" (for McCarty) entails "not-forbidden" (Section IIID). Furthermore, "permitted" entails "not-forbidden" (*loc.cit.*, formula (10)). But "obligatory" does not, on his account, entail "permitted", and thus of course "not-forbidden" also fails to entail "permitted". The underlying definitions (numbers 4, 5 & 6) are given in section IIC. Without going into formal details, it seems that the basic idea is that, for "permission", an action α is permitted if and only if *all* subworlds in which it is strictly satisfied represent permitted courses of action. On the face of it, that appears to be a very strong requirement to make for "permission". Would it entail, for instance, that if Andrew has a glass of beer in a situation in which Andrew is robbing a bank (not a permitted course of action!), then, whatever else we might say about Andrew's beer-drinking, it was not a permitted act? The answer to that question has to be negative, as I see it, given the way McCarty defines *strict* satisfaction (Section IIA.2) and given the role of strict satisfaction in the definition of "permitted". But I am nevertheless unclear about how this analysis of permissions would enable one to describe an agent as doing what *he* is permitted to do in one and the same situation as that in which he has also violated some obligation, where the permission itself holds just in virtue of the fact that the obligation *was* violated.

The notion of "not-forbidden" is of course weaker, and requires satisfaction in just some subworld representing a permitted course of action. Since McCarty does at times appeal to our ordinary usage of deontic terms to support his case, it would I think be helpful if he gave us more actual examples in his discussion of how these terms are inter-related. Can we, for instance, find a straightforward example of a situation in which we would naturally say that although a person was not forbidden to do ϕ he was not permitted to do it either? Similarly, regarding the failure of "obligatory" to entail "permitted", some further discussion of concrete examples would help. However, I suspect that our ordinary talk about permissions oscillates between (something like) what McCarty defines as "permitted" and (something like) what he defines as "not-forbidden", so it would be unwise to rest too much on an appeal to ordinary usage. The main point is to investigate the usefulness of distinctions made in the formal model for characterizing the structure of deontic systems, not to decide where the labels used in ordinary language should be hung on that model. I also suspect that some of the notions described in McCarty's framework will turn out to be very useful indeed; but, as I have indicated, I would also like to see them applied to the broader range of problems in deontic logic outlined above.

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Footnote April 1987

Since this paper was written, McCarty has given an analysis of Chisholm's problem in the published version of his paper for the second international conference on the theme "Logica, Informatica, Diritto" (in *Automated Analysis of Legal Texts*, A.A. Martino and F. Socci Natali, eds., North-Holland, Amsterdam 1986). I shall offer further critical comments on McCarty's system at the conference on AI and Law to be held in Boston, USA, May 1987, pertaining particularly to his account of the relationship between obligation and permission.

Dag Wiese Schartum

THE SOCIAL INSURANCE ADMINISTRATION OF NORWAY POSSIBLE APPLICATION OF DEONTIC SYSTEMS

1. Introduction

The social insurance administration is one of the most important government institutions that distributes welfare in the Norwegian society. As basis for the distribution of grants lies a complex statutory system controlling most decisions down to the last detail. This paper deals with some major problems of citizens and of the local social insurance offices when trying to cope with this comprehensive rule system, and considers if and how deontic systems may facilitate local office work and improve service quality.

2. The social insurance provisions

2.1 Introduction, background

The present Norwegian Pension Scheme of 1966 represented a total break with previous systems for assessing pensions. The Scheme was not only planned as a program preventing poverty, both wealthy and poor were a part of the system by guaranteeing every citizen a minimum income (basic pension benefits) and reflecting previous income of the more wealthy people (supplementary pensions). As for the supplementary pensions strong emphasis was put on creating a fair scheme with grants accurately reflecting previous earned income and without an escalating system based on income brackets as in previous schemes. The minister of social affairs expressed this aim in the Parliament debate of 1966:

"It has been a part of the objective for this proposal, here submitted for consideration, that one should avoid making so called thresholds which always will be discriminating for those that do not come on the right side of the threshold."

The objective of attaining detailed justice, as expressed above, constitutes a major explanation for the legal complexity of the provisions and the difficult working conditions of the social insurance service.

2.2 Legal substantive contents

In the following we will outline the major structures of the provisions regulating pension benefits. The "basic amount" (BA) is the very cornerstone of the Pension Scheme because most benefits are estimated by means of the basic amount. Pension benefits can be divided into two main groups; basic benefits and supplementary benefits.

The "basic pension" constitutes the major part of basic pension benefits and is assessed on the basis of the BA and certain other criteria.¹ Most pensioners satisfy these conditions resulting in a basic pension equaling 1 X BA for single persons and 1,5 X BA for spouses.

A "special supplement" is granted on top of the basic pension as a compensation for those not entitled or with only limited entitlement to supplementary pension. Special supplement is granted to each pensioner with supplementary pensions less an amount than the special supplement grant, i.e. the granted amount is deducted in the supplementary pension. Maximum special supplement is established as a percentage of the BA.²

The third basic benefit is a compensation for value-added tax (VAT) which constitutes a small amount with no connection to other amounts of the Scheme and is granted to every pensioner with different amounts to single persons and spouses.

A supporter's supplement is granted on top of the three other basic pension benefits if the pensioner supports children from the age of 0-18 or a spouse. Supporter's supplement is conditioned by a limited means testing linked to income exceeding a certain percentage share of the BA.

Only annual income exceeding the BA is included in the basis for assessment of supplementary pension and every year such income is registered, stored and accumulated until pension age is reached. Annual income is turned into pension points according to the formula:

$$\text{pension point} = (\text{pensionable income} - \text{BA}) : \text{BA}.$$

Every pension point is summed up when the pension age of 67 is reached and a "final pension point" (FPP) is established on the basis of the 20 highest annual points. The supplementary pension is then calculated according to the formula:

Pension-earning time, matrimonial status and spouse's benefits from the National Insurance.

For the time being 54,5% of BA.

$$\text{supplementary pension} = BA \times FPP \times 45\% \times (YPE : 40).$$

where YPE is abbreviation for year of pensionable employment, ie number of years with employment counting as basis for supplementary pension.

These formulas constitute the basic concept of the pension scheme. Special rules of pension payments for pensioners between the age of 67 and 70, deduction provisions in case of institution stays and special rules concerning supplementary pensions for groups of elder citizens complicates this picture.

