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Computer Techniques and Indicators in the Policy of Optimization of Legislation and Law Enforcement

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***Abstract*—Assessment of optimization of legislation and law enforcement includes the use of numerous computer techniques and models designed for big data processing. In this study, indicators for assessing changes in legislation and law enforcement were divided into mathematical and social groups. Some of important for legal policy indicators and connected computer techniques are shown and discussed in the paper. The subject homogeneity indicator is based on an application of dimensionality reduction and used to assess the state of subject homogeneity of legal regulation. The time indicator is used in various time series analysis methods and shows specific legislative and law enforcement changes. The individualization of punishment indicator is based on correlation analysis and time series analysis and demonstrates implementation levels of the important principle of bringing to justice and legal politics. The indicator of rationality reflects the logic of decision making and based on machine learning. In modern legal policy, it is customary to operate with legal goals as the grounds for making certain decisions in the field of lawmaking, interpretation of law and law enforcement. The use of indicators makes it possible to check whether the goals of these political decisions have been achieved or not.**

Keywords—legal policy, computer methods, indicators, machine learning, big data

I. INTRODUCTION

The use of numerical methods and models to support legal decision making has been discussed for a long time [1]. In modern conditions of widespread digitalization, computer technology is becoming promising in the development and implementation of legal policy. To support the legislative process in the multilingual environment of European countries, systems and models have been developed to help implement European directives in national law [2]. The "big data" of historical sources seems promising for substantiating the ideas of originalism in the practice of the historical interpretation of the US Constitution [3]. Some legal information systems provide support for law enforcement decision making by producing reasoning (for example, "LexrideLaw" [4]) and predictions (for example, "SMILE+IBP" [5] and "VJAP" [6]).

An important problem is the limitation of the scope of application of computational methods. Various methods are shown to be effective in solving narrow problems and in a limited domain. To overcome this difficulty, the authors are exploring the possibilities of using indicators to link different computational models and techniques. Such links should facilitate a comprehensive assessment of changes in the legal system generated by political decisions.

II. METHODS

A. General approach

Indicators are widely used in regulatory policy [7] and law [8]. Composite indicators for specific areas strongly depend on the research methodology, therefore, the methodology at the intersection of computer and social sciences determines the need to develop indicators that are acceptable for validating the results of processing empirical data and for assessing the state and processes of the domain.

B. Computer methods and models

Assessment of optimization of legislation and law enforcement includes the use of numerous computer techniques and models (knowledge modeling, natural language processing models, clusterization models, classification models, etc.). These model techniques are integrated into a microservice architecture and are designed for big data processing in the legal domain based on machine learning.

C. Working classification of indicators

In this study, indicators for assessing changes in legislation and law enforcement were divided (as a working hypothesis) into two groups: mathematical and social.

Mathematical indicators are metrics that, for the purpose of interdisciplinary research, show the quantitative characteristics

of the algorithm as a direct consequence of the quantitative characteristics of the empirical base (legislation, judicial practice, etc.). For example, the frequent solution of classification problems based on the materials of court decisions allows the use of such metrics as accuracy, precision and recall; these metrics are indicators of the uniformity of judicial practice, since the confusion matrix demonstrates how instances of court decisions fall into the general model of legal reasoning. The rules for calculating mathematical indicators are accepted in the form in which they are proposed in mathematical and computer sciences [9].

Social indicators are static or dynamic indicators of the legal system. They need special verification and justification. Some of these indicators that are important for legal policy are shown and discussed below.

III. Results

A. The subject homogeneity indicator

The subject homogeneity indicator is used in the social sciences [10]. In this study, this indicator is based on a method developed in computer science for reducing the dimension of the feature space [11]. This indicator is static and is used to assess the state of subject homogeneity of legal regulation.

The heterogeneity of administrative offenses covered by article 20.1 "Petty hooliganism" of the Russian Federation Code of Administrative Offenses shows in fig. 1. The method was applied to 55,286 court decisions.

