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**LEGAL INFORMATION SYSTEM  
AS A SOURCE OF KNOWLEDGE ABOUT LAW.  
THE CONCEPT OF THE ARCHITECTURE  
OF AN EXPERT LEGAL INFORMATION SYSTEM**

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**SYSTEM INFORMACJI PRAWNEJ  
JAKO ŹRÓDŁO WIEDZY O PRAWIE.  
KONCEPCJA ARCHITEKTURY  
EKSPERTOWEGO SYSTEMU INFORMACJI PRAWNEJ**

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**Abstract:** This article aims to present the concept of the architecture of an expert legal information system. The authors of this article, working with entrepreneurs in the field of supporting business activities, identified a significant gap in ICT solutions providing legal knowledge. The research question that inspired the considerations contained in the article is: Do the current solutions supporting the provision of legal knowledge enable the creation of an expert legal information system? In order to answer this question the authors conducted a critical analysis of the literature and identified ICT solutions used by entrepreneurs in the field of obtaining and processing legal information. The article presents the main sources of legal information, trends in the development of ICT solutions and the areas of their application. The key part of the article is the concept of an expert legal information system architecture.

**Keywords:** legal information system, law, legal informatics, legal norms.

**Streszczenie:** Niniejszy artykuł ma celu przedstawienie koncepcji architektury ekspertowego systemu informacji prawnej. Autorzy niniejszego artykułu, współpracując z przedsiębiorcami w obszarze wspomagania działalności biznesowej, zidentyfikowali znaczną lukę w rozwiązaniach ICT dostarczających wiedzę prawną. Pytanie badawcze, które stało się inspiracją dla rozważań zawartych w artykule brzmi: „Czy aktualne rozwiązania wspomagające dostarczenie wiedzy prawnej umożliwiają stworzenie ekspertowego systemu informacji prawnej?” Aby na nie odpowiedzieć, autorzy przeprowadzili krytyczną analizę literatury, jak również dokonali identyfikacji rozwiązań z zakresu ICT wykorzystywanych przez przedsiębiorców w zakresie pozyskiwania oraz przetwarzania informacji prawnej. W artykule zaprezentowane zostały główne źródła informacji prawnej, tendencje rozwoju rozwiązań ICT oraz obszary ich zastosowania. Kluczową część artykułu stanowi koncepcja architektury ekspertowego systemu informacji prawnej.

**Słowa kluczowe:** system informacji prawnej, prawo, informatyka prawnicza, normy prawne.

## 1. Introduction

The issue of using technology to disseminate information about the law in force with the use of electronic digital machines dates back to the 1970s. In the legal literature, the term, 'legal informatics' was introduced by J. Wróblewski (1971, p. 639) in 1971. The main application of legal informatics was to use digital machines in the process of law creation, its interpretation and application, the systematization of legal acts and searching for information about law.

In legal informatics, the main role in the development of the concept of providing information was carried out by F. Studnicki (see: Studnicki, 1978a) and J. Wróblewski (1985), and it was mainly the former who continued the research in that area (see: Studnicki, 1977, 1978b, 1983, 1990, 1993).

With regard to the concept of law, in legal literature it can be assumed that „1) law is the norms (rules, patterns) of human behaviour, 2) law is an expression of the will of social power (class, class) ruling in the state, 3) the law is protected (sanctioned, secured) by the state” (Rot, 1994, p. 16). At this point, it is worth quoting Z. Ziemiński: „When analyzing how legal provisions fulfill the role of a means of verbally expressing norms, we must avoid terminological misunderstandings” (Wronkowska, 2006, p. 33). This concerns situations when a concept is understood differently in different sciences. Therefore in normative acts one of the key elements are dictionaries of terms used in these acts and legal interpretations of how the legislator understands the concepts defined on the basis of a given act. At this point, one should also mention global definitions, which, defined in one act, cover the entire legal system. A huge problem for entrepreneurs is the enormous multitude of legal acts as well as their interpretations. Although access to the binding legal regulations is guaranteed by constitutional law (pursuant to Article 88 of the Constitution of the Republic of Poland, in order for certain provisions to function in reality, they must be announced in a certain way), many entrepreneurs have significant

problems with accessing the appropriate information resources and their correct interpretation.

As the research carried out by the authors shows, Polish entrepreneurs have the opportunity to use public and private sources of legal information distributed at three levels of availability (see: Chomiak-Orsa, Krajewski, and Golusińska, 2018, pp. 29-37).

