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DECISION SUPPORT IN ANALYSIS OF CONSTRUCTION CONTRACTS

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ABSTRACT

Preparation of an agreement has a great influence on economic success of both parties and on their behaviour in order to increase their profits and to protect themselves against possible loss. It is important to use technological innovations in construction contracting. Even when the construction contractor is selected and the price and work terms are negotiated, it's possible to choose at least several variants of agreements. The aim of this article is to develop a hierarchical model of criteria of a construction contraction agreement based on their functions. Construction contraction agreements can be concluded, evaluated and compared on the basis of this model. This model forms the basis of decision support system for analysis of construction contracts. Decision support system created on the basis of presented model can be very useful and helpful in construction contraction agreement and can be widely implemented in different construction sectors.

KEYWORDS

Decision support systems, construction contracts, multiple criteria evaluation.

1. GENERAL INSTRUCTIONS

Economic, political, legal, social, technical and technological environment makes advanced countries of the world transform their traditional business to electronic in one or another degree, assign part of human activities to computer-based decision support systems in decision-making and use opportunities provided by internet more effectively.

One of the most important futures which derives construction from other processes it is a complexity of the process with a number of stages, which must be appropriately adjusted and managed. The entity that commissions construction must make different multi-aim decisions at various construction stages.

Contractor's selection it is one of most important processes and causes a lot of problems encountered during construction. Therefore, selection of a contractor is a very important stage in the implementation of an investment project. Patrick Sik-Wah Fong and Sonia Kit-Yung Choi [1] have analysed methods of contractors' selection and noted

that some methods are non-exhaustive and tend to be biased: there is a lack of opportunities to evaluate abilities of a contractor and meet time, price, quality and security requirements at the same time. These authors have analysed possibilities to apply the Analytic Hierarchy Process (AHP) Method in contractor's selection according to various criteria.

Architects are not less important in the construction process. F.K.T. Cheung et al. [2] claim that price cannot be the only criterion influencing selection of an architect. Authors have compiled a questionnaire and made an expert research, which helped to determine criteria that influence architect's selection and the significance of the criteria. An architect was selected using AHP method.

Multicriteria methods may be used not only for selection of contractors or architects. E.K. Zavadskas, L. Ustinovičius and A. Stasiulionis [3] have analysed possibilities to apply *Electre III* method in evaluation of effectiveness of investment to commercial objects. J. Antuchevičienė [4] has introduced a system of criteria specially designed for reconstruction of rural buildings.J. Šaparauskas [5] reviewed guides, manuals, recommendations, databases, software and internet tools for multicriteria building evaluation from the sustainable development perspective. T. Vilutienė and E. K. Zavadskas [6] have presented a system of criteria, which helps to make decisions related to maintenance of residential houses. Possibilities to use various methods of the game theory while making decisions in the construction sector were analysed by E. K. Zavadskas, L. Ustinovičius, Z. Turskis, F. Peldschus and D. Messing [7]. E.K. Zavadskas, A. Kaklauskas and V. Trinkūnas [8, 9] have analysed systems of e-trading for construction materials and goods and have offered the model of an internet decision support system for trading in construction materials.

Most of the above-mentioned authors solve various issues related to construction investment process. However, such an important question as evaluation of construction contracts remains unanalysed or almost unanalysed. Even when a contractor is selected and price and terms of work agreed, at least several contract variants are still available.

The aim of article to present a model of multicriteria system which will form the basis of construction contracts legal evaluation decision support system.

Research objectives are to study the possibilities of current legal decision support systems, to prepare the structural model of construction contracts evaluation criteria and test the possibilities of such model practical implementation.

Research methods are based on works of Lithuanian and foreign scientists in the sphere of management of construction processes, decision support theory, modelling of decision support systems, application of computer technologies and on legal methodology related to preparation of agreements. Development of the theoretical model of the decision support system for evaluation of construction contracts is related to legal regulation of a construction contracts and application of principles of decision support systems intended for construction and law.