2.3 Rule structures and complexity

The brief sketch of the legal-substantive contents of the Pension Scheme may indicate the complexity of rule structures. In the following we will describe rule characteristics and factors that may make it difficult to comprehend and interpret the statutory text of the scheme. We do not intend to present a complete list of such factors, only those we believe are of special importance are comprised.

2.3.1 Volume

The large number of rules is an independent factor procuring complexity and making it difficult both for citizens and social insurance staff to master the legal instruments. Statutory provisions in the system can be divided into 3 different levels: The National Insurance Act, regulations and circular letters. The regulations are linked to the Act, while the circulars may link to both superior levels.

A total of 100 provisions are made under the National Insurance Act and the total number of sections of the Act and regulations exceeds 1000. Approximately 170 circular letters exceeding 2600 pages (A5) links to provisions in the Act and regulations.

As for the old age pension sector, the volume of text implies that an officer in charge or a client wanting to overview the total body of legal instruments that may be employed in case procedure, must go through the following three steps: First,

statutory provisions especially concerning old age pensions are presented in a separate closely written 6-page section of the Act. The second level, the regulations made under the old age section of the Act, is more comprehensive, comprising 6 sets of regulations. These rules often elaborate on the provisions of the Act but contains just as often juridical contents of equal importance to the Act, which is often a result of lack of time during preparatory work of social insurance bills, forcing the Parliament to delegate parts of the legislative power to the bureaucracy.

A total of approximately 75 circular letters form the statutory undergrowth with instructions and guidelines to the Act and regulations. These circulars are probably the most important support for the officials in charge when solving case procedure tasks and are intended to constitute a guarantee for nation-wide equality with its detailed resolution of questions that may cause doubt.

Since our concern is of a rather practical nature, first of all aiming at presenting the work conditions of the employees and the situation of social insurance applicants, we will not discuss the juridical status of these three legal sources. It should nevertheless be mentioned that circular letters are of an internal character with legal validity only to the employees of the social insurance administrations. This implies that courts may disregard interpretations expressed in circulars, but circular letters should in practise be regarded as legal sources on line with the Act and regulations, unavoidable, if legal contents as they are usually practised shall be revealed.

The sketch of 3 legal levels illustrates how the texts become considerably more comprehensive as we move downwards in the legal hierarchy, but this abundance of rules is hardly visible for the majority of citizens. What most people see when they regard the Act is really the top of an iceberg, and even if they are aware of the underlying regulations and circular letters it may show problematic to obtain them. One may claim that accessibility decreases as volume of legal texts increases: Provisions of the Act are quite easy accessible in the Norwegian Code and in other special publications. Regulations are published in a special collection of provisions pursuant to acts placed under the Ministry of Social Affairs, but it is rather symptomatic for the situation that 4 of 6 old age regulations are omitted from the collection, probably due to insufficient procedures at the Ministry and the

National Insurance Administration.³ Regulations are also distributed as part of the internal loose-leaf file of the social insurance administrations but are not easily accessible to people outside the organization. Circular letters are only accessible as loose-leaves and are extremely difficult to up-date properly, partly because of the many changes and partly because the correct placing may cause doubts.

2.3.2 Editorial and linguistic complexity

The provisions of the National Insurance Act and the regulations are marked by typical and traditional factors that make it difficult to understand and overview the legal contents. The provisions are for example of a fragmentary nature, implying that several rule fragments must be read and interpreted in a decision making process. Besides, length of words and sentences and the linguistic construction of sentences make the texts difficult to acquire. Legal education and practise ables the profession to master such obstacles, but the juridical profession requires a certain textual preparation as well, which by no means is met in the composition of the national insurance provisions.

The provisions are not always placed in a logical succession, and rules are sometimes tangled without having a necessary and direct link as to contents. The reference arrangements between various inherent rules are also rather incomplete, making it difficult to combine all required rule fragments.

We will not go any further into these weak editorial and textual points in this context, only ascertain that such problems exist especially for untrained persons but, to a certain degree, also for legal practitioners.

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3. Which is a subject directorate placed under the Ministry and the superior institution of the local social insurance offices.

2.3.3 *Fixed and discretionary rules*

The National Insurance Act is rights-oriented, implying that benefits are granted according to rather "fixed" rules. Exceptions may however in some cases be made without referring to specified conditions leaving it up to the discretion of the social insurance administration.

"Fixed" and "discretionary" rules are here used to describe the degree of liberty in decision making⁴ Rules will be identified as "fixed" if they are structured to indicate a complete list of legal and relevant factors to be considered. When interpreting such a rule, no other possible considerations could legally be made in addition to those listed in the rule. For example, the decision maker is not in a position to appraise whether the result is reasonable and fair.

Other rules render some freedom to the decision maker regarding the considerations that could be taken into account. The rule itself is only a frame, that is, decisions may be made within a certain limit stipulated by the rule. This category is comprised of "discretionary rules". Discretionary rules lead to decisions where the following two characteristics should be stressed:

- 1) It is not possible in advance to give a complete list of the factors to be considered. It is in principle always possible that new and relevant factors will occur.
- 2) It is not possible to decide in advance what weight the various factors should carry.

Norwegian statutory law, including the old age pension section of the National Insurance Act, uses discretionary rules to prevent unfair results. Thus, in combination with fixed rules, a discretionary rule functions as a security net for certain individuals that the fixed rules are unable to catch. An example of such a combination taken from the old age pension provisions, §7-2, number 3, subsection 2, which end a series of fixed rules by stating:

* This distinction refers to a norm theory developed by Sundby 1974 and Eckhoff/Sundby 1976.

"Foreign refugees domiciled in the Realm may, notwithstanding period of insurance, be entitled to full basic pension if extra ordinary reasons make it reasonable."

Discretionary rules are found both in the old age section of the Act and in the regulations. The discretionary elements are usually elaborated on in the regulations or in circular letters, ie at an inferior legal level, but the guidelines always renders discretionary freedom to the decision maker.

Discretionary rules constitute a quite useful tool for catching up with exceptions and less typical life situations and needs. From a rule complexity perspective it creates however a legal situation that may be hard to survey both for the officers in charge and the citizens because conditions can not be described in advance.

