Legal Decisions and Integrated Systems

R.M. Di Giorgi, E. Fameli, R. Nannucci
Istituto per la documentazione giuridica del Consiglio Nazionale delle Ricerche

1: Legal decisions

In the field of legal informatics research it has also been argued that knowledge based systems, and especially expert systems, could be of considerable assistance to lawyers and, therefore, many experiments have been carried out on automated advisory systems. An expert system is software that simulates the reasoning of one or more human experts (usually the author or authors of the program) and is able to transfer its specialized knowledge to users. These are normally specialized users (such as for instance judges, lawyers or notaries in case the application is oriented to the law).

However, a system cannot be called "expert" when it only provides expertise, even if it is that of more than one expert. "The system - as De Mulder argues - must be able to learn, to communicate in natural languages and to make unexpected replies; that is, it should possess its own creativity" [10]. In order to make it of some practical utility, the system should contain, apart from expert knowledge, general and formal principles that are the bases of interpretation and the practical application of the law, both by the legislator and the courts. In short, it should contain all those elements constituting "empirical knowledge" or "knowledge of reality".

Supplying systems with this kind of knowledge would mean studying the construction of models of legal phenomena more closely (for example, it would be valuable to analyse the effects of national legislation in order to evaluate how a law is applied in practice, how words are used in the text, what meaning is to be given to words and phrases). These studies are, however, very complex and up until now experiments of this kind have still not been carried out, with the result that we cannot talk about real knowledge based systems in law. The experiments implemented so far may only be defined as "legal advisory systems", "legal aid systems" and not as "expert systems" or "knowledge based systems" or "Artificial Intelligence systems". We are dealing with programs informing and supporting the user in specific domains, on the basis of wide legal knowledge. They are all the more useful when they are structured to work as "checking" tools, like a kind of memory for the user regarding facts and data that has to be taken into account when deciding on a particular case [17] [25].

When there is no unambiguous interpretation for a particular law and the decisions made for analogous cases are controversial, it is certainly not enough to consult and ask a group of experts to discuss the matter among them, for the purpose of evaluating their answers and then choosing, on the basis of quantitative criteria, the solution to adopt as a reply in the system. Undoubtedly, knowledge of legal authority and legal precedents is useful but cannot lead to a conclusive evaluation [18]. The very concept of analogy is subjective. It is precisely in making these choices that the lawyer's professional ability is manifested.

Judges also are not always capable of discussing the theoretical categories they use in decision making. They must worry about defining the concrete case and not about writing a treatise, whereby that which is read in a decision is only a hint about something far wider and completely implicit. All judges have different ideas about how to construct the legal schemata and categories to which to refer. The level of analysis differs from case to case and from one judge to another in the same branch of the law. On the other hand, there is always an important relationship between facts and categories: the retrieval of certain facts instead of others implies the use of certain categories rather than others, like the categories in which it is assumed there is a certain type of factual knowledge that they are called upon to classify [19]. It is, therefore, difficult to think that all this complexity can be adequately dealt with in an automated system.

2: Expertise and documentation

In order to build the knowledge base of legal advisory systems, domain experts and knowledge engineers, after collecting the necessary documentation, interpret, re-elaborate and standardize it, making a "filtered" product out of it to put at the user's disposal. Systems developed using this methodology have the advantage of being already defined and tested proposals, becoming, in practice, decision support tools. However, proposed solutions remain choices, even though made by experts and perhaps even worked out in groups as well as having been given practical testing.

As a result of our discussion so far, there are too many heterogeneous elements of a subjective kind (linked to individual sensitivity, to the place, to political and social reality) that can - and should - be taken into account in giving advice or in making a decision. All these variables may lead to marked differences between one decision and another on the same case; on the other hand, a lawyer's use of discretion is a guarantee and fundamental element in the application of the law [14] [6] [4].

In the course of the reasoning (absolutely autonomous, personal, difficult to deal with in its completeness and complexity) that the lawyer carries out in reaching his decision, further information is required, for example, about decisions made by other courts in analogous cases, about the existing legal literature on the matter, or about the legislative measures referred to. From this point of view, systems may be proposed that integrate their basic knowledge with notes and comments added by the user after reading original legislative measures or evaluating similar cases.

It would, in effect, seem necessary to maintain implemented systems in such a state that enables them to be constantly evolved: new decisions, different interpretations, the same analyses of reality and conditions peculiar to each concrete case should be capable to influence reasoning for a non static and narrow view of the law. It should be therefore possible to design models open to the influence of the external world and to the new emerging awareness, capable of coping with the continual evolution of contemporary life [22].