Research results – presented model of criteria system which can form the basis of construction contracts legal evaluation decision support system. This system can be used in order to conclude acceptable and well-thought construction contraction agreements on the basis of effective methodologies for their evaluation and comparison.

2. CURRENT LEGAL DECISION SUPPORT SYSTEMS

To solve various legal issues a lot of decision support systems are already created in the world. It is possible to derive two different rules were used in the systems [10]: general norms defined in claims and special norms taken from precedent cases.

TAXADVISOR [11] used *EMYCIN* system in order to assist lawyers in land tax administration. The audit company *Ernst and Young* has created three legal expert systems: *VATIA*, *Latent Damage Adviser* and *THUMPER*.

The main attention in *VATIA* (Value Added Tax intelligent Assistant) [12] system is paid to VAT calculation. With the help of *VATIA* system auditors could analyse VAT payments of a client.

Latent Damage Adviser [13] was created on the basis of 1986 Latent Damage Act (Australia). With

the help of this system experts of latent damage could solve some difficulties with less efforts; however, it was too complex for non-experts, because they were not knowledgeable in abundant interrelated rules, which are characteristic to this sphere of law.

THUMPER [14] system was meant for employees of *Ernst and Young* who specialize in general taxation issues.

SAL [15] is another system created by the *Rand* Corporation; it is also used to solve inheritance issues. These two systems are important in that they represent first steps of IT in property distribution solutions.

WIRE IQ (Wire Intelligent Quantum) [16] is an internet decision support system, which enables lawyers, insurers and reinsurers perform quantitative analysis for claims in property distribution and personal damages rapidly.

A number of legal decision support systems in the It and law laboratory created Donal Berman [17].

In order to conclude acceptable and well-thought construction contraction agreements (hereinafter CCA), effective methodologies for their evaluation and comparison must be created. Analysis of both technical, organizational and economic aspects of construction and legal aspects of CCAs is necessary in order to prepare such methodologies [18]. In order to prepare a proper CCA, it is necessary to analyse agreement provisions thoroughly considering the descriptive indicators.

3. MODELING OF CONSTRUCTION CONTRACTS AGREEMENTS PROVISIONS

The system of CCA provisions may be also modelled considering functions of provisions. All CCA provisions have certain functions. For example, contract provisions regulating guarantees, surety and forfeit have liability guarantee function. All provisions regulating this function may be joined to a separate subsystem. Other contract provisions may be joined to subsystems analogically. The model of the system of CCA provisions formed on the basis of this principle is shown in Figure 1.

After analysis of few possible models this model was selected as the most suitable for creation of the multicriteria evaluation technique for CCAs. Such conclusion can be made due to the following reasons:

- experts can more easily evaluate importance of contract provisions when the provisions are grouped according to their functions;
- legal power of all CCA provisions is equal despite the group they are attributed to according to any of analysed classifications; however, the latter classification shows real operation and functions of a CCA best.

During assessment or interpretation of evaluation results, different construction contract provisions may be treated differently. This, on its turn, may cause some misunderstanding, erroneous results or erroneous interpretation of the results. Therefore, it is very important to elaborate each construction contract provision.

The model of construction contracting provisions based on their functions (Figure 2) has been used during evaluation. No problems related to formation of the evaluation criteria hierarchy have been encountered during the evaluation; therefore, it can be claimed that the developed model of construction contracting provisions based on their functions meets the requirements applicable to a hierarchy and may be used for evaluation of construction contracting.

4. CONCLUSIONS

Various authors offer different multicriteria decision-making methods for problem solving at various stages of an construction investment process: selection of a contractor and architects, evaluation of priority for building reconstruction, evaluation of buildings from the perspective of sustainable development, making of decisions related to building maintenance, selection of construction materials etc.