An example of the use of an expert system may be a preliminary assessment of evidence, predictions whether the enforcement proceedings will prove effective in recovering the debt, or whether, based on the new knowledge, it will be possible to conduct court and enforcement proceedings more effectively (see: Chomiak-Orsa and Greńczuk, 2017c, pp. 33-41).

On the other hand, for entrepreneurs it is necessary to strive for the coexistence of legal information systems that would cooperate with ICT solutions supporting the activities of enterprises.

Therefore it seems necessary to create solutions in the field of ICT supporting the management of legal information, the functionalities of which would be much wider than those currently offered on the market.

The aim of the article is to present the concept of an expert legal information system, namely a proposal of a solution that could contribute to the improvement of the processes of obtaining legal information as well as the expert management of legal information.

The proposed concept of an expert ICT solution is limited to the presented assumptions for the database architecture and the possibilities of using visualization solutions.

The research methods used in the article were critical analysis of the literature, and practical research consisting in the identification of the technological solutions available on the market. As a method for designing the solution, the definition of conceptual assumptions and visualization were used.

## **2. Sources of information about the law**

The system of legal regulations creates a business environment for entrepreneurs, therefore management of organizations means constantly dealing with complex legal problems. The legal advisory services available on the market are an exclusive commodity for many entrepreneurs which is mainly due to the price paid for this type of service. This is the main reason for the growing popularity in obtaining legal information from publicly available sources of legal information gathered in knowledge bases dedicated to this area.

The criterion of the publisher of the content published on them is crucial for many entrepreneurs. In this context, two sources of information about law can be distinguished: private and public (see: Chomiak and Krajewski, 2019, pp. 9-21).

A **public source of information** on law, pursuant to the Constitution of the Republic of Poland in force, the established law must be published (Article 88 (1) and (2)). This includes the Constitution, statutes, ratified international agreements, regulations and acts of local law established in the area of operation of the bodies that established them, to the catalogue of sources of law (which is a closed catalogue). In principles and procedure of publication the Constitution refers to the Act of July 20, 2000 on the publication of normative acts and certain legal acts (Dz.U. 2019, poz. 1461). According to Art. 8 of the Act, official journals within the meaning of the Act are: Journal of Laws of the Republic of Poland, Official Journal of the Republic of Poland "Monitor Polski", official journals of ministers managing government administration departments, official journals of central offices and voivodeship official journals. This act regulates which normative and legal acts are published in which official journal.

As **private sources of information** about law, one can include private compilations of binding legal provisions, i.e. all the others not included in the private group. Such an example may be commercial legal information systems, such as LEX by Wolters Kluwer, Legalis by C.H. Beck, also various types of publications on the Internet that collect and unify the applicable law. It should be noted that private sources of legal information are not sanctioned. Sanctioning value is carried by official publication, in which the publication of anything that becomes part of the legal system.

It is worth pointing out that the compilations in the form of tables containing different summaries (even if they are erroneous) are of an official nature. Although it will be possible to later indicate any irregularities contained therein, a change requires re-publication. In such a case, a normative act of the same rank is issued, which indicates changes in the original act.

The most important benefit of both types of sites is their free accessibility, while looking through the prism of their design, their substantive content, quality, functional solutions including *usability*, the differences between them are significant.

### 3. ICT solutions used in the legal information system

The development of the Internet and its general availability have contributed to the fact that it became the main carrier of information for all its users. This is also reflected in the distribution of legal information. For most entrepreneurs, the first stage of searching for legal information to solve business problems are the free websites created by public or private legal information providers (see: Chomiak, Golusińska, Kruczek, and Krajewski, 2019, pp. 9-18).

Naturally, a stakeholder seeking legal information undertakes to search websites for materials on a topic similar and relevant to the problem they want to solve. Unfortunately, finding the information one sought is usually insufficient because the specificity as well as the high degree of specialization of legal knowledge mean that the

seeker is not able to correctly assess the quality of the information found, and often is not able to interpret it properly. This problem poses a considerable challenge for the commercial producers of the systems and databases containing legal information.

A Polish entrepreneur looking for support in solving legal problems has the opportunity to seek legal information in areas of accessibility such as (Chomiak, Krajewski, and Golusińska, 2019, pp. 29-37):

- 1) websites,
- 2) electronic systems (databases) of legal information,
- 3) ‘analogue solutions – paper version such as magazines or books or their ‘hybrids’ with electronic equivalents.

