

**INFORMATION SYSTEM OF THE UNIVERSITY EDITORIAL-PUBLISHING
COMPLEX**

**SISTEMA DE INFORMAÇÃO DO COMPLEXO UNIVERSITÁRIO EDITORIAL E DE
PUBLICAÇÃO**

**SISTEMA DE INFORMACIÓN DEL COMPLEJO EDITORIAL-EDITORIAL
UNIVERSITARIO**

Maxim Sergeevich LOGACHEV¹
Viktoriya Viktorovna KOVALEVA²
Agamali Kulamovich MAMEDOV³
Eka Demurievna KORKIYA⁴
Alisa Valeryevna BAGAEVA⁵

ABSTRACT: This article presents the results of designing the structure of the data models necessary for the proper functioning of a database supporting the editorial, proofreading, printing, and publishing activities of an educational organization. The goal of the study is to create a coherent, objective, holistic, and non-redundant data set appropriate to the subject area to support the process of digital transformation of the publishing and publication sphere within an educational organization. The resulting data models reflect the logical structure of databases independent of the choice of a particular database management system. As part of the design, JavaScript Object Notation models and relational data models are developed to create a relational database. The results allow identifying and estimating the resources needed to implement each process, determining all participants affecting the implementation of the relevant processes, and defining the access to resources needed by certain participants in the process.

KEYWORDS: Design. Education. JavaScript object notation. Relational data model.

RESUMO: O artigo apresenta os resultados do desenho da estrutura dos modelos de dados necessários para o bom funcionamento de um banco de dados que suporta as atividades editoriais, de revisão, impressão e publicação de uma organização educacional. O objetivo do estudo é criar um conjunto de dados coerente, objetivo, holístico e não redundante adequado à área temática para apoiar o processo de transformação digital da esfera editorial e editorial dentro de uma organização educacional. Os modelos de dados

¹ Moscow Polytechnic University (MPU), Moscow – Russia. Associate Professor. ORCID: <https://orcid.org/0000-0002-0425-5014>. E-mail: logachevmaxim@gmail.com

² Moscow Polytechnic University (MPU), Moscow – Russia. Associate Professor. ORCID: <https://orcid.org/0000-0003-3896-5230>. E-mail: viktoriaaaa2006@yandex.ru

³ Lomonosov Moscow State University (LMSU), Moscow – Russia. Professor. ORCID: <https://orcid.org/0000-0002-2607-7546>. E-mail: akmnauka@yandex.ru

⁴ Lomonosov Moscow State University (LMSU), Moscow – Russia. Associate Professor. ORCID: <https://orcid.org/0000-0003-3136-8433>. E-mail: ekakorkiya@mail.ru

⁵ Lomonosov Moscow State University (LMSU), Moscow – Russia. Associate Professor. ORCID: <https://orcid.org/0000-0002-1708-9860>. E-mail: dagny35@gmail.com

resultantes refletem a estrutura lógica dos bancos de dados independentemente da escolha de um determinado sistema de gerenciamento de banco de dados. Como parte do design, os modelos JavaScript Object Notation e os modelos de dados relacionais são desenvolvidos para criar um banco de dados relacional. Os resultados permitem identificar e estimar os recursos necessários para implementar cada processo, determinar todos os participantes que afetam a implementação dos processos relevantes e definir o acesso aos recursos necessários para determinados participantes do processo.

PALAVRAS-CHAVE: Projeto. Educação. Notação de objeto Javascript. Modelo de dados relacional.

