

Expert assessment issues of civil legal protection of computer software and databases based on the example of the software complex for payment systems within the housing and utility infrastructure

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Abstract — The automation of payment system for housing and communal services using copyright-protected item, computer programs and databases comprise a set of tools for the development of housing law, which, in the days of global digitalization of the economy, proves the issue is to be viewed through the lens of mutual integration, in a sort of legal diffusion context. The work of legal specialists should involve both of housing and copyright legislation, basic awareness of information and analytical digital technologies, methods and algorithms applied for the calculation of payments for housing and utility services. Such a procedure of dual contingency, the adaptability of lawyers to the terminology of the digital environment bring up a number of problems which legal specialists face when performing analyses as part of a civil law assessment of payment software for the housing and utility infrastructure. Using the example of a software package for a payment system for housing and utility services, the calculation of utility payments accrued for individual tenants, the article offers an approximate list of assessment questions, the analysis principles for a database as a complex copyrighted item. We propose several options for comparing screen forms and video sequences of software products, to be used in case of copyright disputes and the release of programs under third-party copyright.

The work may be recommended for partial and / or holistic study to a wide range of readers interested in digital technology, assessment of programs and databases for the housing and utility infrastructure systems, university students, specialists in digital economics and law, students of the housing and copyright law and related legal courses, theorists of modern civil law and practicing lawyers.

Keywords — *legal tools for digitalization, civil law protection of databases, problem of computer assessment, utility payments – individual tenants, digital economy in housing law, automation programs for payment systems, copyright for databases in housing and utility infrastructure.*

I. INTRODUCTION

The digitalization of the housing and communal services system is a powerful instrument of economic expansion, a kind of peaceful method of globalization and absorption of the economic, legal aspect of comprehensive society development. According to Thomas Mesenbourg (2001), the concept of “digital economy” can be characterized by three key

components: 1) mere infrastructure of electronic business, i.e. hardware, software, telecommunications, networks and human capital as a relationship participant implementing / creating a service or a product; 2) electronic business in the context of the proprietorship method, physical and legal processes the organization implements through computer networks; and 3) electronic commerce, which includes the processes of receiving and delivering goods or services to the end consumer. Modern trends and technical potential of new applications erase the boundaries of this triad and add more technical, technological, terminological, semantic and legal complexity of the conceptual perception of processes associated with matching primary / secondary programs and databases, identifying markers of plagiarism and compilation (borrowing and copyright elements) through the integration of law enforcement methods of regulatory environment.

In the housing and utilities sector, digital processes are further laden with the calculations and formulas, as the housing and utility infrastructure system, using the digital economy elements, implements a comprehensive service and provides a complex of activities for the separation of the functions of the Contractor and the Customer within the system reform. Given the specifics of housing and utility services, the system analyzes the range of items: resident’s account, house, street, block section, city, district, region, etc., along with the data on tariffs, rates, housing services, specific calculation methods. While characterized by a complex variability of settings, specific calculation methods and principles, digital automation of the housing sector contributes to the complexity of the analysis to be performed by experts and lawyers, however it is imperative to start from the “head” of the digitalization process, namely, the problem of civil-law protection of computer software and databases. Therefore, in view of the global digitalization of the society, the objective of this article is the problem of expert assessment within the civil protection of PC software and databases based on the example of a software package for a payment system for the housing and utility infrastructure, the tasks of the rent/utility payments and tenants’ accounts. As databases are within the most common items of copyright and include special cases, collections, integral and divisible joint works, a database may contain works or parts of works and other items which can be categorized as materials, data or

information. Therefore, a database may include items of copyright and related rights, and sometimes some items of industrial property rights.

Hence, as databases and software products are analyzed as a complex object to be protected by the intellectual property law, the objective of the research is to demonstrate the existing problems of the digitalization of the housing and utility infrastructure system based on the example of expert assessment of the rent/utilities payment tasks, which are solved through partial unification and standardization of the expert assessment processes.

Research materials: Experimental studies were performed based on the analysis of three popular software products designed to calculate the utility payments for public services in the context of the housing and utility infrastructure facilities: 1C-Housing and Utility Infrastructure (copyright for the software package, property of the developers: LLC Circulation Solutions 1C-Rarus ", Yoshkar-Ola; LLC "1C: First BIT", Moscow) STEK + Housing and Utility Infrastructure (copyright for the software package, property of the developers: LLC Steksport, Rybinsk, and JSC SBiS ,Yaroslavl) and Kontur Housing and Utility Infrastructure (copyrights belong to a set of programs for developers - JSC Production Company SKB Kontur, Yekaterinburg).