Undoubtedly the focal point of every information system is the place where information is stored, i.e. the database. This can be a relational database, an object database, or flat files.

According to M. Chałon’s definition, a database is “a set of data organized in a certain logical and restructured way. The actual structure depends on the data model adopted in organizing the data. Its size depends on the amount of data and the interrelationship between them” (Chałon, 2001, p. 14). Additionally, from the legal point of view, the concept of a database was defined at the European Union level in Directive 96/9 of 11 March 1996 on the legal protection of databases. Art. 1 clause 2 defines a database as “*a collection of independent works, data or other material, arranged in a systematic or methodical manner, and individually accessible by electronic or other means*”. In turn, in the Polish Act on the Protection of Databases of 27 July 2001 (Journal of Laws of 2001, No. 128, item 1402), a database means “a set of data or any other materials and elements collected according to a specific system or method, individually available in any way, including electronic means, requiring a significant investment in terms of quality or quantity in order to prepare, verify or present its content”.

The database should contain information not only on the applicable law, but also on previously applicable provisions, information on the basis for the amendment of these provisions, information on the justifications of draft laws, court decisions (decisions of common and administrative courts and the Constitutional Tribunal, judgments of the above-mentioned courts), legal bibliography, which can be used to check what has been written about the law, glosses (discussion by representatives of legal science of the position regarding the decision in an approving or denying manner).

In addition to the database, a middle software layer is needed that mediates communication between the user and the database, which will also store the database connection information and display the results requested by the user accordingly.

This layer also responds to communication with the application server on which the application will run. Therefore, it is extremely important to create a proper database architecture as well as the use of tools to visualize its content.

## 4. Presentation of information about law in commercial information systems regarding law

As mentioned before, the most important element is the visualization layer that will present the information sought. According to Dudycz, “visualization can be presented as a process of processing complex data structures into a form readable for the recipient (using the perception mechanism) with the use of graphic elements. The image can be made using various tools, starting with a pencil and a piece of paper, and ending with IT means (hardware and software)” (Dudycz, 1997, p. 25).

Knowledge can be presented in the form of tables, charts, diagrams, maps (whether concepts or geographic) and/or using advanced notations, i.e. BPMN (Business Process Modeling Notation) and UML (Unified Modeling Language). The appropriate form of presentation of legal information is to facilitate the understanding of what the legislator meant (see: Chomiak and Greńczuk, 2017a, pp. 21-34).

