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RATING SYSTEMS FOR SCIENTOMETRIC INDICES OF UNIVERSITIES: KEY ASPECTS, DEVELOPMENT, IMPLEMENTATION

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Our time is characterized by the phenomenal acceleration of knowledge accumulation and the complication of its structure. Today information technologies are one of main ways to arrange and create effective tools for organizing the interaction and processing large amount of information. Nowadays academic institutions need to rely on special research, analysis of accumulated achievements and, on this basis, to develop forecasts, identify trends and prospects for the development of a scientific or other industry, and evaluate its potential. Today many information systems attempt to create methods and technologies of processing and saving information on the activities of scientists.

The article provides a brief overview of rating systems for scientometric indices of universities. In our opinion, information of university's scientific activity should be presented in the rating form, which gives an opportunity to analyze development in different directions and changes. The key idea of the article is presenting of our experience in developing system of automatic construction of ratings of scientific organizations based on their scientometric indicators in Scopus, Google Scholar and Web of Science.

The main task of the system is automatic construction of consolidated rating of scientists, research groups, and organizations according to indicators of processed scientometric systems (Scopus, Google Scholar and Web of Science). These indicators are h-index, citations (numbers of total citations of documents that are indexed by the system), total number of scientist's publications.

The philosophy of the system is providing open data of different scientometric systems, and possibility to deploy our system in other organizations and customize it for individual goals and tasks.

Keywords*: scientific activity, information systems, scientometric systems, bibliometric systems, scientometric indicators, automatic ratings.*

1. INTRODUCTION

Our time is characterized by the phenomenal acceleration of knowledge accumulation and the complication of its structure. According to Dell-EMC [9], the amount of produced data is growing more than twice every two years. Based on IDC (International Data Corporation) report prediction, the global data volume will grow exponentially to 44 trillion gigabytes by 2020. This tendency is inherent to all areas of human life. The same problem of storage of information exists in scientometric systems.

Human consciousness is objectively incompetent in processing and storing of large volume of complex accurate data. Today information technologies are one of main ways to arrange and create effective tools for organizing the interaction and processing large amount of information. In our opinion, nowadays in Ukraine the archaic methods of collection, processing and presentation of information and scientific activity are adopted.

Nowadays academic institutions need to rely on special research, analysis of accumulated achievements and, on this basis, to develop forecasts, identify trends and prospects for the development of a scientific or other industry, and evaluate its potential.

Today many information systems attempt to create methods and technologies of processing and saving information on the activities of scientists. In our opinion, presentation of information on the university's scientific activity should be in the rating form. The rating accumulates several aspects and provides an opportunity to analyze development in different directions and its changes.

It is important to note that rating is subjective concept, and based on the principles of rating, it is possible to model the development of scientific activity at the university according to its goals, and for the same purpose the influence of a certain element of the rating can be changed at any time.

The evaluation of the effectiveness of scientists as a process of obtaining the necessary information about the scientific potential of the organization is fairly considered the most important component of science management. An assessment as a process represents a system with a complex structure that allows it to perform a regulatory function relative to the activities of evaluated research staff.

Our system allows automating the processing of information and its presentation, so we get more accurate result much faster. It is important that result can be obtained at any moment, and it allows us to get a dynamic picture, helps to make decisions related to the scientific activity.

The availability of information system that would collects, processes and presents the scientific indicators of organizations is the actual. Therefore, the aim of our work is to present our experience in developing system of automatic construction of ratings of scientific organizations based on their scientometric indicators.

In the article we consider the existing information systems for the processing of scientific activities (2), describe the key components of our system and basic principles of its work (3), as well as the basic methods and technologies (4) used for its implementation.

2. RELATED WORKS

During the scientific activity we faced the problem, the absence of a clear mechanism of evaluation of personal contribution in the work of the University, and incomprehension of the construction of university decisions related to scientometric. In addition, for the analysis of the scientific indicators of scientists' group, or a specific organization, it should be carried out manually. The only option of its partial automation is rating the organization's profile in Google Scholar. These reasons motivated us to implement the system of automatic rating construction, its basic principles were described in the previous article [6].