Object of research: the database of a comprehensive software solution for the automation of the rent and utility payment tasks within the housing and utility infrastructure system. The study thoroughly analyzes the options of annual user versions of calculation programs and databases for 2 years (2017-2018). The scheduled changes in all versions of the installation package for reporting were made by the software developers: 1) in strict compliance with the current automation standards adopted in the Russian Federation, 2) due to changes in the legislation pertaining to payment mechanisms and principles of the housing and utility infrastructure system, and 3) at the sole discretion of the developer: software upgrading (restyling), improving the performance quality of the payment program package, simplifying the processes of database maintenance and intralist programming (codes) of the software for the Rent & Utilities task.

Subject of research: Problems and perspectives of the unification of expert analysis processes within the work on civil law protection of computer software and databases for the housing and utilities sector. Furthermore, the research focused on the comparison of screen forms and video sequences of software products, legally significant questions posed by experts and users of software products when comparing programs and databases, along with programming and technical issues. Since computer programming and databases are an exact science, a coherent mathematical process, where human creativity is manifested in the algorithming and systematizing knowledge, here, the principle, idea and date of an event become key elements. Equally important would be the correct combinatorial, comparative assessment of a certain number of markers of the authenticity and uniqueness of programs and databases by legal experts.

Research Methods: A dominant trend in modern jurisprudence is the researchers' reference to the philosophy of

law: intrinsic law, as the basis of undeniable principles and rights, in other words, as the subject of theoretical speculation and empirical study of law, as a behavioral science. Hence, the principal methods of the legal aspect used in this study are mere speculative analysis by means of abstract, speculative reasoning, and an empirical study conducted in the form of comparative analysis of three software products in various user versions (basic installations) made by software developers in 2017 and 2018.

As a methodological procedure, the article refers to the works by experts on copyright issues, intellectual property and legal protection, namely the illegal use of computer programs, such as: Androshchuk A.S., Petrenko I.K., Bliznets I.A., Leontyev K.B., Zasursky I.I., Kharitonov V.S., Entin V.L. Digital economy, prospects, historical and economic aspects of its development are covered by such authors as: Bykov A.Yu., Dukhanina L.N., Makhutov N.A., Martynov V.G. Housing law, the theory and practice of forensic are represented by: Krashennnikov P.V., Rossinskaya E.R., Skovikov A.G., Tushkanova O.V., Chernyak V.Z., Yakimova E.S., Borisova L.V., Besedkina N.I. etc.

II. DISCUSSION

The analyzed program and the Rent & Utilities databases by three software developers have common features inherent in every version regardless of their modifications (finalized and translated into other languages). Each developer produced the Rent & Utilities program and database, stating their name as the copyright holder on the program copy, applying their copyright mark. The manufacturers have an official copy of copyright registration certificate (Rospatent certificate) for the Rent & Utilities program and database. As the audio-visual displays generated by the program are protected by the intellectual property law, the significant similarity of these program elements in different versions of various programs, when submitted for examination, would confirm the infringement of rights [7, p. 68; 9, p. 12].

For example, in all reviewed Rent & Utilities programs the main functions are: work with directories, work with personal accounts, calculations, input of payments and quality certificates, compilation of final reporting forms. Therefore, the coincidence of screen forms for these operations, all other things being equal, indicates a significant similarity of programs, both in terms of visual display and the database structure. Experts often do not have special knowledge in the specific area of calculating the rent and utilities, and have difficulty comparing screen forms. [2, p. 75, 289-301; 3, p. 85]. To facilitate the work of experts, it was proposed to compare screen forms and video sequences using the data analytics structure presented in Table 1.

TABLE I. CHECKLIST FOR EXPERTS

No.	Item
Comparison of screen forms and video sequences of software products	
1.	Video sequences for search (account number /list /filter);
2.	Opening screen for the facility and individual account;
3.	Screen for setting tariffs and standard rates;
4.	Screen for setting categories and discount calculations;
5.	Screen for entering tariff categories;
6.	Screen for entering service suppliers;
7.	Screen for entering premises characteristics;
8.	Screen for entering patterns and algorithms for accrual and discounting;
9.	Screen for entering reports on poor services quality;
10.	Screen for entering discounts by source (budgets);
11.	Screen for entering discounts due to absence;
12.	Screen for entering consumption control based on registered meter readings;
13.	Screen for entering directories and their contents;
14.	Screen for entering lists of utility companies;
15.	Screen for entering various schedules and their contents;
16.	Screen for entering tenant's files (accounts), including account balance, quality, discounts;
17.	Screen for entering payment documents (packs, payments, meter readings).
Legal issues	
18.	Are the texts and database structures of the programs in the language (specify the language) used by (Developer 1), translated from or substantially similar in appearance to the texts and database structure of the programs by (Developer 2) in the languages (specify the language)? Could the former have been created independently, without using the latter?
19.	If there is a significant similarity, how is it manifested and how it can be explained: by coincidence or by the same area of application (same legislation), or only based on the same ideas (methods, principles) or by using previously existing source programs with original database structure (processing, modification) data?
20.	What and whose trademarks are on each version of the program and database on file and on the ones being compared (listed in clauses 1.2, 1.3., 1.4 of the materials provided)? Are there any indications in the source texts or the programs proper about the author(s) and the copyright holder of each version of the program and database? What is the date of their creation (by file date, by date in texts ...)?
Technical issues	
21.	How many and which versions of the Rent & Utilities programs and databases are submitted for assessment? Whose copyright marks (trademarks) are installed in them?
22.	What is a computer program version? How is the next version related to the previous one?
23.	What is the sequence of creating all versions of the Rent & Utilities program available to the experts? Which program versions were created earlier: in the language (specify the language) of Developer 1 / Developer 2? Where does this information come from?
24.	What is the relationship between all programs submitted and their versions: are these independent original works, or are they derived from each other, or are they merely significantly similar to each other?