RESUMEN: *El artículo presenta los resultados del diseño de la estructura de los modelos de datos necesarios para el correcto funcionamiento de una base de datos que soporta las actividades de edición, revisión, impresión y publicación de una organización educativa. El objetivo del estudio es crear un conjunto de datos coherente, objetivo, holístico y no redundante apropiado para el área temática para apoyar el proceso de transformación digital de la esfera editorial y de publicación dentro de una organización educativa. Los modelos de datos resultantes reflejan la estructura lógica de las bases de datos independientemente de la elección de un sistema de gestión de bases de datos en particular. Como parte del diseño, se desarrollan modelos de notación de objetos de JavaScript y modelos de datos relacionales para crear una base de datos relacional. Los resultados permiten identificar y estimar los recursos necesarios para implementar cada proceso, determinar todos los participantes que afectan la implementación de los procesos relevantes y definir el acceso a los recursos que necesitan ciertos participantes en el proceso.*

PALABRAS CLAVE: Diseño. Educación. Notación de objetos JavaScript. Modelo de datos relacionales.

Introduction

At the present stage of social development, any educational organization is an important part of the book culture, as it embodies its main systemic elements (OSKIN; MAKAROV, 2017). Such elements include publishing activities carried out with the help of editorial and publishing departments and printing houses, distribution of publications, and their use in the educational process as printed or electronic resources (LOGACHEV, 2020).

The preparation, publication, and printing of educational, methodical, and scientific literature are complex and costly processes that require the participation of many profile specialists (BENMESSAOUD; BUZELIN, 2018; LOPEZ; ORTUNO, 2019). To organize these processes to obtain quality results, the development of an information system of the university editorial and publishing complex (UEPC) is required. Ensuring the smooth functioning of such an information system calls for the development of a database based on certain data models (CEVIK; DUMAN, 2018; KUCHMEZOV, 2019).

A data model is an interconnected structure of data, operations on them, and a set of rules for limiting the stored data (NESTEROV, 2016). The created models allow dividing the architecture of the information system into several levels: the application level and the database level (MIKHAILENKO; BAGMET, 2016; ZAINUDDIN *et al.*, 2020). Each level has its own tasks that are not contradictory to one another and differentiate access to resources and methods of individual process implementation to provide for client-server interaction (SRIPAN; SUJIVORAKUL, 2020; SUCHKOV; PUCHKOV; BRITVINA, 2020).

The conducted research is of **theoretical significance** as it allows to define and describe the objects and subjects of editorial and publishing activities of an educational organization, as well as to establish relationships between them. The obtained results are presented in the form of graphic models, which correspond to the generally accepted design methodologies while creating a theoretical basis for other research in this subject area.

The practical significance of the study lies in the unification of data involved in the processes of editorial, proofreading, printing, and publishing activities of an educational organization, the systematization of experience in this subject area, and the provision of input data to information systems and other software products that ensure the quality distribution of the workload across specialists to reduce the labor costs and other resources required to implement the processes without compromising the quality of the final result.

Methods

Data is an integral part of the information system. Their transformation at each stage of the information system's functioning allows for the organization of interaction of all objects and subjects of the problem domain (KUCHMEZOV, 2016). Modeling such processes requires the construction of several interrelated data models to show the features of the transformation of the relevant data (LOGACHEV *et al.*, 2020; ZLATKOVSKAIA, 2020).

The creation of the models involves the use of **structural-functional modeling methods** allowing to highlight the key objects and links between them with the subsequent construction of models corresponding to the graphical notations of generally accepted software and information systems design methodologies (CHERVIKOV, 2020).

The structural and functional modeling of data models for the editorial and publishing complex is carried out using **the “bottom-up” design method** to obtain a relational data model (PANCHENKO; TIMOFEEVA, 2019). The use of this method makes it possible to isolate objects and subjects involved in the relevant processes from the subject domain, define

their properties, establish relationships between them, and form relationships. To avoid data redundancy and anomalies when working with data (adding, deleting, and updating), **normalization methods** are used to bring the model to its normal forms. Normalization methods made it possible to obtain atomic values for each tuple value of any domain, to establish unambiguous dependence of the key domains on the non-key domains, and to avoid transitive dependencies (dependence of non-key domains on other non-key domains) within each relationship. The visualization of the data model is carried out using **Crow's Foot notation**⁶ allowing to demonstrate the cardinality and ordinality of instances of each relation (ETHIER; LEFRANCOIS, 2020). The resulting data model becomes the basis for the implementation of the data schema using the means of a specific Database Management System (KOSINOVA, 2020).