As mentioned in our previous article [1], we realized system's interaction with Web of Science, as the second in authority international database.

We build a consolidated rating of scientists' activity based on data from such scientometric systems as Scopus, Google Scholar, Web of Science, ORCID, Tutor Network. Evaluation of teaching activity is realized in the form of a service KSU Feedback.

1. Scopus

Scopus is the largest abstract and citation database of peer-reviewed literature, which indexes more than 7 000 items of scientific, technical and medical journals and about 4,000 international publishers [2].

Scopus enables researchers to combine their articles under a single profile [3].

Our system gets the following attributes from Scopus:

1. author's name;
2. number of publications;
3. scientometric indicators:
   3.1.Hirsch index,
   3.2.citation index;
4. links to the publications;
5. publication description.

2. Google Scholar

Google Scholar is freely accessible search system, which indexed the full text of the scientific publications of all formats and disciplines.

Google Scholar executes not only informational, but scientometric function. From the list of results on a hyperlink Search Cited by we can obtain the information how many and what documents are linked on the publication in data base Google Scholar.

The number in Cited by reflects the degree of authoritativeness and publicity of publication [3, 4].

Our system gets the following attributes from Google Scholar:

1. scientometric indicators:
   1.1. Hirsch index,
   1.2. citation index;
2. articles in Google Scholar.

3. WEB OF SCIENCE

Web of Science is an International established data base of Scientific Citation, and a search platform that combines abstract databases of publications in scientific journals and patents, including databases of the mutual citation of publications. Web of Science gives possibility to search among 12 000 magazines and 148 000 materials of conferences in the field of natural, social, human sciences and arts, which allows to obtain the most relevant information for your questions. It is the most extensive database of abstracts. It is available by subscription [3, 4].

Our system gets the following attributes from Web of Science:

1. author’s name,
2. number of publications.

4. ORCID

ORCID (Open Researcher and Contributor ID) is a nonproprietary alphanumeric code to uniquely identify scientific and other academic authors and contributors [15]. This addresses the problem that a particular author's contributions to the scientific literature or publications in the humanities can be hard to recognize as most personal names are not unique, they can change (such as with marriage), have cultural differences in name order, contain inconsistent use of first-name abbreviations and employ different writing systems.

The ORCID offers an open and independent registry intended to be the de facto standard for contributor identification in research and academic publishing [15].

In our system ORCID id is used for unique scientist identification in different scientific databases and systems.

5. TUTOR NETWORK

Tutor Network is a web service, developed in Kherson State University. It was developed using such technologies, as ASP.NET MVC, C#, ADO.NET Entity Framework, JavaScript Framework − JQuery, AJAX and Microsoft SQL Server.

This service provides an opportunity to take into account all types of scientific works and publications, which can not be considered by other systems.

A distinctive feature of this system is displaying information about such scientific works as manuals, monographs etc.

Technical details will be considered in a subsequent article.

6. KSU FEEDBACK

KSU Feedback service was developed to provide adequate means for building circuit of feedback. It is the system for gathering and analyzing data taken from interview of anonymous respondents. One of the main goal here is to reach full anonymity of requested groups, and distinctly determine these target groups.

This service is web-based and has a multi-tier architecture consisting of complex presentation tier, data processing and security tiers. Besides, it has useful means for tracking the process of voting and mechanism for storing the data in arbitrary structure.

Survey is carried out as follows: students give answers to questions such as "How intensely teacher uses information technology in the classroom?" or "How is the teacher providing the material in the classroom?". Students can answer each question by rating points on a scale from 1 to 10, where 10 is the maximum score.

Results of survey we get through the API.

Full description and technical details about this service you can find in the article [14].

Based on scientometric analysis of the systems described in section 2, we decided to implement the interaction of our system with such widely used scientometric systems as:

- Google Scholar, as the most commonly used bibliographic database and it is easy in using;
- Scopus, as the largest and the most authoritative abstract database.
- Web of Science, as the second in authority international database.