2.3.4 "Rule-in-term"

A number of new terms were introduced with the National Insurance Scheme of 1966.⁵ Terms like "basic amount", "insured person", "time of insurance", "pensionable income" and "pension point" created a new universe unlike every other terminology in Norwegian legislation. Each of these terms have a specific meaning which is expressed in special statutory definitions which implies that most people can not use their general experience to make a correct interpretation of them. The following example from §7-3, number 2 concerning supplementary pensions may illustrate the problem:

"A person who has been credited with pension points for at least 40 years shall be granted a supplementary pension at the rate of 45% of the amount obtained by multiplying the basic amount by the final pension point figure, consult the third paragraph."

This rule fragment can not be understood without reading the rules laying down the contents of the terms "basic amount" and "final pension point figure". An

5. A couple of terms were however inherited with certain adjustments from previous social insurance schemes.

ignorant reader is therefore forced to look up and read a special provision in another section of the Act that explains the term. In other cases, when ordinary words are utilized, people will get an immediate comprehension of the contents. Even though interpretation problems of ordinary words will occur as well (see below), there is a distinct difference between the every-day words and the especially constructed terms of the National Insurance Act.

2.3.5 Word specification

Words are more or less ambiguous and need therefore sometimes explicit explanation and specification if every person of the social insurance system shall interpret and understand the provisions equally. Words like "spouse", "earned income", "support" etc express important conditions of the provisions and need a more fixed contents compared to daily language. Regulations present us with some examples of word specifications, but the majority of such explanations are formulated in circular letters. To understand the Act in accordance with the application of rules of local office case procedures, it is necessary to read the circulars in addition. No signals are given in the Act that special and - to the social insurance service - binding interpretations exist, the reader has to know the system and where he can find the circular letters in question.

Even though the reader knows the system and knows that a word specification exists it may be hard to locate. As previously mentioned, practical obstacles will usually occur when trying to obtain regulations and especially of circular letters.

2.4 Possible rule amendments

2.4.1 The work of the Social Insurance Act Committee

The so-called Social Insurance Act Committee was appointed by the government in 1981 to consider comprehensive amendments of the National Insurance Act, regulations and of certain other acts and regulations within the field of social insurance. The basis was the very complex nature of the provisions, here illustrated by means of examples from the old age pension system, and a wish of simplifying to make it possible for ordinary people to read and understand the juridical texts and to facilitate the case procedure of the social insurance service.

The work was initiated within the legal-substantive framework of the existing scheme implying that amendments would be of an editorial, linguistic and legal-technical nature. According to guidelines stated in a lecture by the chairman of the Committee,⁶ the social insurance rules will be more systematically classified, language simplified and sections moved to other parts of statutory law. Thus, the Committee will probably propose to retain only provisions regulating direct monetary grants to citizens as part of the National Insurance Act and move other subjects, such as payments to hospitals etc, to other parts of legislation.

Many of the regulations could, according to the Committee, be repealed and some placed as part of the Act. Certain circular letters were regarded to be of such an importance that the correct placing should be on a statutory level.

A new and re-edited National Insurance Act may be approved by Parliament by 1991 under the condition that the present progress plan could be held.

6. Professor dr. juris Asbjorn Kjonstad, published in Social Trygd, 1982, volume 7, page 18-26.

2.4.2 Repeal of discretionary provisions

In both the long range program of the period 1982-1985 from the Labour Government⁷ and the long range program of the period 1986-1989 from the Conservative/Center/Cristian Peoples Party Government⁸ discretionary rules are pointed out as expensive, and consequently as objects for simplification.

In the Labour Governments program such rule simplification is also especially considered in relation to the national insurance system.⁹ Partly as result of a claimed need for more marked borderlines between the Scheme and other social assistance arrangements, in order to put brakes on the benefit cost increase of the National Insurance Scheme, and partly as step of rule simplifications and administrative rationalization, discretionary rules of the Scheme were proposed to be repealed and citizens concerned be referred to the social welfare¹⁰. In this way rule characteristics, in both the National Insurance Act and the Social welfare Act, could, according to the Labour Government, be cultivated; the National Insurance Act with its rights-oriented fixed rules and the Social welfare Act with its means testing oriented discretionary rules. Moreover, such an alteration would imply changes of costs division between the governmental National Insurance Scheme and the municipal social welfare.

The present government has followed up the ideas of the Labour Government. The Ministry of Social Affairs has on a parallel and, as far as we know, independently of the work of the Social Insurance Act Committee initiated a work for simplifying the statutes of the pension sections of the National Insurance Act

Cf. St. meld. number 79, 1980-1981, page 180.

Cf. St. meld. number 83, 1984-1985, page 309.

See page 104.

- Important parts of the social welfare can only be compared with the poor relief system of former days. The program is a municipal responsibility and benefits vary considerably but are generally on average very modest.

by removing discretionary rules. Proposals for amendments are not yet put forward but the principle strategy is explained and is - as shown - in accordance with a consensused political trend of recent Norwegian legislative considerations.

3. Case procedure

3.1 Organization, work division and staff

Most types of social insurance benefits, included the old age pension benefits, are administrated by a two-level organization; the local social insurance offices and the National Insurance Administration. 451 local offices, one in each municipality, are the units directly providing services to the citizens and are assisted by approximately 150 "attached offices" with more limited activities. The majority of local social insurance offices are extremely small, ranging from 1 to approximately 540 employees, with 50% of the offices employing from 1-5 persons and 92,5% employing a staff of from 1 to 20.¹¹

Every office have tasks comprising the whole National Insurance Scheme, with disability pension, rehabilitation aid, survivor's pension, unemployment benefit, daily sickness allowances and other sickness benefits (institution stay, etc) as the most important. Each of these benefits are controlled by provisions that could be compared - both with respect to volume and complexity - with the described old age pension arrangement. All pension arrangements are, however, tailored to the same pattern which implies an easier acquirement of knowledge on other pension subjects once the first field is mastered. Other public social insurance and pension arrangements and arrangements according to agreements between the employees' and employers' organizations are also a part of the work of the central and local administration, all in all approximately 10 different schemes. Most of these arrangements comprise however a minority of citizens.

Social insurance offices have traditionally been scattered all over the country and have, despite centralization efforts during the 1950'ies and 1960'ies, by far held ground. It could be expected that a comprehensive amendment of social insurance schemes would alter the organizational structure and imply a much more

11. 1983 figures, cf. Habberstad, October 1983.

centralized social insurance service, with larger units and concentration of expertise to solve the increasingly extensive and complex case procedure tasks. Marked centralization of decision-making was one of the characteristics from the initiation of the Pension Scheme in 1967 but the explicit condition was that future return of authority to the local offices should be given priority. Decentralization was also a part of the general political trend of the 1970's and was regarded to be a strategy for increased efficiency in government administration. This double political framework forced the central social insurance administration to delegate power despite heavy problems of carrying the strategy into effect.