JavaScript Object Notation (JSON) Schema methods are used to provide serialization of complex data structures for individual EPC processes and data exchange between them. Working with JSON data formats makes it possible to use any programming language to implement the information system and accurately and concisely describe the properties of the required data (STRUZHKIN; GODIN, 2016).

Results

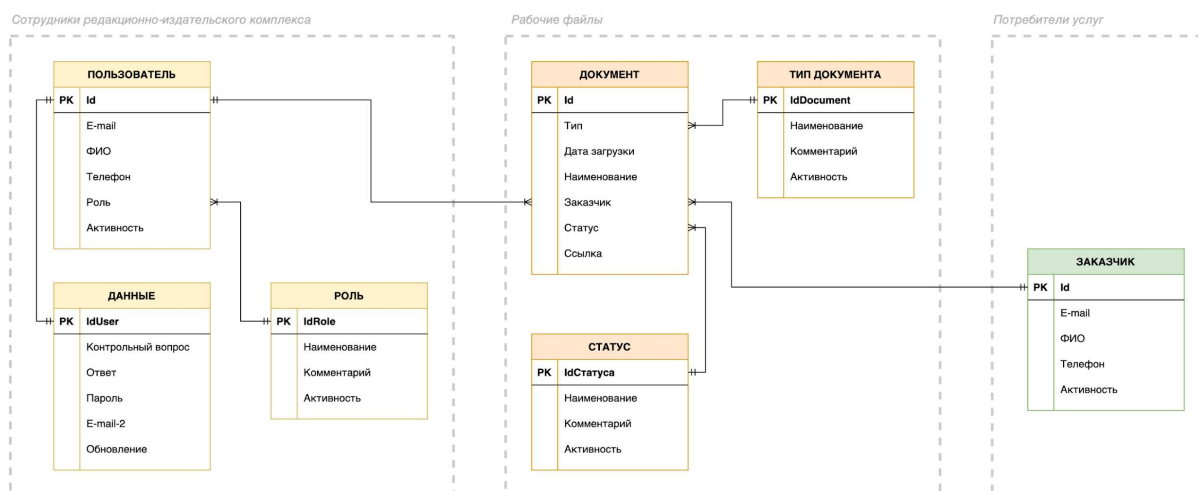
The main functionalities of the UEPC information system are:

1. Reception of materials from authors and follow-up work with them for further printing and publication (textbooks, methodological recommendations, scientific journals, conference proceedings, etc.).
2. Organization of the process of blind review of the received materials by independent specialists.
3. Organization of the interaction and control of UEPC specialists between each other during all stages of the editorial and publishing process.
4. Organization of the interaction between UEPC specialists and the author (or a team of authors) during all stages of the editorial-publishing process.
5. Import of published materials into profile information systems.
6. Printing orders without editing and proofreading (e.g., bachelor's theses, master's theses, etc.).

⁶ The crow's foot notation was invented by Gordon Everest, who originally used the term "inverted arrow" but now just calls it a "fork". For cardinality, a fork or crow's foot intuitively indicates "many", by its many "toes".

Based on this, a data model (Figure 1) was developed for the database supporting the UEPC information system.

Figure 1 – The data model for the UEPC information system database



Source: Prepared by the authors

For easier perception and further organization of interaction with the software modules of the UEPC information system, the entities of the presented data model are grouped into the following categories:

1. **Entities related to UEPC employees.** The data stored in the corresponding entities provide the authorization of each UEPC employee in the information system, setting up distributed access to the resources and functionality of the information system. Users of the information system (the “ROLE” entity) include the editor-in-chief, editors, proofreaders, reviewers, typesetters, and print specialists. The data required for authorization (the “DATA” entity) is stored in an encrypted form to ensure its safety from unauthorized access and other actions of intruders (SUCHKOV; PUCHKOV; BRITVINA, 2020).