The research team of Kherson State University (KSU), included the authors of the article, took part in a number of international and national projects whose aim was the development and implementation of scientific and management processes of analytical information systems and services. These projects were - Tempus TACIS CP No 20069-1998 "Information Infra-structure of Higher Education Institutions"; Tempus TACIS MP JEP 23010-2002 "UniT-Net: Information Technologies in the University Management Network"; US Department of State Freedom Grant SECAAS-03-GR-214 (DD) "Nothern New York and Southern Ukraine: New Partnership of University for Business and Economics Development", etc.

During the scientific activity we faced with such problem, as the absence of a clear mechanism of evaluation of personal contribution in the work of the University, and incomprehension of the construction of university decisions related to scientometric. In addition, for the analysis of the scientific indicators of scientists' group, or a specific organization, it should be carried out manually. The only option of its partial automation is rating the organization's profile in Google Scholar. These reasons motivated us to implement the system of automatic rating construction, its basic principles were described in the previous article [6].

On the next step we consider the system architecture.

7. STRUCTURE OF THE SYSTEM

The high-level system architecture is shown in Fig.1.

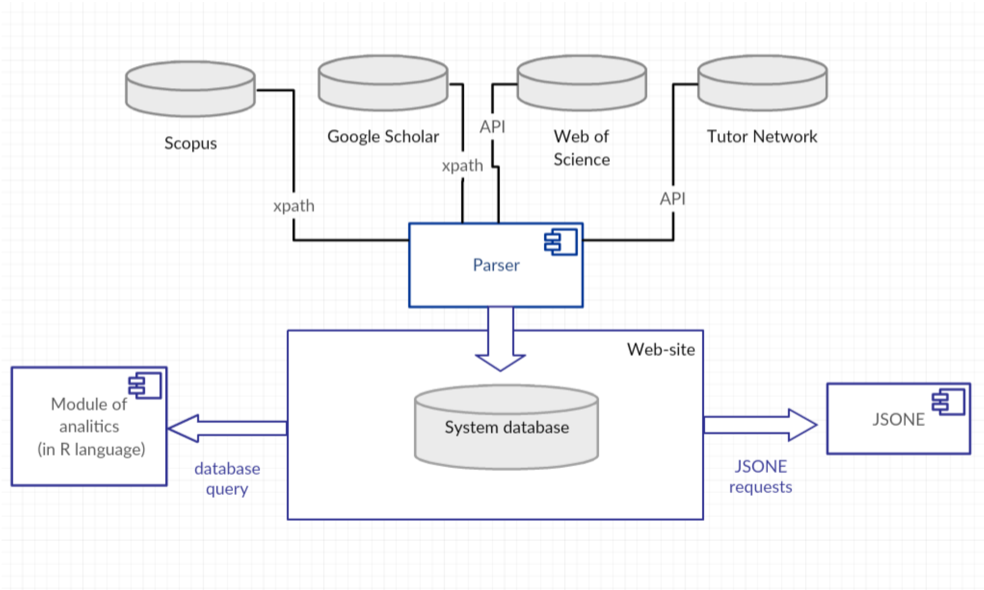


Fig.1. The interaction of key system components.

Parser is search, receiving and transfer the open information of scientometric indicators of authors and journals provided by Scopus and Google Scholar.

Parser is made by using xpath queries and regular expressions. Each xpath query turns to the page of resource. We developed multiple-stream parser; each its stream initializes the parsing of particular resource.

For interaction with Scopus and Google Scholar parser uses xpath queries, and API is used for getting information from Web of Science and Tutor Network.

All data received by parser is stored in the system database. DB of system is distributed by the data storage. Individual entities of DB are database of scientometric indicators of researcher and scientific publications.

Information processing is realized by performing a set of predefined SQL queries.

System description

The main task of the system is automatic construction of consolidated rating of scientists, research groups, organizations according to indicators of processed scientometric systems. These indicators are:

1. h-index (Scopus & Google Scholar). The h-index is based on the highest number of papers included that have had at least the same number of citations;
2. citations (Scopus& Google Scholar). Numbers of total citations of documents that are indexed by the system;
3. publications (Scopus, Web of Science). Total number of documents that are indexed by the system.