No.	Item
25.	Does the legislation have a significant impact on the development of a specific database structure and program code: would programs and database structures be essentially similar under the same regulatory instruments which the program implements, or would only the implemented algorithms be similar?
26.	Do the program matrix in the language (specify the language) by Developer 1 and the program by Developer 2 contain fields (data sequence and format) with similar names (possibly encoded in English but identical in meaning) and identical data type? Compare the matrix. What is the coincidence percentage (field ratio)? Is the similarity significant? How can this be explained? Is the comparative table of programs by Developer 1 and Developer 2 confirmed by these materials?
27.	Is there a significant similarity in the structure of links between various database tables (organization of the data pools) of the specified programs in the language (specify the language)?
28.	Do the program databases have indices for the same fields (identical organization of the data pool)? Is the coincidence of the indices significant?
29.	Do the programs in the language (specify the language) have specific forms (visual display, video) of the information presentation with similar data pools (cards, lists, directories of general data)? Are these similarities significant?
30.	Do the databases use the same solutions compromising the quality of the end product: denormalization of database tables (the table entries have no single field with unique value in each record; the uniqueness of each record is determined based on the values of several fields, resulting in data redundancy); placement of heterogeneous, barely interrelated, data in a single table; calculation of the individual account performed in several stages?
31.	Are the substantially similar automatic optimization of calculating benefits used by the number (or attribute) of a service group in the programs by Developer 1 and by Developer 2?
32.	Do the indicated programs in the language (specify the language) have forms (data sequence and format) of displaying information on the screen (visual display, video sequence) containing identical control elements, while the other controls have been modified? Are there any significant matches? Is there a possibility of derivation of the visual display?
33.	Is the calculation formula (principle) linked in a substantially similar way to the service in the compared programs? Are the same names (numbers) used for calculation formulas?
34.	What calculation system is used in the barcode on the bills generated by programs in the language (specify the language) by Developer 1 and by Developer 2? How unique is it? Is the barcode structure similar in different programs?
35.	Specify the significant (in your opinion) differences between the programs by Developer 1 in the language (specify the language) and by Developer 2 in the language (specify the language)
36.	How does a programming language affect the database structure? What is the connection between the organization of a data pool (database, structure) and a series of (program) commands in different languages?
37.	In your opinion, what is the approximate (number sequence: day-month-year-years) period for creating a program of this class by one average skilled programmer: a) with a set quality problem statement (including translation (or modification) from one programming language into another) (with a free work schedule and with a regular workload), b) without a set problem and the lack of the subject knowledge by the developer, and with a regular workload

The expert examination appointed by the Arbitration Court identifies the similarity (analogy) of programs based on the following criteria: functionalities, run file size, external interface (visual display), file composition, database structure, reliability of programs and databases (ability to perform the required function), availability of user instructions. As a rule,

the illegal use of a program or database provokes infringements are associated with significant similarity, identical processing, indication of the authors' names, violation of non-property (personal) copyrights. [11, p. 37-108; 8, p. 56-58].

Courts urge developers to provide the evidence of their creative contribution to the creation of the program and database. Instead of proceeding from the presumption of authorship and creative contribution, the court obliges them to provide additional evidence. Even if all authors / co-authors acknowledge their creative participation in the production of the disputed programs and databases, it does not ensure sufficient assessment of the actual registration of all applications for a program or database (by the totality and importance of attributes), does not infer that "modification" does not entail the creation of a derivative work, the regulations and standards of the current legislation, and incorrectly define the facts important for the case, which ultimately leads to an unlawful judgment. It goes without saying that a court should not take into account all changes to a program or database, but only the creative input of the developers. Error correction, adaptation, actions of legitimate users, as stipulated in the operation manual for programs or databases, cannot result in the creation of a derivative work (although they may violate copyright in the part of unacceptable distortion of the work).