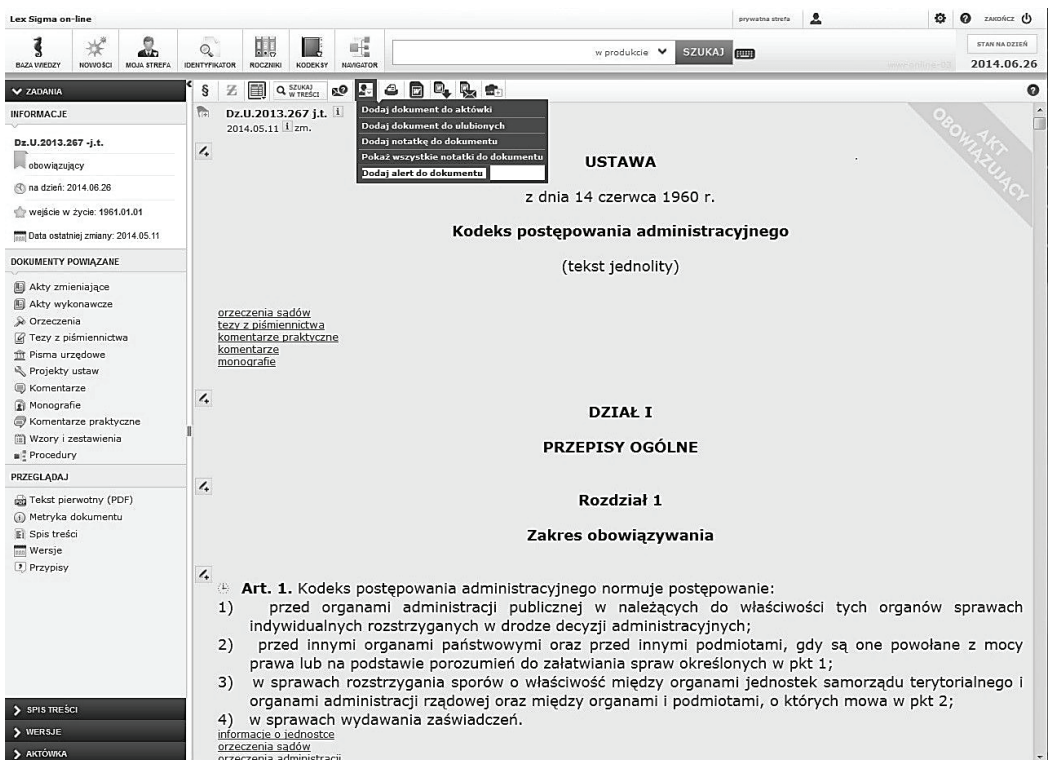


Fig. 1. Visualization of a normative act such as a code in the LEX system

Source: Wolters Kluwer Legal Information System „LEX”.

As can be seen in Figure 1, the view of the Code of Administrative Procedure is presented, where we can observe that the editorial unit of this act (article) has references to the indicated in point 2 of this article to other resources. As you can see, references were made to such resources as: court decisions (only those in which the courts referred to a specific provision are indicated), theses from the literature, monographs and comments (if a given publishing house has published in a 'book' form, the content is adequate). If a given normative act has been changed, the program also offers the possibility to track these changes over time, including the possibility of displaying the current content from a specified period in separate windows.

Additionally, if the content of an act refers to the content in another act, by indicating the relevant article or act, it is possible to go to that act (article)<sup>1</sup> by using hyperlinks. This transition occurs either by opening the indicated act in a specific place or displaying its content in a new window.

This layer is also meant to facilitate moving around the system by displaying indexes, thematic terms, categories, years (Internet System Legal Actions allows to view legal acts adopted by the Parliament in a given period of time, whereby it should be noted that in this way they are numbers displayed logs set, and after the entry in the number one can see its contents). It is worth pointing out that this system enables searching for the enacted legal acts after a specific date.

It is worth remembering that the law is constantly changing, so in view of the above-mentioned legal information system it indicates whether a given normative or legal act is valid or not. This is important because the entity that wants to refer to a specific provision, group of provisions or a specific act must be aware of whether it is possible or not. Therefore it should be pointed out that the system must indicate such information. As suggested by Mach, "these aspects can be briefly characterized as follows:

- a) time in law – temporal units and relations in legal texts,
- b) law over time – law changes over time, just like legal knowledge, i.e. knowledge about law,
- c) transitional law – when the law changes, not only new regulations apply. Sometimes it is necessary to apply the preceding (old) rules, and sometimes both of them" (Mach, 2006, p. 94).

As one can see, time in law is very important. This is related, for example, to accounting where changes in the accounting rules which are to be introduced within

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<sup>1</sup> An example is Art. 2 of the Act of August 21, 1997 on real estate management (consolidated text, Journal of Laws 2020, item 1990) which indicates that "the Act does not infringe other acts in the field of real estate management, in particular ...", where the relationship is calculated laws. After clicking on the link (usually the word "law"), it allows one to go to the content of the relevant act. Elsewhere in the act, e.g. Art. 12a paragraph. 1, there is a reference to specific provisions of the Act of 27 August 2009 on Public Finance (Journal of Laws of 2019, item 869, as amended), that is: Art. 56, art. 57 and art. 58 sec. 2-4.

a few days or weeks, must be introduced to the IT systems supporting accounting in order to avoid not only the financial but also the legal consequences related to accounting or issuing incorrect accounting documents.

### 5. The concept of the legal expert system

In the literature on economic informatics, one can find examples of expert systems for decision-making support processes at management level. These systems can support a specific department, e.g. co-create the company’s operating strategies or influence its marketing policy. This concerns having an appropriate knowledge base that the company has at its disposal, and also its up-to-date status. As part of this system, one can also set up machines that will acquire specific domain information and insert it into the database. Then, such information can be processed either manually by the appropriate manager or in a suitable algorithm that will extract the information and process it with the appropriate knowledge.

Examples of use cases are shown in the figure below (Figure 2).