Thus, the main task of the new version was the realization of an automatic construction of consolidated rating, which allows building a rating for any scientists, research groups, organizations.

We determined types of presentation of the results for scientists:

- profiles of the scientists of the university with generalized information of scientometric indicators for each database;
- the rating list of all the scientists of organization;
- the rating list of all the scientists of organization’s structural subdivision (faculty or department);
- the general scientometric information about the university.

The system allows to search a scientist by:

– ORCID id;
– Scopus ID;
– Google Scholar ID;
– full name of a scientist.

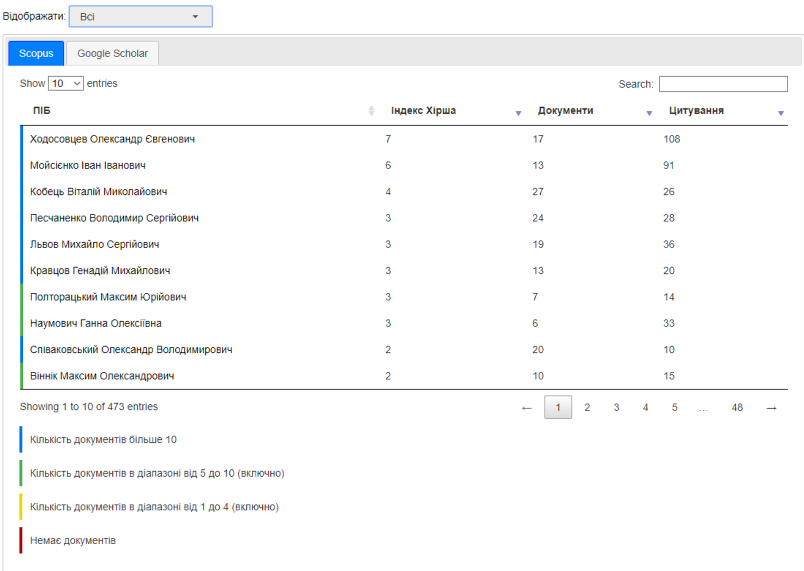
In response to a search query, the system will return the list of references to scholars, information about which is in the database, or the message that nothing is found. After clicking on the link, the personal profile of scientist with generalized information of scientometric indicators for each database will open.

On the tab **“Rating of Faculties”** we get the list of faculties and the highest H-index on the faculty. There is an option to select the number of list items that will be displayed on the page. You can also sort the list of faculties by increasing or decreasing in alphabetical order or by the value of the H-index. Depending on the selected tab you can view information from Scopus or Google Scholar. Information on the tab **"Rating of Departments"** is displayed similarly.

On the tab **"Rating of Scientists"** we see the list of all scientists of the university, sorted in descending order of such scientific metric indicators as the h-index, the number of documents in the chosen scientometric database, and the number of citations.

Based on the number of scientist’s papers (publications) in scientometric system, we offered to divide scientists into 4 categories and we defined an equivalent color for each of them (Fig. 2):

- *blue* — the number of documents is over 10;
- *green* — the number of documents is in the range of 5 to 10 (inclusive);
- *yellow* — the number of documents is in the range from 1 to 4 (inclusive);
- *red* — no documents.



ПІБ	Індекс Хірша	Документи	Цитування
Ходосовцев Олександр Євгенович	7	17	108
Мойсієнко Іван Іванович	6	13	91
Кобець Віталій Миколайович	4	27	26
Песчаненко Володимир Сергійович	3	24	28
Львов Михайло Сергійович	3	19	36
Кравцов Генадій Михайлович	3	13	20
Полторацький Максим Юрійович	3	7	14
Наумович Ганна Олексіївна	3	6	33
Співаковський Олександр Володимирович	2	20	10
Віннік Максим Олександрович	2	10	15

Fig. 2. The tab "Rating of Scientists".

The current version of the system allows you to select the category of scientists for which the rating should be displayed. A list of categories includes:

- a postgraduate student,
- a lecturer,
- a doctoral student,
- a professor,
- a student.