Given that the legal expert system user needs to consult the original documentation and, therefore, use his own judgment in interpreting the facts of the case of interest to him, such a kind of support may only be provided by databases linked to an implemented advisory system [12].

Before examining the specific problems related to the implementation of integrated expert systems in the law, it seems advisable to analyse - from a technical point of view, neglecting the peculiarities of the specifically chosen domain - possible integration between different application domains within a single composite system.

3: Integrated systems models

The design of integrated systems is based on the assumption that it is possible to reach a greater degree of efficiency and functionality by combining the resources and powers of different programming environments and making them interacting each other suitably. Even though, in the abstract, models of integrated systems can be designed to meet a wide variety of different needs, the application of Artificial Intelligence technology to implemented programs - mainly expert systems, hypertext and databases - can be subdivided into three main approaches, according to the purpose assigned to the composite system to be developed and the role to be played by each single component [7].

3.1: Integration between expert system and hypertext program, with an advisory-decision making approach

A first model of integration may be defined when an expert system uses hypertext technology in performing the functions for which it was designed. Within the same application program, two distinct technologies co-exist and work together: the expert system as much as the hypertext program work separately but one completes the operations performed by the other, communicating and integrating reciprocally [21]. In this case the overall architecture of the system keeps functionally oriented to the fulfilment of the primary purpose of the expert system, namely problem solving or decision making: knowledge representation methods (like production rules or decision trees), inference mechanisms and inductive techniques keep being as the central core of the composite system. The hypertext component operates only to widen and strengthen the system's capacity, providing a variety of functions which, although qualifiable as auxiliary with respect to the performance of logical functions and to procedural checking, are, nevertheless, essential to the general results achievable by the system and to their effective user friendliness [23].

3.2: Integration between expert system and hypertext program, with a documentary approach

Compared to the first model described here, a second type of intelligent system may be based on an inverse configuration of the relations between hypertext program and expert system. According to this approach, the structural architecture of the composite system hinges on the characteristic functions of the hypertext tool, which is therefore the dominating component: the organization of documentary units is based here on non linear, hierarchical and conceptual links, while the expert system is limited to performing specific tasks, aimed at aiding navigation within the database, providing alternative trails to retrieving the information found in documents or enabling additional information to be identified, referred to the subject area of the user's

search but disseminated in documents pertaining different topics. The result of this particular combination of the two components within the global system, deriving from an integration model in which the hypertext application functionally prevails over the expert system, may be defined as a kind of "animation" of documents, supported by the complementary capabilities of the two different tools [1] [9].

3.3: Integration between expert system, database and hypertext program, with a documentary approach

A third model of integration can be seen in the development of expert systems built for pre-existing databases that may be of different sizes and, therefore, stored in the hard disk of a personal computer, or in the memory of a mainframe (or on CD-ROM). Three components operate in this system architecture: the expert system, the database (or, more generally, the information system) and the hypertext program. The dominating role is played by the database, whereby the expert system and hypertext component are oriented towards performing subordinate but essential tasks, such as user-friendly (intelligent) retrieval of information pertinent to the query (expert system) and the conceptual and graphic organization of the documents retrieved as output (hypertext program). The action of the expert system in aiding the database user is particularly valuable when very large databanks are involved, which are stored on mainframe or CD-ROM and distributed by on- line information networks. Artificial Intelligence technology may make query formulation easier in the sense of unambiguously defining the content and restricting the search domain, thereby making retrieval more efficient [24] [3].

3.4: Integration between expert system, database and hypertext program, with an advisory-decision making approach

An opposite but symmetric combination compared to that described so far can be seen when, without prejudicing the function carried out by the hypertext program, the central and dominating role within the general integrated system is, instead of the database, played by the expert system, that has been designed to give advice or to aid in decision making within a specific application domain. In this case, the expert system must be able to interact with the database relating to the subject matter within its competence for the purpose of directly retrieving the information required for performing its principal tasks from it. In turn, the result of this procedure may simply be of use as complementary information for the end user, or may influence further man-machine communication, directly influencing the logical path for reaching the advice or the decision. The latter occurs when the expert system obtains the values with which to draw attention to the variables found in the different phases of the dialogue system directly from consulting the database [2].

The functioning of this complex mechanism of integration- interaction between expert system and database solicits the user to perform different roles and activities with regard to the individual components of the general system: in fact, in the interaction between the user and the expert system, as far as this is based on carrying out a computer-guided dialogue, the questions are formulated by the system and it is the user's task (possibly with the aid of the database attached to the expert system) to supply the answers; in the interaction between user and data it is, instead, the user (possibly with the aid of the same expert system) who has to formulate the questions, while the database has to give the answers. The outcome of the interaction is, in the former case, an integration of the system's knowledge, in the latter, an integration of the user's knowledge.