Accuracy visualizes the subject homogeneity of the facts of offenses and the sentences imposed. Numerous remote cases demonstrate the shortcomings of legal policy and determine the need for differentiation of legal regulation (separation of responsibility for repeated petty hooliganism and petty hooliganism by drunken persons).

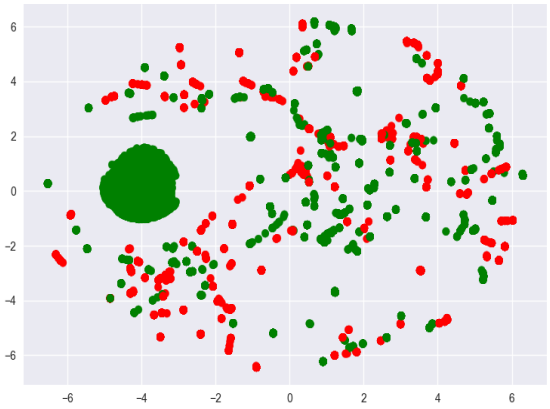

Fig. 1. Subject homogeneity indicator based on an application of dimensionality reduction

The use of computational methods to identify the subject homogeneity indicator also led to a number of other conclusions regarding the legal policy in relation to petty hooliganism.

For example, it was concluded that it is necessary to toughen the sanction of part 2 of article 20.1 of the Code (more serious petty hooliganism associated with disobedience to a police officer) in order to bring it in line with the established judicial practice. Currently, the courts avoid setting short terms of administrative arrest, since short terms are commensurate with the less serious offense of petty hooliganism provided for in part 1 of the article (now the terms of administrative arrest in parts 1 and 2 of the article coincide).

In addition, it was concluded that it is necessary to revise the list of circumstances mitigating administrative responsibility, or to revise the rules for taking these circumstances into account when imposing a sentence. In petty hooliganism cases, offenders abuse some extenuating circumstances (offender's remorse and offender's confession of guilt) in order to obtain less severe punishment. Formal consideration by the court of such circumstances does not contribute to the appointment of a just punishment, which is contrary to the principles of legal policy.

B. The time indicator

The time indicator is dynamic. It is used in various time series analysis methods. For example, in the correlation matrix (fig. 2) the indicator shows serious changes as different values of the correlation of an article for different periods. The matrix is based on 50,438 judgments in which several articles of chapter 18 of the Russian Federation Code of Administrative Offenses were applied.

In this case, the legislator made the last significant changes to articles 18.1, 18.2, 18.8, 18.10, 18.11, 18.15, 18.16 and 18.17 before 2016. These articles did not show changes in the zero correlation value for the time periods 2016, 2017 and 2018. On the contrary, the correlation values of 2017 and 2018 (zero correlations) for the article 18.9 were changed in compare with 2016 (positive correlation). In this case, the time indicator shows some significant change in the judicial practice concerning the article 18.9. The presence of such changes is objectively confirmed by the fact that the legislator amended article 18.9 in 2017 and 2018.

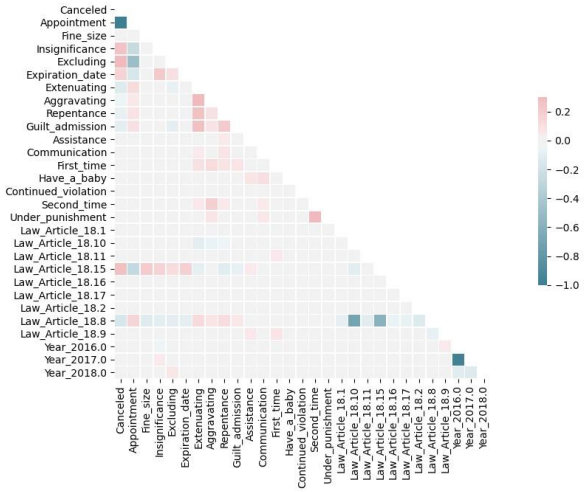

Fig. 2. Correlation matrix

Another use case for the time indicator can be demonstrated in a decision tree (fig. 3). This decision tree was derived from machine learning on 56,500 court decisions in cases of violation of fire safety rules (article 20.4 of the Code of Administrative Offenses) for 2010-2017.