2. **Entities associated with work files.** Work files include (instances of the entity “DOCUMENT TYPE”):

- Documents uploaded by authors for pre-publication preparation;
- Print files that do not require proofreading or editing;
- Contracts for the provision of editorial and publishing activities and the distribution of published materials;
- Contracts for printing the uploaded documents;
- File templates necessary to support editorial and publishing activities;
- Metadata files for configuring print parameters.

The “DOCUMENT” entity contains links to the corresponding files. This reduces the load on the database and makes it quickly and conveniently scalable. The files themselves are uploaded and stored in the cloud (KUCHMEZOV, 2016).

When a file is changed or the corresponding process for it is completed, its status changes (*the “STATUS” entity*) in accordance with the document type.

Documents are sent to the archive as needed and are deleted when storage limits are reached. This feature is enabled by the options to delete the corresponding records from the database using triggers and to delete files from the cloud via methods at the software level (KUCHMEZOV, 2019).

3. The “Service consumers” group only includes *the “CLIENT” entity*. It allows storing data about the UEPC service customers. Clients in this case include:

- The authors who send manuscripts for editing or proofreading and subsequent publication;
- The authors who publish materials in their own edition;
- The people wishing to print any material without editorial or proofreading work.

Each such user is authorized in a simplified form with their email or phone number. When the authorization method is selected, the user receives a message with a one-time randomly generated password.

A separate data model implemented in the JSON format is used to provide for the editorial and publishing processes. Its structure is as follows:

Table 1 – Data model

```

{
  "idTask": {"type": "string"},
  "taskStatus": {"array": ["in progress", "completed", "suspended"]},
  "subtask":
  {
    "idSubtask": {"type": "string"},
    "document": {"type": "object"},
    "subtaskStatus": {"array": ["in progress", "completed", "suspended"]},
    "date":
    {
      "start": {"type": "string"},
      "end": {"type": "string"},
      "norm": {"type": "string"}
    },
    "charged":
    {
      "id": {"type": "string"},
      "accepted": {"type": "boolean"},
    },
    "note":
    {
      "date": {"type": "string"},
      "controler": {"type": "string"},
      "comment": {"type": "object"},
      "status": {"array": ["in progress", "rejected", "renewed", "suspended", "archive", "withdrawn"]}
    }
  }
}

```

Source: Prepared by the authors

Each task corresponds to a document uploaded for editorial and publishing work. The content of each subtask of the corresponding task is defined according to the type of document. Each subtask is assigned to a specific employee responsible for controlling its execution and current status, deadlines for the completion of the subtask are identified for them.

The following JSON data model is used to ensure quick work of the information system with the materials being prepared for publication:

Table 2 – Data model

```
{
  "idDocument": {"type": "string"},
  "file": {"type": "object"},
  "date":
  {
    "received": {"type": "string"},
    "reviewed": {"type": "string"},
    "published": {"type": "string"}
  },
  "publicationType": {"array": ["open", "paid", "metadata"]},
  "ContentsRu":
  {
    "titleRu": {"type": "string"},
    "authorsRu": {"type": "string"},
    "summaryRu": {"type": "string"},
    "keywordsRu": {"type": "string"},
    "bodyRu": {"type": "string"},
    "referencesRu": {"type": "string"}
  },
  "ContentsEng":
  {
    "titleEng": {"type": "string"},
    "authorsEng": {"type": "string"},
    "summaryEng": {"type": "string"},
    "keywordsEng": {"type": "string"},
    "bodyEng": {"type": "string"},
    "referencesEng": {"type": "string"}
  }
}
```

Source: Prepared by the authors

The developed data model for the publication content allows using its parts at different stages of the editorial and publishing process and ensures quick integration with search systems and the systems organizing the processes of control and quality of educational, methodological, and scientific activities of the university.