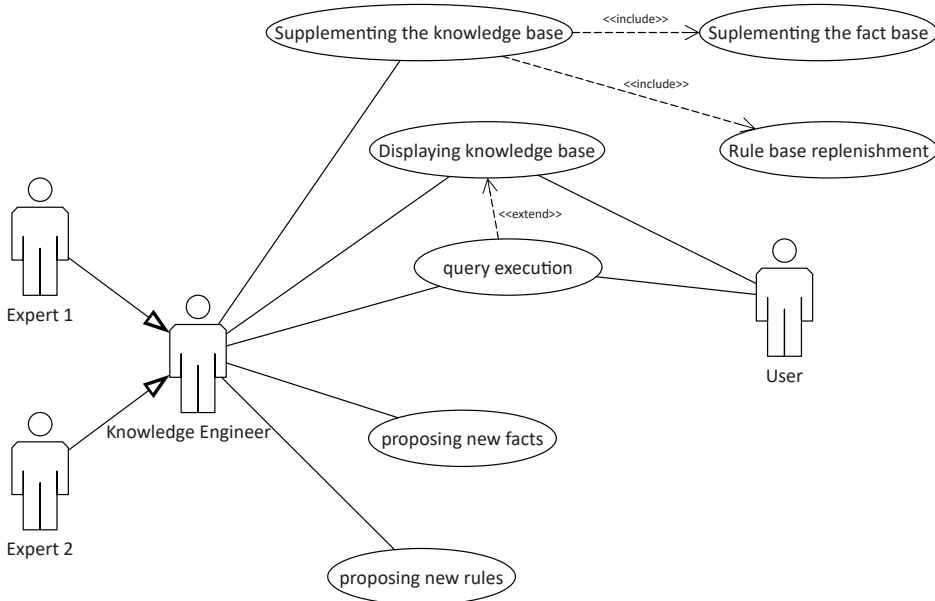


Fig. 2. Selected use cases in the expert system

Source: own elaboration.

Regarding the expert system, one can assume, following Blachnik, that “it is a program or a set of computer programs supporting the use of knowledge and facilitating decision-making. Expert systems can support or replace human experts in a given field, they can provide advice, recommendations and diagnoses on



problems in this field ” (Błachnik, n.d.). Such a system is characterized by having a specific intelligence. According to the online dictionary of the Polish language, intelligence is understood as: „the ability to understand, learn and use the possessed knowledge and skills in new situations” and „in general educated people and people who work in intellectual work” (*Słownik języka polskiego*, n.d.).

“The purpose of expert systems (SE) is to generate expert opinions aimed at supporting decision-making processes in poorly structured problems in a rather characteristic way. The process of generating expertise consists in searching for a solution to a problem (or even providing a ready-made solution) with the use of primary knowledge obtained from an expert, which during processing is systematically extended as a result of the activation of procedures enabling machine conclusions” (Palonka, 2006, p. 116). Below, the SE diagram is presented, which will be most appropriate for the described concept (Figure 3).

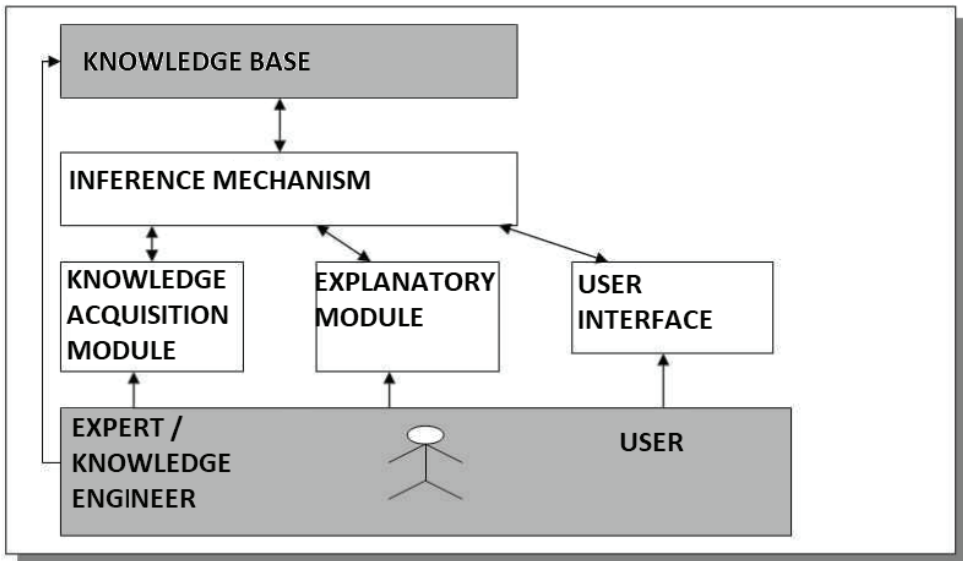


Fig. 3. The diagram of the expert system

Source: (Juszczuk, n.d.).