III. RESULTS

The study clearly demonstrated that, regardless of the architectural approaches of a software product developer to building a database of the rent and utilities task, the language used and programming principles, it is possible to ensure correct expert assessment by means of a certain unification and standardization of approaches. This can be achieved through the application of a uniform terminology defining concepts of video sequence assessment, comparison of screen forms to decide on the significant similarity of programs.

Further on, unification will simplify the proceedings of claims "On the protection of violated copyright for a computer program or a database for housing and utility services payments, in terms of the honor, dignity and business reputation of the author, recovery of losses and compensation for moral damage" and will allow to minimize the instances of infringement and fundamental errors of the court. It will allow to anticipate the development prospects for copyright, as in the age of the digital economy and the hourly development of advanced technology, the prompt and reasonable legal regulation should guarantee the stability of citizens' welfare, when intellectual property ensures a balance between copyright holders and society. [4, p. 22, 69-71, 389; 5, p. 19]. Another result of such unification can be the creation of a unified terminology structure pertaining to databases in the housing and utility infrastructure system [10, p. 85].

The impact of the legislation on the development of a specific database and program codes extends to their information content. The logical components (program algorithm and database structure) may coincide in the cases where the basic classical tasks are implemented (e.g., displaying a specific image, solving simple mathematical tasks), where the programs are created by the same person or

group, or when a "student" copies the "teacher". This is also evidenced by the availability and possibility of the same solutions reducing the quality of the end product and procedures eliminating the denormalization of database tables. The programming language does not predetermine the database structure. There is no direct relation between the organization of a database package (database structure) and a series of commands executed in different programming languages, since the database structure implies data construction logic, and a programming language is a means of expressing it. Our study of the programs proved that the principal difference is in the user interface and the video sequence generated by the programs, and the experts find it hard to assess the coincidences in the video sequences of the two programs in terms of the input and used data, the performance of the visual display, as a result of the software automation of the same application environment. Experts can partially find borrowed elements of the functional algorithm, however the exact definition of the borrowed code is impossible, for example, due to the application of various programming languages. The unification and systematization of knowledge, the implementation of ideas aimed at improving the existing legal basis will provide insight into the issue addressed to the users, organizations in various economic sectors and of various forms of ownership, and wide social strata. This would significantly facilitate the legal and technical understanding of new information technology aimed at creating a unified information and analytical database as a basis for stability, awareness and, consequently, to the economic welfare of the public.

IV. CONCLUSION

Reasonable technical challenges and criticism of copyright result in stricter and more advanced legislation applicable to software and databases as a whole, and within the housing and utility infrastructure in particular, as a special case of the legal segment. Stricter policies often result in the restriction of user's access to information. However, it is impossible to disregard the technological progress in the information exchange, which renders such exchange beyond the copyright system. This factor has a particularly negative impact on the production of Goods and the provision of housing and utility services employing copyright items. [6, p. 99; 12, p. 171-173, 201].

For this reason, to avoid exigency, it is essential to maintain the balance and adapt the interests of copyright holders to the public interests. Today's potentially efficient trend is to adopt a legal status for computer programs with open codes or texts, when any copyright item can be used freely, including modification, under one condition: the result should remain free for further changes and use. In this scenario, the category of exclusive proprietary right may disappear, leaving undeniable only the personal non-property rights. As for the analyzed databases for the rent & utilities tasks, we would propose the following: regardless of its structure, verification, systematization and content, a database represents a significant contribution, as labor costs or investments, therefore legal protection should apply to the database regardless of its form, software, hardware and publicity.

The database creator is entitled to protection and may allow or prohibit the extraction or use of its contents. The database

creator's rights may be assigned freely at their discretion. At present, the following possibilities are being analyzed: introducing the concept of "compulsory archiving" for 5 to 25 years; introducing and defining categories of database significance, according to which storage periods, application mechanisms and procedures for database access for business purposes should be assigned. Here, the categorization should be a flexible concept changing with any significant qualitative or quantitative modifications of the database, including any significant changes as a result of the accumulation of successive supplements, extractions, checks and changes in the systematization.

The protection of databases for housing and utility services should not affect any of the following: transactions, rights of the designer, rights or obligations pertaining to the databases or their contents. Neither should it neglect copyright, copyright-related rights, patents rights, trademarks, industrial design, antitrust laws and competition laws, trade secrets protection laws, data protection and confidentiality regulations, laws on access to state documents and contract law. Protection should not derogate [1, p. 112-114].

The best rule should always be somewhere in-between. It is important to provide for liability for the user's bypassing a database, including the payments in the housing and utility infrastructure system, as well as any technical, software and hardware protection tools for computer programs and databases designated by the author through executing specific contracts / agreements on the global security system for computer programs and databases. The research proposes a structural approach which would simplify the "classic" case of counterfeiting the use of programs and databases at the level of understanding of nuances and would reduce the basic technical imperfect understanding among judges and experts.

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