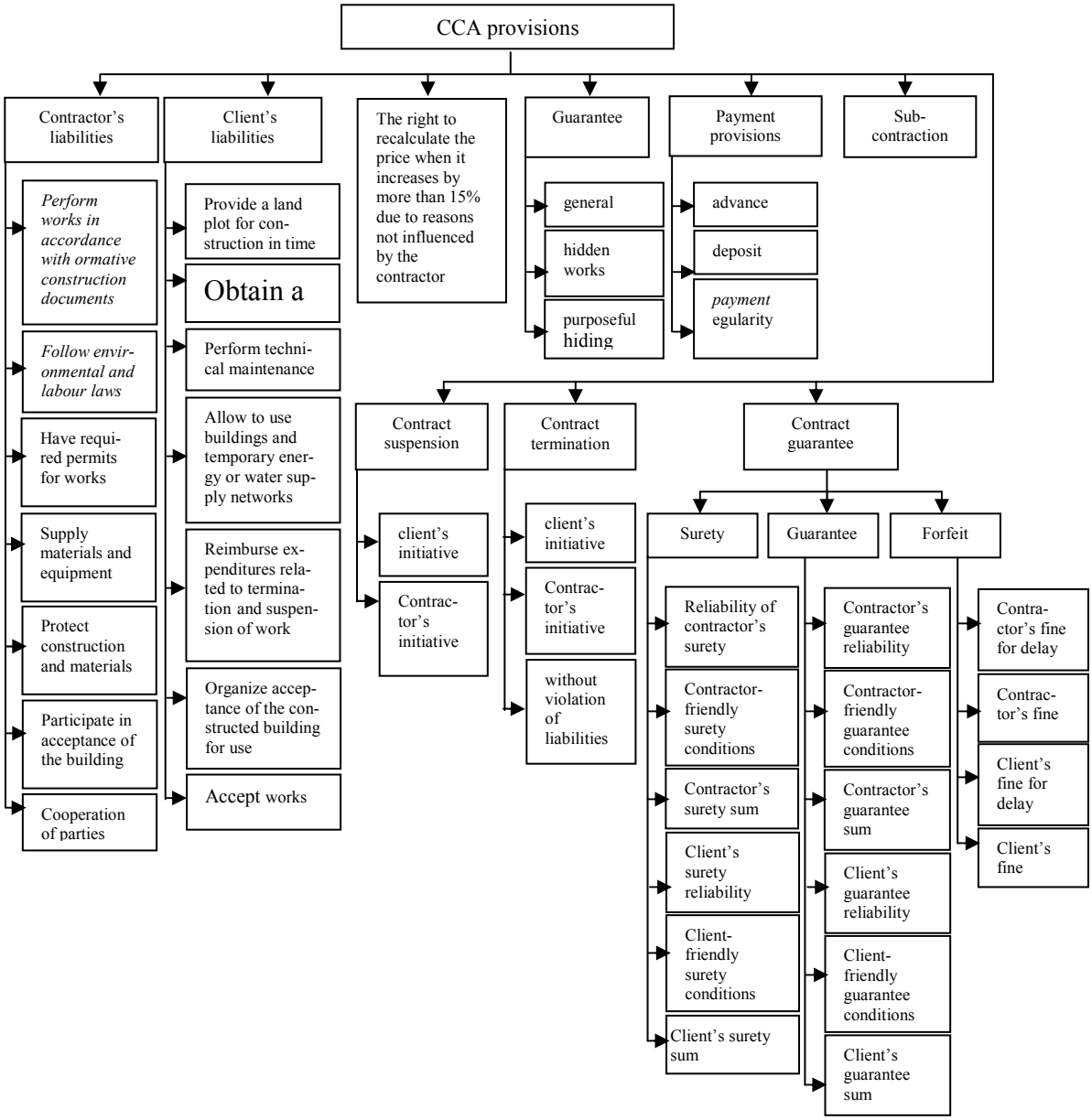

Figure 1. The model of CCA provisions based on functions

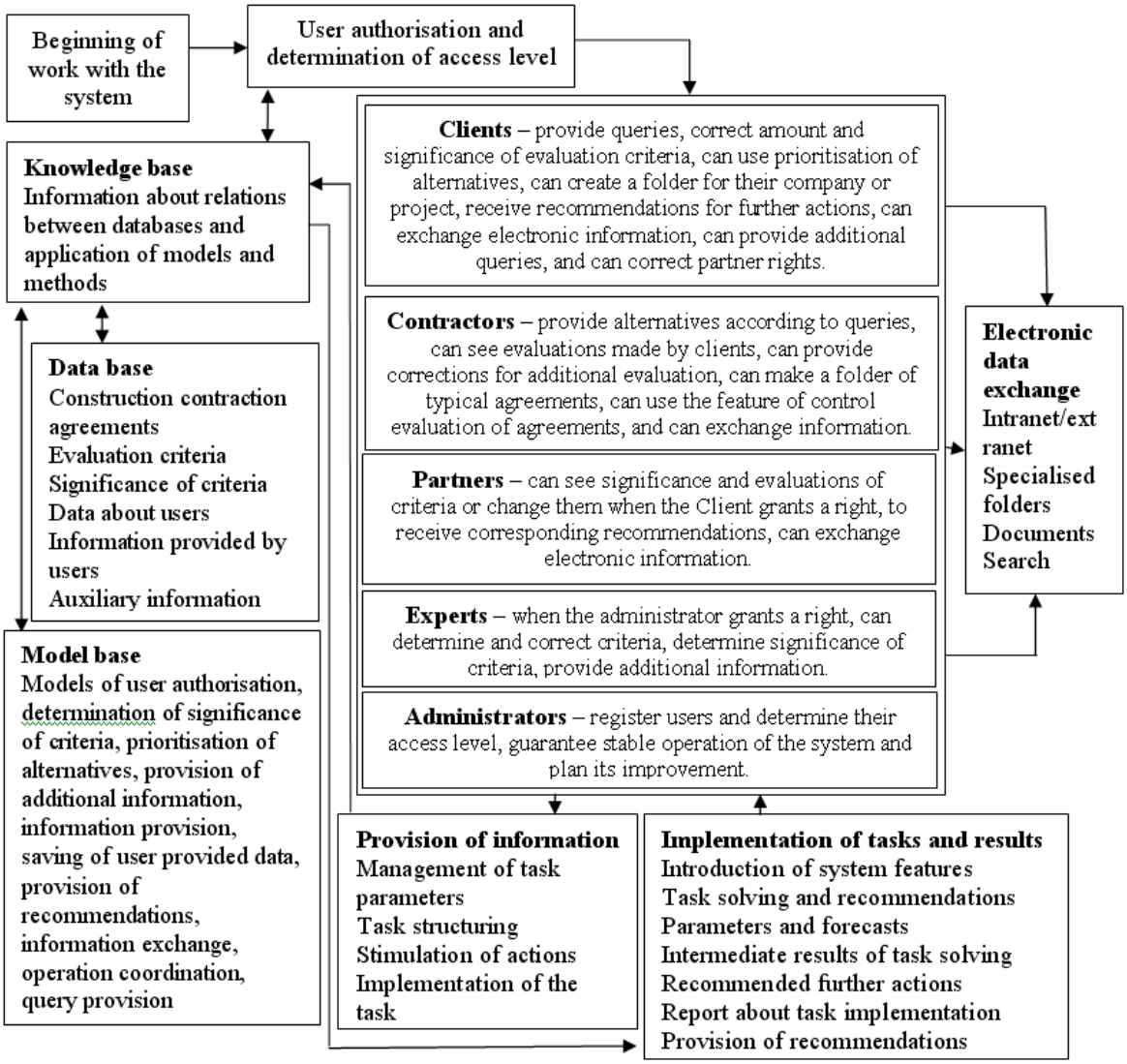

Figure 2. The model of the web-based decision support system for construction contracting preparation

Currently there are many systems alleviating contract making and legal issue solving in the world. Although these systems are created by various authors, in different time and for different tasks, it is possible to distinguish one common feature: information and the sequence of problem solutions are detailed on the basis of certain principles. In order to reveal peculiarities of construction contract making, it is expedient to make a scheme showing construction contract provisions and their relationships in detail.

The model of the construction contract provisions' system based on functions of provisions helps to determine significance of contract provisions. Thus this model enables to create an internet based legal construction contract decision support system.

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