As one can see, the expert system consists of the following elements: knowledge base, inferring mechanism, knowledge acquisition module, explanatory module and user interface, which can be accessed by an ordinary user, expert and knowledge engineer.

**The knowledge base** in expert systems consists of two elements, namely the database of facts that state certain states of affairs and validation rules that are used to verify the collected facts and generate answers, as well as new knowledge.

**The inference mechanism** is at the heart of this system because it contains implementations of a specific algorithm that is used for work. **The explanatory module** presents the way of inference and can generate additional actions, i.e. generate a graphic view. **The knowledge acquisition module** is responsible for acquiring new knowledge by indicating a specific place with a resource or manually entering it – it is dedicated to the knowledge engineer and expert. This module can be used for input/output for the Central Information about Court Proceedings and Enforcement Proceedings (more: Chomiak and Greńczuk, 2017b, pp. 33-43). **The user interface** is used for communication between the user and the SE. It can take many forms, be it a classic text application, a ‘window’ application or a web application. In any case, it is to enable easy navigation through the system, and in the event of a specific error, explain it clearly to the user.

In order for this system to check the database in the market, it must be expanded to get the starting position in the output. In the subject literature, four methods proposed by S. Chmist can be found:

- validation of the quality of knowledge acquired and recorded in the form of knowledge representation,
- estimating the level of knowledge based on measurable criteria,
- estimating based on decision-making decisions,
- indirect advice of an expert (Chmist, 2006, p. 37).

For the knowledge to be as relevant as possible, it needs to be obtained from more than two experts to eliminate different approaches to a specific issue. In the case of law, the way in which certain legal provisions are to be interpreted or even understood is contained in the jurisprudence of the courts. More than once, it can be found that the justifications of judgments/decisions contain quotations from scientific publications that have analysed a specific issue. If there is no such analysis, the panel of judges undertakes their own analysis, which may also be time-consuming.

In order to be able to use the expert system in the process of legal interpretation, which is *“an operation performed on a legal text and consists in determining the meaning of expressions used in legal provisions in order to reconstruct a legal norm”* (Gromski, 2008, p. 244), appropriate principles of legal inference must also be implemented. Legal conclusions *“are the ways of recognizing as binding legal norms also such norms of conduct that have not been expressly formulated in any legal provisions, due to the fact that they constitute consequences of norms clearly formulated in provisions”* (Gromski, 2008, p. 244). It is important that in the process of interpreting the law, the basic interpretation is a linguistic one, which aims to unequivocally establish the meanings of the words, phrases and terms used in the legal language (more: Gizbert-Studnicki, 1978). If, as a result of the linguistic interpretation, the unambiguous expression has not been obtained, then one resorts to a systemic and functional interpretation.

From a technological point of view, expert systems use techniques and methods appropriate for artificial intelligence, machine learning, and artificial neural networks. Such a technological dispersion is to create an IT system that will most closely resemble human reactions.

## 6. Conclusion

The purpose of this article was to indicate the role that legal information systems play in checking not only the applicable law, but also how these laws have evolved over time. The importance of knowledge about applicable law is important for every participant in a given community. It is possible to imagine that a certain behaviour of a given social group at some point is restricted or becomes legally protected.

The law also states that individuals must be certain about the law in force. It is true that the law cannot be written in a clear-cut manner, because it is not possible to predict what new circumstances may arise that would not be legally provided for. This also creates a situation where the number of legal norms would be so large that it would be difficult to navigate, even for legal professionals.

Legal information systems aim to cover the legal provisions provided by presenting those legal provisions already in force. On the other hand, expert systems could generate ready information on what legal norms would apply and would interpret the law. The size limitations of this article make it impossible to perform a full analysis, and the authors would like to point out that they will undertake further work for the purpose of developing this issue in a wider scope.

Further literature analysis and proposal of concepts for potential solutions, are being discussed by the authors, who are also planning to carry out a deeper analysis of the potential impact of economic informatics on legal informatics, and analyze what the latter can take from the former in the context of legal information management.

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