The up-growth of the circular letters should be regarded in this decentralization context, resulting from the combined delegation of authority and the demand for nation-wide equality. By describing every step of case procedure and every statute and regulation in detail, local staff would be increasingly capable of producing equally correct decisions and providing more or less the same level of social insurance service to the citizens. Another closely related strategy was to enforce education and to increase the level of competence both at a central and local level.

These and other developments, in combination with increasing utilization of computers and office facilities, led to a rather dramatic change of the composition of staff, with the group of local managers/officials in charge increasing from 1300 in 1972 to 2876 in 1983 and local clerical staff decreasing from 2544 in 1972 to 1690 in 1983. A similar development was registered at the National Insurance Administration.

Work at the local offices has traditionally been divided into management, case procedure and clerical tasks. In connection with a reorganization and computerization of the local offices which started in 1984/85, clerical posts were removed by means of not replacing clerical staff leaving employment, and of internal promotions for clerical staff in case of the vacant posts at officer in charge level. Training courses and computerization have made these amendments possible.

The new work organization implied also increased job rotation from one type of benefit to the other and between different functions. This was a main strategy of the reorganization, first of all aiming at levelling out the work load between the different sectors and cutting down on arrears to improve service quality. Job rotation was also regarded as having an important educative effect, enabling employees to contribute on several social insurance subjects and thereby increasing client service.

3.2 Computerization

Pension benefits were computerized from the implementation of the Scheme in 1967. A large central computer facility controlled and estimated grants on the basis of information collected, judged and forwarded by the local offices. Final control and payments were executed on a local level. Today, terminal systems cover most of the benefits being part of the Scheme, making most manual document routines redundant.

Plans of introducing terminal systems in the local insurance offices should be judged in the context of delegation of authority and the requirement of nation-wide equality. The first initiative was made in 1968, but obviously with long term objectives and with the recognition that gains would not be reached during the first years. The initial two pilot projects with regular run were started in 1975, more offices were included in the on-line system during the next years and from 1986 every local office (451) and 2 attached local offices are part of the system covering most benefits within the National Insurance Scheme.

Two different computer system are used, one based on IBM (INFOTRYGD) and one based on Norsk Data (NORTRYGD). INFOTRYGD offices are linked to 7 regional computer centers with most of the hardware and software placed at the centers. NORTRYGD is a distributed concept with most computers placed in the local offices and with regular on-line up-dating of the central registers. NORTRYGD covers a population of approximately 1.5 million and is especially designed for small offices. INFOTRYGD is designed for larger offices and covers approximately 2.5 million people.

Both INFOTRYGD and NORTRYGD applications divides the work of the local offices into a certain number of routines; pension routines, daily sickness allowance routines, accounts routines etc. Each routine comprises most data input and assessments that are required to complete case procedure steps within the various fields of benefits, guides the user through the procedures in correct succession and controls the validity of certain data. This implies a totally new work situation for the officers in charge, compared to previous manual routines, and has turned the users' manual into a central position.

User's manuals were introduced when terminals were brought in and should probably be placed in the same category as circular letters often completing or replacing these. They express case procedure rules by instructing what information that should be involved in the procedure, the succession of partial routines etc, and they express legal substantive rules for example by determining information source and thereby a specific contents of terms (cf. "word specification" above). User's manuals should consequently probably be added to the list of legal instruments on the level of circulars.

1. Possible Influence of deontic systems

Our discussion of possible deontic systems in the social insurance administrations does not arise out of any specific concept but has its basis in possibilities that emerges from works of the Norwegian Research Center for Computers and Law, especially the SARA and SMARN projects and the prospects of advanced text retrieval systems. It may be criticized that actual possibilities are not closely discussed and that our point of departure with respect to the technical basis is of a rather vague nature. Our general stand is however that legal, political and administrative requirements should define the possible objects and utilization of deontic systems and not the other way around. When signals are received that computer experts are reaching a certain skill level, this definition activity should be initiated thereby rendering it possible to adapt research and development to actual needs and acceptable concepts.

We will stress that the arguments presented in the subsequent sub-sections are not claimed to have a general validity. Proposals are put forward and considered within the special context of the Norwegian social insurance services.

4.1 Job satisfaction and service quality

Acts, regulations and circular letters are created by Parliament and the subject bureaucracy to control case procedure on the local level. Every stage of case procedure from the time the application form is received to the time grants are paid out have usually been executed by staff, ie employees have both collected and considered the required information and used these data in a manual decision making process which implies that both case procedure rules and legal-substantive contents have been employed by the human brain.

The introduction of a computer system has changed this situation rather dramatically. Case procedure directly executed by people is now limited to collecting information and punching it into the system. As a main rule, very limited understanding of why the registered data is collected and its function in the decision-making process is required. The system also control if the right succession of procedures are followed, and that value of input data is within certain validity limits.

This new situation changes not only the decision-making but certainly also the utilization of legal instruments. Provisions of the Act and regulations may now appear as less necessary compared to prior the computerization. Circular letters describing the interactions between the different factual conditions are probably also less important because the computer programs will carry out most of the described processes automatically. Circulars elaborating on the contents of various terms being conditions in the decision-making are however probably still important.

In this situation, when computers have become the tool in most situations and in relation to most kinds of benefits, computer programs and user's manuals have actually moved in as new legal sources.¹² Central and authorized interpretations are partly implemented in the computer programs, partly expressed in the users manuals and comprise both case procedure rules and legal-substantive contents.

12. Computer programs as legal sources is discussed by Bing in Niblett 1980, page 119-136.

The computer routines must be mastered if the work at the local offices is to be carried out. This creates a situation where user's manuals move into a front position among the legal instruments. The introduction of computer systems at the local offices has, in other words, created a barrier between the statutory and other traditional legal texts and the employees in charge of case procedure.

Both work environment and service quality are certainly influenced by a lack of knowledge of the rules which are implemented in the computer programs. An officer in charge at a local office in western Norway express the situation in this way:¹³

"A lot of knowledge which previously was required of me is now implemented in the system. This has deteriorated the profession."

The employee also describes the reactions on computers after the implementation period:

"The computer facilities were both interesting and stimulating during the first period but gradually work procedures are experienced as increasingly monotonous."