Discussion

Since the declared research methods were applied correctly in the course of the study, the obtained results are reliable and reproducible in the development of data models for any educational organization implementing a UEPC information system.

The developed data models do not violate the generally accepted mechanisms of interaction of specialists of the educational organization in the field of publication and scientific and methodological activities, as well as their control and quality (ETHIER; LEFRANCOIS, 2020). The presented data models allow to fully implement the processes of correction and editorial interaction and the processes of organizing scientific-publication activity in an educational organization with the use of an information system (BENMESSAOUD; BUZELIN, 2018; ZINTSOV; 2017).

The created data models distribute the load between the objects of the information system. Thus, part of the processes of organizing work with the data is carried out at the software level (by the client application or application server), as well as by the database server. This approach provides distributed load on information system objects and full implementation of client-server interaction (KARPOVA, 2017; PANCHENKO; TIMOFEEVA, 2019).

The structure of data models allows consolidating the ecosystems of any educational organizations or publishing centers with the existing data models using the UEPC information system. This approach provides remote centralized interaction of UEPC specialists with authors or other clients in need of printing services. At present, such organizations do not use unified UEPC systems, instead, these systems function separately and are not integrated into the overall ecosystem of the organization (KOSINOVA, 2020; LOPEZ; ORTUNO, 2019).

An indisputable advantage of the developed models for the UEPC information system is the ordering, openness, and accessibility of processes of the interaction of different specialists when working with orders, authors, or their colleagues. In addition, the presented models are normalized, which simplifies sampling processes in the operation of the UEPC information system, ensures data integrity, simplifies the potential processes of scaling the system or database, and prevents data redundancy and uncoordinated dependencies (SZLACHTA, 2019; VARGOLA, 2017).

Conclusion

Using methods of structural and functional modeling of the subject area allows obtaining accurate data models for the functioning of the information system. In each data model, all key entities and their attributes are highlighted, relationships between entities are demonstrated and characterized, and their multiplicities are defined. All this allows for the formation of queries of varying complexity to quickly obtain information on any entity instance or group of instances.

Data models are “flexible” and easily customizable depending on the customer’s requirements or any external changes. Such changes may include the transformation, addition, or removal of objects or entities involved in the organization and maintenance of editorial and publishing processes (e.g., expanding the editor’s responsibilities, adding a new status to a task, reducing the amount of metadata in a publication, etc.).

The acquired results go in line with the methodologies of modeling, allowing to obtain precise instructions for the specialists creating the information system at the database development stage. At the same time, the integrity of the database is ensured through the possibility of using triggers or saved procedures for the simplest application procedures (e.g., deleting archived data or long inactive users, etc.), while complex methods are executed directly on the client’s side in the corresponding application program or a separate server depending on the functions performed by users. In addition, using JSON files as data storage reduces the amount of memory used (e.g., compared to XML), enables fast parsing through the use of simple syntactic constructs, and provides quick and complete data migration to another information system ecosystem.

An information system using the developed data model allows supplementing the archive of the university’s electronic educational resources with new materials, grants quick access to them to any specialist or student, and allows customizing the quick printing of any number of copies of a document.

REFERENCES

BENMESSAOUD, S.; BUZELIN, H. **Publishing houses and translation projects**. London: Routledge, 2018.

CEVIK, H.; DUMAN, T. Analyzing the effects of E-Learning on science education. **International Journal of Instruction**, v. 11, n. 1, p. 345–362, 2018. Available in: <https://files.eric.ed.gov/fulltext/EJ1165196.pdf>. Access in: 05 Feb. 2021.