However, the assumption behind one and the other is always the possibility of co- ordinating and fusing the knowledge base of the expert system with the database linked to it. In this sense, the integration, in turn, solicits the identification of common "objects" or "entities" and their uniform processing in the two different environments.

There are still many problems to solve before reaching the final result (advice/decision making), mainly with reference to the dynamic aspects of the overall functioning of the general system and, among these, to the value of the increase in knowledge (learning) in the system and in the user: how these processes occur and with which results is still to be adequately investigated.

Of course, the evolution in research in this direction is an important objective for the future development of expert system applications. In fact, the capacity to acquire knowledge from the text of documents stored in a database, and, therefore, the capacity also to "construct reasoning" by using new information taken from them, is an essential element for learning in the system considered as a whole, with regard to information retrieval from databases as well as problem-solving [16].

4: Integrated systems in the law

Adopting the system model described as last, the problem of accessing legal documentation (legislation, case law and legal authority) from an expert system linked to a selected communication trail may be faced by taking one of these two approaches: very large legal databases available on national and international telematics networks may be used or local databases specifically oriented to the subject matter taken into account on each occasion may be built.

The analysis of these two different solutions leads to some comments. Whenever it is chosen to link the advisory system to remote databases, it becomes necessary to develop very sophisticated interfaces, aimed at allowing the user to move about very easily and with best results within the vast and heterogeneous documentation available; so, tools for the conceptual organization of information such as thesauri and semantic networks will be very useful.

On the other hand, when it is thought to be more advisable to build local databases, it is necessary to make a choice among the available documentation, so that the user is supplied with already selected sources. This, then, will be the most delicate phase, to which the closest attention must be paid.

Opting for the connection with very large on-line databases involves some inconveniences: operating within different systems forces a user to know retrieval rules and languages created for different types of documents. Accessing a number of heterogeneous databanks (legislation, case law, legal authority, statistics, socio-political databases, etc.) is anything but easy for non computer literate users, as is generally the case with lawyers [11].

On the other hand, interacting with local databases seems easier and more useful, because it considerably reduces the risk for the user of getting lost within the large mass of documents. Certainly, in this case, it may happen that sources are not exhaustively indicated and, therefore, some elements may be neglected that the user could, instead, judge to be interesting. However, a support of this kind appears to be more functional if compared to the previous one. The link to remote databanks may be foreseen as an additional element, in case of occasional retrieval of general documentation, not directly pertinent to the subject matter under consideration.

The architecture emerging from the analysis made so far is that of integrated or composite systems, consisting of expert systems linked to specially built databases: in this way, unified environments may be defined where the user may move about easily without interrupting the work session, by simply exporting queries from the advisory system to the database for the purpose of collecting all information useful in decision making.

5: The man-machine interaction

Within the sphere of integrated or composite systems, the interface between the various modules is essential. Only in depth research on user groups enable useful work to be done on the man- machine communication. In practice, it would be necessary for creating user-oriented interfaces to understand exactly which questions the potential user will ask the system, what they deal with and, above all, what mental parameters will be involved.

In cases where no analyses have been made on user groups, the implementation of the interface will imply introducing functions of the database retrieval language into it [8]. Tools that have already been acquired in the world of information retrieval, based on the conceptual organization of terms relevant to the subject matter (thesauri), just like intelligent information retrieval systems that use semantic networks and frames [15], still represent essential references.

Currently, however, as it has already been pointed out, an approach that is sure to have considerable impact is that connected to the development of hypertext interfaces, enabling users to manage semantic tools in a simplified way. This technology becomes particularly significant in designing advisory systems oriented to legal users: it may not be forgotten the fact that lawyers do not generally have much familiarity with computer technology and do not fully exploit the opportunities offered by these new tools [6]. It, therefore, becomes essential to develop these specific features within legal informatics research, to make it possible to design system architectures whereby, with a minimum of effort in terms of learning retrieval languages, legal users are furnished with a simplified approach to automated information systems.

It, therefore, seems necessary to pay special attention not only to building user-friendly interfaces for database access (remote or local), but also to the new models that are becoming established in the sphere of technology for the database development. A lawyer needs to interrelate legal sources of different kinds that, in a traditional database, imply resort to specific documentary formats; with hypertext all of this is no longer necessary, because heterogeneous documentary material can be managed in a single

environment [5]. From here to processing hypertext links with Artificial Intelligence techniques the step is short and this is undoubtedly the direction studies for designing really innovative systems will have to take in the future [13] [20] .

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