We believe it will be important to improve the work situation of the employees beyond what is possible to do within today's computerized case procedure. What is more urgent to put into focus is however that the quality of social insurance services probably will deteriorate due to the present computer routines, because it creates barriers between important social insurance rules and the employees, probably implying less knowledge of legal-substantive relations in counter situations.

These problems may be solved by introducing deontic systems linking the statutory texts to the computer routines revealing the statutory network behind the computer operations. When filling in the condition "spouse" on the registration screen the operator should be capable of locating the provisions of the Act, regulations, relevant court decisions etc. as part of the computer routines. Definitions of terms etc, now primarily placed in circular letters, should in addition be placed as

3. From the local office of Stord, in Kartellnytt, number 1, 1986.

regulations and be equally accessible. Such a tool will first of all improve the counter functions and improve service to the citizens. Counter tasks would also be more varied and constitute a more attractive activity. Job rotation within the offices, implying that every officer in charge in periods will work at the counter will also contribute to increase the knowledge level of the other case procedure operations.

Text retrieval in statutory texts and circular letters are part of the future plans of the National Insurance Administration, though not given priority. Further development of the computer programs may make these plans less important because the control routines in the programs can be extended and improved and collection of information automatized to a larger extent than today. If this strategy is selected, the liberty in the decision-making situation could be sufficiently restricted and the data collection could be automatized to obtain a "satisfactory" case procedure routine in relation to formal equality, implying that statutory texts, regulations and circulars will be increasingly "redundant" at a local level. This may be acceptable if only cost-benefit considerations are taken into account. From a legal point of view it is however problematic to accept a situation where the employees in charge do not understand the consequences of their operations. It could for example be difficult for the staff to satisfy one of the major case procedure regulations (§14-1, 2. sub-section) which states that the social insurance office has an obligation to see to that every condition that could influence on the handling of a case is clarified as far as possible. How can the staff judge possible influences at all if they are not capable of matching the information with rule contents?

4.2 Retaining exceptions and discretion

The proposal of cultivating the National Insurance Act as a text containing only fixed rules and transfer special groups of clients to the discretion of the social welfare system may be an adequate strategy for increased efficiency but certainly conflicts with Norwegian social insurance and social welfare policy of the last decades. One of the basic principles of the National Insurance Act was the *rights* orientation. This, and most previous social insurance reforms lifted people from social welfare (or poverty relief) to a system guaranteeing minimum rights which made the people involved capable of supporting themselves on a level preventing poverty. Most life risks and life situations deserving official monetary support were comprised by social insurance arrangements during the 1950'ies and 1960'ies, while more non-uniform life risks and situations remained in the social welfare system. The objective has however always been to move the part of the

social welfare system granting money towards the minimum grants of the National Insurance Scheme and thereby making the social welfare more rights-oriented.¹⁴

The present situation is, in other words, that rationalization efforts and social political goals conflict. Our question would therefore be whether deontic systems within the social insurance administration can make it possible to retain the extent of detailed handling of clients today procured by the discretionary rules of the National Insurance Act without too high running expenses. A possibility would be to model rule structures similar to that which was done in the SARA project, ie to "translate" discretionary rule structures into rather complex structures of fixed rules with carry of defined weighting for each factor involved. Such a measure would increase efficiency of the decision-making but still make it possible to maintain the client groups, at present comprised by discretionary rules of the National Insurance Act, in a fixed and rights-oriented Scheme.

Other groups, now comprised by the social welfare system, could probably also become part of the National Insurance System by employing the same types of deontic systems.¹⁵ This could make it practically feasible to realize the old wish of a more rights-oriented social welfare system. The Social Insurance Act Committee considers to distinguish between direct monetary grants and other benefits of the National Insurance Act such as payments to doctors and institutions for various health services to citizens, only retaining in the Act rules concerning direct monetary grants. Social welfare is in a similar position partly granting money, services and benefits in kind. Deontic systems could make it more feasible to lift monetary grants, now placed as part of the social welfare system, up to the National Insurance Scheme and thereby collect all such benefits in one system, independently of which life risk that constitutes the basis for public support.

4. Cf. Sosialreformkommiteen, innstilling I, Ot. prp. number 15, 1971-1972, Sosialreformkomiteen, Innstilling II, St. meld number 9 1975-1976, Ot. prp. number 36, 1980-1981 and NOU 1985:18.

5. Cf. NOU 1985:18, §5-8.

4.3 Increased statutory rigidity

Representation of legal rules in computer programs will always imply a certain rigidity in the case of amendments. The experience with the central computer system for assessing pensions shows that such rigidity may cause rather grave problems because the politicians are not capable of adapting to the technical-administrative procedures. This often leads to insufficient time limits from the time the Parliament carry the amendments to the time it comes into force. In the Pension Scheme such problems have among other things led to criticism from the bureaucracy, stating that the Parliament should limit the number or basic amount regulations to once a year.

It is of course possible that politicians should take administrative conditions into consideration, but especially within a field like social insurance which is marked by a lot of political prestige and with a connected need for considerable maneuver possibility, it would not be wise to constrain possible political actions to any notable degree. The existing computer routines have already introduced a certain rigidity. Our stand is that further computer obstacles against amendments and other political actions must be avoided, which implies that prospective deontic systems employed in the social insurance administration should be of a flexible nature, allowing rather comprehensive changes within short time limits.

4.4 Conclusion

The problems considered in this paper concern - as a point of departure - only a limited part of the government administration and consequently only a fraction of civil servants. The National Insurance Scheme which is administrated by these institutions constitutes probably the second most important arrangement for distributing welfare in the Norwegian society (apart from the tax system), and the problems outlined and the proposed solutions influence therefore of the very bedrock of our political system.

We have pointed at the fact that the statutory instruments are too comprehensive and complex to fully be accessed and understood by clients. Officers in charge,

especially those employed in small offices in the extremely decentralized social insurance system of Norway, also have problems with coping with the Scheme. On-line computer routines have been used to increase efficiency and improve service quality at the local offices. The cost-benefit effect is obvious and computer routines may have improved case procedures in the sense of more nation-wide equality. On the other hand, both work environment and service quality (in other respects) have probably been deteriorated because the computer routines have created a barrier between the legal instruments and the officers in charge, implying that employees know less of legal contents and are therefore not always capable of explaining conditions and results to clients.