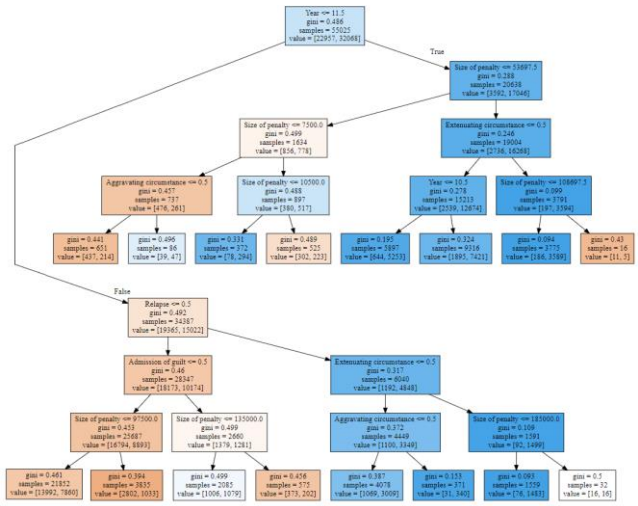

Fig. 3. Decision tree

In June 2011, the legislator significantly changed the article, which led to a drastic change in judicial practice and the basic branching of the decision tree based on time (year 2011.5, i.e. mid-2011). This means that a serious political decision was made in mid-2011, and this decision should be correlated with a very specific legislative change.

C. *The individualization of punishment indicator*

The correlation of an article of the Code with various circumstances mitigating or aggravating a punishment is an example of the individualization of punishment indicator (fig. 2). This is a static indicator, but it can be used in conjunction with the time indicator if required.

Individualization of punishment is one of the most important principles of bringing to justice and legal politics. The lack of individualization of punishment (zero correlation with each of the circumstances), as a rule, means violations in the process of enforcement. Zero correlation is a normal practice only in cases where the law provides for only one option of punishment, without any alternatives. Otherwise, a zero correlation for any circumstances mitigating or aggravating the punishment means that the law enforcer reduces the proceedings, avoids clarifying the actual circumstances of the case, and the punishment assigned to him is not individualized. In practice, in this case, the minimum punishment is imposed to avoid appealing the size of the punishment. This violates the rules for sentencing (article 4.1 of the Code) and makes the alternative punishments provided for by the legislator a “dead” norm.

For example, article 18.1 provides for various penalties. In particular, in parts 1 and 2 of this article, which are most often applied, the punishment for citizens provides for a fine in the amount of 2,000 to 5,000 rubles. However, in practice, an administrative fine for this offense is set at a minimum amount (2,000 rubles). The correlation matrix shows that the article has zero correlation with each of the circumstances of the case, which mitigate or aggravate the punishment. This conclusion is fully consistent with real practice.

On the contrary, articles 18.8 and 18.15 of the Code have a non-zero (positive or negative) correlation with many circumstances that affect the individualization of punishment. This indicator is extremely important for assessing the implementation of punitive legal policy.

D. *The indicator of rationality*

The decision tree (fig. 3) shows another important indicator. It is the indicator of rationality, reflecting the logic of decision making. If the decision tree is built in such a way that the presence or absence of a number of factual circumstances of the case consistently lead to a legally significant conclusion, then rationality is maximum. In this case, it should be concluded that the practice of applying the law is understandable, and therefore predictable. This state of affairs strengthens the rule of law and creates certainty in legal regulation, which are related to the general objectives of legal policy in a democratic state.

The indicator of rationality is a static indicator, but it can be used in conjunction with the time indicator if required. This can be shown in fig. 3. This decision tree has a punishment as a target, so the rationality of the decision tree is assessed based on the logic of the arguments leading along the branches of the tree to the choice of one punishment or another.