CHERVIAKOV, A. S. **Zashchita personalnykh dannykh v bazakh dannykh i kompiuternykh programmakh** [Protection of personal data in databases and computer programs]. Moscow: Institute of Scientific Information on Social Sciences of the Russian Academy of Sciences, 2020.

ETHIER, M. A.; LEFRANCOIS, D. Review of editorial activities. **Revue des sciences de l'éducation**, v. 1, n. 46, p. 1–2, 2020. Available in: <https://www.erudit.org/fr/revues/rse/2020-v46-n1-rse05421/1070724ar/>. Access in: 14 Mar. 2021.

KARPOVA, I. P. **Proektirovanie relatsionnoi bazy dannykh**: Metodicheskie ukazaniia k domashnemu zadaniiu po kursu “Bazy dannykh” [Designing a relational database: Instructions for homework on the course "Databases"]. Moscow, 2017.

KOSINOVA, N. A. Puti sovershenstvovaniia sistemy dokumentooborota v redaktsionno-izdatelskom tsentre VUZa [Ways to improve the document management system in the editorial and publishing center of a university]. **Forum molodykh uchenykh** [Forum of Young Scientists], v. 1, n. 41, p. 349–352, jan. 2020. Available in: <https://www.forum-nauka.ru/arhiv-nomerov>. Access in: 19 Dec. 2021.

KUCHMEZOV, KH. KH. Nekotorye osobennosti primeneniia oblachnykh tekhnologii [Some peculiarities of using cloud technologies]. **Aktualnye napravleniia nauchnykh issledovani: Ot teorii k praktike** [Current research areas: from theory to practice], v. 4-1, n. 10, p. 235–236, 2016. Available in: <https://www.elibrary.ru/item.asp?id=28092480>. Access in: 10 Oct. 2020.

KUCHMEZOV, KH. KH. **Oblachnye tekhnologii v vysshem obrazovanii** [Cloud technologies in higher education]. Moscow: 1C-Publishing, 2019.

LOGACHEV, M. S. **Informatsionnye sistemy i programmirovaniie**. Spetsialist po informatsionnym sistemam. Vypusknaiia kvalifikatsionnaya rabota: Uchebnik [Information systems and programming. Specialist in information systems. Graduate qualification work: textbook]. Moscow: Infra-M, 2020.

LOGACHEV, M. S.; *et al.* Problem of quality of educational programs: Automated assessment method. **Revista Inclusiones**, v. 7, n. esp., p. 312–321, 2020. Available: <https://revistainclusiones.org/pdf13/26%20VOL%207%20NUM%20ESPECIALJULIOSEPTIEMBREEE2020ZZ.pdf>. Access in: 18 May 2021.

LOPEZ, A. G.; ORTUNO P. A. H. Communication strategies of literary publishing houses in Spain. **Investigacion bibliotecologica**, v. 33, n. 80, p. 57–71, 2019. Available in: <http://www.scielo.org.mx/pdf/ib/v33n80/2448-8321-ib-33-80-57.pdf>. Acceso in: 23 Mar. 2020

MIKHAILENKO, T. D.; BAGMET, N. P. Organizatsiia nauchno-izdatelskoi deiatelnosti v otraslevom vysshem uchebnom zavedenii [Organization of scientific-publishing activity in an industry-specific higher education institution]. **The Russian Customs Academy Messenger**, v. 4, p. 136–143, 2016. Available in: <https://www.elibrary.ru/item.asp?id=27469688>. Access in: 15 Nov. 2020.

NESTEROV, S. **Bazy dannyh**: Uchebnik i praktikum [Databases: Textbook and workbook]. Moscow: Iurait, 2016.

OSKIN, D. A.; MAKAROV, A. A. **Bazy dannykh v avtomatizirovannykh sistemakh**. [Databases in automated systems]. Moscow: Moscow State University of Design and Technology, 2017.