We have pointed at the possibilities of employing deontic systems to remove such barriers and thereby both improve job satisfaction and the quality of social insurance services. We have also pointed out the possibility of facilitating statutory and social political amendments by employing deontic systems which may make it possible to retain and even extend detailed and rights-oriented case procedures.

These suggestions show how deontic systems may match with actual needs of public administration and in a way which influences both citizens and employees and that such systems promise potentials with regard to service quality and job satisfaction.

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Johannes Hansen

**POSSIBILITIES FOR USING SMARN
IN CALCULATIONS OF OLD AGE PENSIONS
ACCORDING TO THE NORWEGIAN SOCIAL SECURITY ACT**

1. Introduction

The Norwegian Research Center for Computers and Law has since 1982 been involved in developing a language for modelling legal norms (SMARN). Such a language is thought used to describe a simple legal problem resolution, where both criteria and rules are strict.

SMARN is formally defined, but not implemented. A description of the rules of succession according to the Norwegian act of intestate heritage is completed in SMARN.

When the NRCCL started looking at knowledge based systems oriented towards public administration, the possibility of using SMARN as an appropriate tool for calculations etc, was obvious. If the answer is positive, it might be of interest to consider an implementation.

The problem discussed here is the possibility to resolve the calculations of old age pension according to the Social Security Act in SMARN. Consequently, some basic principles of the old age pension chapter will be sketched.

2. The Social Security Act and subsidiary legislation

2.1 The Social Security Act

The Social Security Act of June 17th, 1966 has as its objective (sect 1-1) to give "support ... in the old age ..." Our discussion will be limited to the old age pension according to the SSA.

Sect 1-2 to 1-4 give the provisions for who is included in the SSA system. The general rule is that everybody domiciled in the realm are included.

"The insured persons have the rights and obligations as stated in the chapters of this act." (Form sect 1-5.)

Chapter 7 includes the provisions for calculating old age pensions. Sect 7-1 states who benefits from the old age pension scheme, and that the old age pension consists of two benefits, basic pension and supplementary benefit.

Sect 7-2 includes the provisions of who are entitled to basic pension and the calculation of this.

Sect 7-3 governs the right of supplementary benefit and its calculation. Sect 7-4 includes provisions for supplementary benefit in case of the death of the spouse of an old age pensioner.

Sect 7-7 to 7-9 govern supplementary benefits for spouse, children and pension in cases where the insured person is committed to an institution. Sect 7-10 includes provisions for claiming pension, and supplements for suspending the claim (revoked April 1st, 1984).

Chapter 13 includes provisions on the administration of the social security system. The social security is centrally under the administration of the National Insurance Institution, and locally of the social security offices. The County Committees and their secretariates are responsible for regional administration according to sect 13-3.

The administration and tasks of the National Insurance Institution are governed by sect 13-2, and the County Committees and their secretariates by sect 13-3. Sect 13-4 provides for one social security office for each municipality.

Sect 14-1 constitutes a duty to inform the insured persons and research the case before a decision is made. Sect 14-2 governs the claims. The social welfare administration has a duty to supply the social security office with information (sect 14-3), and the County Committee has a duty to consider, recommend decisions or decide certain cases (sect 14-4 and 14-5).

Sect 14-6 states which cases are to be decided by the NII.

Sect 14-7 includes the principle that a case should be decided speedily and that the insured is to be informed of the result. Further, the information given by the insured should be correct, or the pension may be excluded.

2.2 Subsidiary legislation and circulars

The SSA includes a number of authorizations for issuing subsidiary legislation, several of which are of interest to the calculation of old age benefits. Sect 7-2 authorizes issuing of provisions on calculating the time a persons is to be considered pensioned when staying abroad, sect 7-5 includes an authorization to adjust the rule known as the "40 years rule", and sect 7-9 authorizes subsidiary legislation on the calculation of income relevant for the pension. According to sect 1-4, it is authorized to issue subsidiary legislation granting pension to persons not insured according to sect 1-2.

The subsidiary legislation is quite limited.

There have been issued a number of circulars, especially relevant to sect 7-9 and 7-10. These will not be further discussed in this context.

2.3 Discretionary decisions by the NII

It has considerable interest to examine the exercise of discretion in the calculation of old age pensions. The calculation is computerized, consequently the discretion can only be found in the description of the facts of a case according to the relevant criteria. This implies that discretion is exercised in specifying facts for inclusion in a form.

Discretion is not exercised after the calculation is initiated and until completed, neither computer-assisted or manually.

There are several examples of discretionary flags i SSA chapter 7. The flags signals that discretion should be exercised. Some of these flags have been examined more closely for the consideration of whether computerization is possible.

Sect 7-2(3) states that if special reasons justify such decision, a foreign refugee domiciled in the realm may be granted up to full basic pension. According to circular of May 5th, 1972, the NII adopts the decision of the Alien's Office with respect to who is to be considered refugees. According to a decision by the Social Security Court, anyone qualified as refugee is granted full basic pension.

The discretion to be exercised according to the statute, has consequently been eliminated.

According to sect 7-8, the NII may make exception to the condition that a pensioner shall have had the care of a child for more than 2 years with respect to the supplementary child benefit. There is granted in total approximately 2 000 child benefits, and this discretion is exercised only a couple of times annually. The only criteria taken into consideration are the length of the period of care and the nature of the foster parents.

It is difficult further to specify the discretionary decision.

The Ministry of Welfare has issued subsidiary legislation for decisions on income and pension payment. In regulation no 2 for sect 7-10 no 6, litra d authorizes the NII to make exception to the provisions in litra a-c if these lead to clearly inconsiderate results. According to circular of March 30th, 1973 (p 8 and 9), this discretion has more the quality of an exception than a true discretionary decision. Illness and unemployment of longer duration may be reasons for exception, as well as work or residence abroad.

Contacts with the NII has established that the criteria are considered vague and that computerization is not feasible.

A preliminary discussion with the NII indicates that discretion is exercised in few cases, and is governed by vague criteria. Little will be gained by computerization.

There are, however, other discretionary rules than those discussed here. Sect 7-9, for instance, that pension including supplements in exceptional cases may be granted according to sect 7-2 to 7-8.

Sect 7-6 and 7-8 both uses as a criterion the condition of "living apart". When are two persons really living apart?

The major example is whether a person is to be considered domiciled in Norway. This discretion is not exercised by the NII.

There would seem to be very limited possibility of computerization of discretionary rules unless a revision of the provisions took place.