The decision tree shows that since mid-2011, the number of circumstances, which are decisive for the issuance of a decision on the imposition of an administrative penalty, has changed. Until mid-2011 (right / top in fig. 3), only two generalized groups of circumstances (mitigating and aggravating) appear in the branches of the decision tree. Since mid-2011 (left / bottom), not only these generalized groups of factual circumstances (mitigating and aggravating) have been built on the decision tree, but also two particular cases of these circumstances (reoffending and admission of guilt by the offender). Thus, since mid-2011, judges have begun to more identify and take into account specific factual circumstances when considering cases.

The decision tree shows a change in the significance of the circumstances of the case for making a decision on the appointment of an administrative fine. Until mid-2011, the circumstances of the case are in all cases below the administrative penalty. Some branches of the "decision tree" do not contain factual circumstances at all. But even on those branches of the "decision tree" where the actual circumstances in the decision are present, they do not form the correct sequence in the decision. In judicial practice, until mid-2011, there is no uniformity in the issue of what circumstances of the case are guided by a judge when imposing an administrative penalty. Starting from the middle of 2011, for all branches of the “decision tree”, the amount of the fine is determined only after a chain of two or three circumstances of the case, i.e. in the issue of the choice of administrative punishment, a uniform judicial practice has been established, based on the consideration of two or three typical factual circumstances.

Such a uniform and predictable state of law enforcement is extremely important for practical jurisprudence and the strengthening of the rule of law in general, as well as for legal policy and for predictive and analytical purposes.

The decision tree shows that after the change in the wording of Article 20.4 of the Code since mid-2011, the main circumstance that influenced the appointment of an administrative penalty was the presence or absence of a repetition of the offense (second from the top level of the "decision tree", left / bottom branch). Thus, the changes in legislation in practice have achieved such an important political legal goal as priority counteraction to persistent violators.

The decision tree shows that after the change in the law (from mid-2011), reoffending is coupled with a plea of guilt on the part of the offender. Thus, changes in legislation in practice have achieved such an important legal goal as the offender's awareness that punishment for the offense is inevitable. The offender pleads guilty and thereby simplifies the proceedings in exchange for a mitigating circumstance taken into account when imposing an administrative penalty.

In general, the decision tree shows that since mid-2011 there has been a qualitative improvement in judicial practice. It has become more consistent and logical. When imposing an administrative penalty, the court began to be guided by the typical factual circumstances of the case.

IV. Discussion and Conclusion

In modern legal policy, it is customary to operate with legal goals as the grounds for making certain decisions in the field of lawmaking, interpretation of law and law enforcement. The use of indicators makes it possible to check whether the goals of these political decisions have been achieved or not.

When describing legal objectives, it is often difficult to compare specific indicators with these objectives. Currently, this problem can be partly solved by involving expert assessments. But in the future, the accumulation of knowledge about the relationship between legal goals, indicators and computational methods for their identification can reduce the role of expert knowledge for assessing the optimization of legislation and law enforcement. At the same time, we believe that expert opinion should always serve as one of the tools for checking the adequacy of computational conclusions at some stage of the study.

An important issue remains the correlation of the above indicators with traditional data of legal statistics, as well as other statistical data. Big data processing makes it possible to significantly supplement knowledge about the legal system, and legal statistics are used primarily to validate computational results [12]. However, in the event that all the primary data forming statistical indicators are included in the empirical base of computational research, the very need for the form of legal statistics that exists now will disappear. All formalized indicators provided by legal statistics are simply extracted from the primary data during the computer processing of primary legal documents.

Computational methods and a system of mathematical and social indicators can be developed as a basis for decision-making in the field of legal policy. The advantages of this methodology are the objectivity of the conclusions based on the methodology open for public verification and big legal data, which ensure the completeness of the study.

Acknowledgments

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