PANCHENKO, A. M.; TIMOFEEVA, I. U. V. **Izdatelskaia deiatelnost Novosibirskogo gosudarstvennogo universiteta v 2006–2010 gg.** (na osnove materialov k otchetam rektora NGU) [Publishing activity of the Novosibirsk State University in 2006-2010 (based on the materials for the reports of the NSU Rector)]. Novosibirsk: The State Public Scientific Technological Library of the Siberial Branch of the Russian Academy of Sciences, 2019.

SRIPAN, T.; SUJIVORAKUL, C. Variables that Influence the Intention to Persist in Vocational Education. **International Journal of Instruction**, v. 13, n. 2, p. 17–32, 2020. Available: <https://files.eric.ed.gov/fulltext/EJ1249050.pdf>. Acceso in: 16 Nov. 2020.

STRUZHKIN, N. P.; GODIN, V. V. **Bazy dannykh**: Proektirovanie: Uchebnik [Databases: design: textbook]. Moscow: Iurait, 2016.

SUCHKOV, I. A. S.; PUCHKOV, P. V.; BRITVINA, V. V. Izuchenie modelei razrabotki prilozhenii v oblasti Web-tekhologii [The study of application development models in the field of Web-technologies]. **Teoriia i praktika proektnogo obrazovaniia** [Theory and practice of project education], v. 3, n. 15, p. 38–43, 2020. Available in: <https://www.elibrary.ru/item.asp?id=45756068>. Access in: 15 Mar. 2021.

SZLACHTA, A. The Role of Student Editorial Practice in Journalism Degree Programs. **E-Mentor**, v. 5, n. 5, p. 28–33, 2019. Available: <https://www.cceol.com/search/article-detail?id=841289>. Access in: 12 Jan. 2021.

VARGOLA, M. Research and publishing activities of the museology and cultural heritage section at the Comenius University in Bratislava. **Muzeologia a Kulturne Dedicstvo- Museology and Cultural Heritage**, v. 2, n. 5, p. 183–189, 2017. Available in: https://www.researchgate.net/publication/322114408_Research_and_publishing_activities_of_the_museology_and_cultural_heritage_section_at_the_Comenius_University_in_Bratislava. Access in: 11 Mar. 2021.

ZAINUDDIN, S. *et al.* The Correlation of Scientific Knowledge-Science Process Skills and Scientific Creativity in Creative Responsibility Based Learning. **International Journal of Instruction**, v. 13, n. 3, p. 307–316, 2020. Available: <https://files.eric.ed.gov/fulltext/EJ1259513.pdf>. Access in: 12 July 2021.

ZINTSOV, K. S. Napravleniia povysheniia effektivnosti izdatelskoi deiatelnosti vuza [Directions of increasing the efficiency of the publishing activity of a university]. **Bulletin of the Plekhanov Russian University of Economics**, v. 2, n. 92, p. 110–116, 2017. Available in: <https://vest.rea.ru/jour/article/view/276>. Access in: 19 Mar. 2021.

ZLATKOVSKAIA, E. M. Elektronnyi dokumentooborot v obrazovatelnoi organizatsii: strukturnyi analiz [Electronic document management in an educational organization: structural analysis]. **Teoriia i praktika proektnogo obrazovaniia** [Theory and practice of

project education], v. 3, n. 15, p. 58–64, 2020. Available in:
<https://journal.jest.su/tpo/article/view/447>. Access in: 17 Mar. 2021.

How to reference this article

LOGACHEV, M. S.; KOVALEVA, V. V.; MAMEDOV, A. K.; KORKIYA, E. D.; BAGAEVA, A. V. Information system of the university editorial-publishing complex. **Rev. EntreLinguas**, Araraquara, v. 8, n. esp. 1, e022013, Mar. 2022. e-ISSN: 2447-3529. DOI: <https://doi.org/10.29051/el.v8iesp.1.16924>

Submitted: 11/11/2021

Required revisions: 19/12/2021

Approved: 06/02/2022

Published: 30/03/2022