3. The old age pension system

The system keeping track of the pension points for a person, calculating the pension and governing the payment of the pension will be termed the old age pension system. (This is not the term used by the NII, but it might facilitate our discussion to have a term for that sub-system of the insurance system of interest to us.)

The files of pension points and the calculation of pension is executed by the Central Social Security System in the NII.

3.1 General files

The old age pension system maintained until 1983 two major files. The file of pension points was updated by relevant information as long as a person was able to earn pension point.

The age brackets were 16 and 70 years of age. This file was maintained by the NII.

After October 1983, the file of pension points is part of the RF-base (the Social Security Data Base of the NII). The RF-base is documented by a structural chart, data definitions and title catalogue. The title catalogue explains the names used for data fields, and describes information and codes.

The base is a DL/I base under CICS.

When a person is granted old age pension by his local social security office, the person is included in a payment file. This may be seen as a pension file, and includes in addition to personal information information on tax deduction, certain creditors, etc. The decision to make payments is the responsibility of the social security offices.

3.2 Entering of income basic for pension calculation

The income basic for pension calculation (PI) is communicated from the Central Tax Authority for the country as a whole, for a number of approximately 2 million persons. Otherwise, income information is received by the Directorate for Seamen, the Social Security Office for Abroad, the Tax Council for Spitzbergen and the Economy Division of the NII. Most is entered by tape generated by the reporters. The reports from the Central Tax Authority take place after the normal assessment of tax returns has taken place, but before the appeals have been decided.

3.3 Granting and calculation of old age pension

Old age pension is not granted until a person is 67 years of age. This takes place at the earliest in the month the persons attain the age of 67.

The social security office is from the NII given a pre-calculated old age pension by 67 years of age. The pension points for last year (which are not available yet) are here equalled with the next to last year.

Two or three month before the person attain the age of 67, a notice is mailed. This is pre-printed. There are variations for those registered as invalids, widows or widowers, supported spouse etc.

With the notice a claim form is forwarded. The person is made aware of help being available at the social security office for completing the claim form.

The claim form includes information on the person in question, for instance other pension benefits, spouse, children, former and current employment (the two last employers).

Current and future income has to be specified. Here problems may arise for self-employed persons, farmers, etc.

The system of special benefits for waiting claiming the pension has been discontinued, but such benefits already earned are maintained for the life-time of the beneficiary. Those between 67 and 70 years of age was granted this benefit until the amendment entered into force. The old age pensioners were informed of the amendment, which entered into force April 1st, 1984.

The claim form is communicated to a data entry office of the NII, where the data is entered. On this basis, the NII produces a grant letter.

The system producing the grant letter has a calculation system, a data entry system and a production system. The system consists of a number of programs. These are documented by R001 - System Specification of the Central Social Security System, and in the programs themselves under the general program R0014201 for the calculation of old age pension.

The data entry system has a schedule of text types using standard texts from which the appropriate bit is chosen when the letters are produced, according to the status of the pensioner.

The texts may be divided in lead-texts and message-texts.

The calculation of old age pension for grant letters is described in the document "Calculation rules in the Central Social Security System" of October 30th, 1983 from 1. System Office of the NII. Chapter 2 discusses the calculation of basic amounts, chapter 3 the calculation of old age pensions.

The NII mails the grant letters with the calculated pensions and sequence of pension points, as well as a basic form to the relevant social security office, which controls the grant letter.

The grant letter shall be signed by two officers of the social security office in two copies. One is forwarded to the pensioner, the second is filed at the social security office.

An automatic re-calculation of the old age pension takes place when a person attain 70 years of age. Grant letter is mailed.

When special benefits or supplementary benefits are amended, grant letter is re-issued. Also when a supported child attains the age of 18, or a spouse attains the age of 67.

3.4 Changes in status

When a pensioner is granted old age pension, certain changes in the status of the beneficiary may influence his pension. Some examples of such changes may be mentioned.

Change from invalid pension to old age pension is automatically made when the age limit is attained. This also holds for spouse with respect to supplementary spouse benefit when the spouse attain the age limit.

In the case of graded benefits, claim form is forwarded.

Divorces and marriages are reported.

Pensioner reports to the social security office, which forwards an amendment form to the NII, for instance if a pensioner have more children or marries a spouse less than 67 years of age.

4. NORTRYGD

NORTRYGD is a solution based on Norsk Data equipment. In principle, the local social security office should have their own hardware.

The claim form is entered in the social security office (cf A1.2), and what corresponds to the basic form is telecommunicated to the NII. The calculations are made in the NII on the bases of the information in the RF-base and the basic form. Pension information is returned to the social security office through the network. The social security office makes the decisions and initiate payment. The information for payment are in general included in the pension file.

Old pension functions are implemented in COBOL. The files are organized by the data base system SIBAS.

5. INFOTRYGD

INFOTRYGD is a solution based on IBM-equipment and linked to the municipality data bureaux (KD-bureaux). A social security office communicates with these. INFOTRYGD uses the RF-base (cf. B2.20) as NORTRYGD. But the pension files are maintained by the KD-bureaux. The KD-bureaux run the payment system for the social security offices using INFOTRYGD, similar to the former situation for all offices.

INFOTRYGD maintains a pension point file as a sub-set of the RF-base. This is accessed by HDAM methods (cf. C p 321). The pension file is accessed using HIDAM methods (cf. C p 324). Both files are maintained by the IMS data base system (cf. C p 275-386).

6. SMARN

SMARN is an extension of the programming language SIMULA. SMARN is specified in detail, but not implemented. The extension is made in order to be able to program rules in an easy way.

Emphasis has been made to discretionary decisions and administration of forms. These are also the characteristics to be discussed here.

When a form is defined, the data is formatted both for storage in internal and external memory and for communication between these.

When entering data in a form, one may find fields which specify the result of discretionary decisions. One is there queried for whether the user wants to specify the result or not. If the result is specified, the user proceeds in the normal way to fill in the form.

If the user does not want directly to specify the result, a model of the discretionary decision will be initiated. This may request further information, and may also initiate further discretionary decisions. Finally, the system will calculate the result of the discretionary decision. After this, the user continues to fill in the form from where interrupted. Programs written in SMARN will be converted to SIMULA by a pre-processor. The norms must be initiated by norm-specific variables before a certain case may be solved.

The data structure on external storage media is hierarchical in SMARN. The data structure is suggested implemented as direct files in SIMULA.

6.1 Form administration in SMARN

To give an example of the ease by which a form may be defined in SMARN, the fields 1, 2 and 4 in the basic form for the old age pension will be described.

object GA;

begin

comment Grunnblankett alderspensjon;

comment oi i denne fremstillingen står for outimage;

outtext(" GRUNNBLANKETT ALDERSPENSJON");oi;oi;

outtext("1 OPPLYSNINGER OM SØKEREN");

integer(1)FNR;

outtext("1.2 Trygdekontornummer");oi;

integer(3)TKNR;

outtext("1.3 Etternavn, Fornavn, maks 25 posisjoner");oi;

integer(3)NAVN;

outtext("1.4 Målfore: B=Bokmål, N=Nynorsk");oi;

boolean MAAL;

outtext("1.5ivilstand, kode: G= gift, U= ugift, A= gift, men lever
adskilt, S=skilt, E= etterlatt");oi;

text(1)KODE;

ouutext("1.6 Tillegg for ektefelle");oi;

boolean TE;

outtext("1.7 Er søkeren norsk statsborger?");oi;

boolean NS;

outtext("1.8 Antall barn som det innvilges forsørgingstillegg for");oi;

integer(2)AB;

outtext("1.9 Framtidig arbeidsinntekt pr år hvis under 70 år?");oi;

integer(6)FAI;

outtext("1.10 Pensjonsgrad hvis søkeren ønsker nedsatt grad");oi;

integer(2)PG;

outtext("1.11 Virkningstidspunkt");oi;

integer(2) mnd.aar;

comment pkt 2 leses bare om ektefelle fins;

if kode = G v kode = A v kode = S

then begin

 outtext("2 OPPLYSNINGER OM EKTEFELLEN");oi;oi;

 outtext("2.1 Fodselsnummer");oi;

 integer(11)FNREK;

 outtext("2.2 Etternavn, Fornavn");oi;

 text(25)NAVNEK;

end;

comment bare hvis nei i pkt 1.7;

if not NS then begin

 outtext("4 SPESIELLE OPPLYSNINGER");oi;oi;

 outtext("4.1 Statsborgerskap");oi;oi;

 integer(1)KODES;

 outtext("4.2 Bosatt");oi;

 integer(1)KODEB;

end;

end;

.....

The form will be entered line by line. Each outtext-message is written out as one line, followed by `<variabelnavn> =`. The start of entering data in a form would therefore be as below:

```
GRUNNBLANKETT ALDERSPENSJON
FNR=
1.2 Etternavn, Fornavn, maks 25 posisjoner
NAVN=
1.3 Trygdekontornummer
TKNR=
.....
```

Though form administration is rather simple in SMARN, at least as seen from the data entry point of view, the data entry ought to be page rather than line oriented, as it is currently.

6.2 Discretionary decisions in SMARN

A discretionary decision is in SMARN described by a number of possible relevant factors. The weight for each f_i is described as a function of the fact sentered. The influence of a factor can be expressed as:

if $b1$ then $f_i := f_i + f1(x1, x2, \dots, xm)$;

This implies that $b1$ is a relevance criterion for the statement. $b1$ is a Boolean expression. If $b1$ is true, the weight for the discretionary decision, f_i , will be changed according to the weight of the factor, $(f1(x1, \dots, xm))$, where $x1, \dots, xm$ are those facts the weight of the factor depends upon.

7. Possibilities using SMARN for old age pension calculation

Will the calculation of old age pension always be possible in SMARN? This report should answer this question. We also will discuss whether SMARN may be used for calculations interfacing with the RF-base.

A SMARN solution will be compared to the current solution. And finally, we will discuss for which ends SMARN might be used by public administration.

7.1 Can SMARN be used for calculating old age pensions?

The answer to this question is based on an assessment of the calculation rules documented in the Calculation Rules for the Central Social Security System and the data structure of the RF-base, which is hierarchical. There is no attempt to design a detailed solution behind the assessment.

As the data structure of SMARN is hierarchical (somewhat more powerful) and SMARN is an extension of SIMULA, it is readily seen that SMARN might handle the old age pension. The most important statements necessary are assignments and conditional statements.

7.2 Can SMARN be interfaced with the RF-base

This question has considerable interest, as SMARN in principle must be compared with the programming language PL/I as programming language interfacing the RF-base.

The first question would be whether SIMULA may be interfaced to DL/I under CICS. If the response to this is negative, one does not have to discuss the issue further.

Neither SIMULA or IBM are aware of successful solutions to this problem. It is doubtful whether it is possible.

Even reentrant programs are not straightforward in SIMULA, as it is not included in the standard definition (SIMULA Common Base).

Consequently, it is very doubtful whether it is possible to use SIMULA, and thereby SMARN, interfacing the RF-base. If at all possible, it will be a rather complex solution.

If technically possible, it would nevertheless not be possible to use the external storage functions of SMARN, as one is using DL/I. Even if SIMULA may generate calls to DL/I under CICS, it would not be appropriate to use SMARN interfacing the RF-base.

7.3 Comparing a SMARN solution with the current solution

How would a pure SMARN solution compare with the current? There are two decisive arguments for the current solution.

First, the Central Social Security System is an integrated system where the old age pension is but a minor part. It would complicate the matter to use different storage methods.

Second, it is necessary to have a data base system (which SMARN is lacking) to store economically important data as in the RF-base. This is an argument of data security.

From these two reasons it would be inappropriate in any case to describe the old age pension system in SMARN for an operating solution. This would be true even if it was seen as desirable to solve discretionary decisions in the system, and create a form

7.4 Possible uses of SMARN by public administration

SMARN is inappropriate as a language to realize systems advising clients. The reason is basically the lack of functions for backtracking in the language. To permit alternative choices or a change of the client's mind, this must be prepared directly in a SMARN program.

SMARN would be appropriate for analyses of consequences where one details a description of actual facts with respect to a problem which has arisen, and calculates the result for this situation. As discussed above, an integration with the RF-base may be difficult.

An objective for SMARN might be to test amendments to rules, using incremented weight rules. This might have as an objective to adjust rules to individual variations to a higher degree than currently.

To use SMARN in a job environment within public administration, it would be necessary to interface SMARN to a data base system. Such interfacing presumes SIMULA interfaces. This issue is currently being considered by SIMULA Ltd.

I would like to thank Per Jensen, Gunnar Slettner and Herman Larsen of the NII for valuable information on the old age pension system, and Dag Wiese Schartum of the NRCCL for assistance navigating the rule structure.

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