On the **Personal page of the scientist** the following information is available:

- general information about author (full name, name of the institution, faculty and department);

- generalized information of author's scientometric indicators for Scopus, Google Scholar and Web of Science (for each separately);
- scientist's ORCID ID;
- the list of scientist's articles.

It should be noted, that in the current version of the system the list of author's publications is presented as a table and in front of each article there is a mark that indicates in which of the scientometric systems (Scopus, Google Scholar, Web of Science) it is. Note that if the article is available in several scientometric systems (for example, in Scopus and Google Scholar) at the same time, then there will be several marks (Table 1).

Table №1.

The example of list of author's publications

№	Title	Scopus	Google Scholar	Web of Science
1.	An Analysis of The Readiness of IT Specialties Students to Use Information Technology in the Educational Process			+
2.	Auditing services in evaluation of companies' information systems and technologies efficiency	+	+	
3.	Decision making in information technologies governance of companies	+	+	+
4.	Design and development of information system of scientific activity indicators	+	+	+
5.	Development of rating systems for scientometric indices of universities	+	+	
6.	ICT advanced training of teachers of university			+
7.	ICT advanced training of university teachers	+	+	
8.	Information competence of university students in Ukraine: Development status and prospects	+	+	+
9.	Monitoring of efficiency of feedback systems use on the base of Kherson State University	+	+	+
10.	Specific features of educational software promotion at Ukrainian market	+	+	+

In current version of the system we used a semantic network for representing of relations between authors.

Semantic networks are knowledge representation schemes involving nodes and links (arcs or arrows) between nodes. The nodes represent objects or concepts and the links represent relations between nodes. The links are directed and labeled; thus, a semantic network is a directed graph [10].

In our system, the nodes are the authors, and the links between them means their scientific publication(s), written in co-authorship.

For example, link to Petukhova L. means article "Tree – Subjective didactic model", link to Maksym Vinnik means article "Design and development of IS of SAC", links to Heinrich Mayr and Sotiris Batsakis represents preface of Conference ICTERI.

Fig. 3. Diagram of scientist's co-authors.

The productivity factor plays an important role in modeling of the dynamics of person's scientific activity. It means that we must take into account not only the quantitative indicators of the author (the total number of author's publications, scientometric indices such as h-index, citation index), but also the dynamics of their quantitative growth.

Serious empirical studies of the age-old aspects of creative productivity have allowed the introduction of so-called "curves of age-old productivity", which have an impact on the age rotation of the research staff of the research organization. To describe this process, we use a mathematical model, which is basically similar to one of the models of the dynamics of the age structure of the population. The main principles of this model were described in [11, 17]. In order to provide the maximum possible total productivity of scientific personnel in a given time interval, the problem of optimal control is formulated, which uses the age indicator of the productivity of a scientist to construct a criterion for a given problem [11].

Consequently, the model presented below can be used effectively to study the relationship between age, mobility, and related processes of human potential growth in a system of scientific fields.

Consider the scientific staff of the research organization, whose age structure varies in connection with the aging of people, their exit from the organization and the adoption of new members.

Age and time are denoted by continuous variables a and t.

Suppose [11]:

- $n(a,t)$ – the density of the number of scientific workers who have age a at the time t;
- $w(a,t)$ – age-old intensity of scientific workers out of a scientific society;
- $v(t)$ – intensity of the input stream of new members at the time t;
- $r(a,t)$ – distribution density of the incoming age stream;
- a_0 – minimum age,
- A – maximum age for members of the organization.

Suppose $w(a,t) = w_1(a,t) + w_2(a,t)$, where:

- $w_1(a,t)$ – the age of the exit through the termination of publishing activities, dismissal etc.,

- $w_2(a,t)$ – the age-old intensity of the regulated exit of the members of the organization.

Assume further that the input stream is formed from the flow that takes into account the output, and from the increase in the flow with intensity $M(t) \geq 0$, that is

$$v(t) = \int_{a_0}^{A} [w_1(a,t) + w_2(a,t)] n(a,t) da + M(t)$$

.

Now consider the equation of balance to change the number of scientists over a period of time $(t, t + \Delta t)$, to get the basic equation of frame dynamics relative to the function $n(a,t)$:

$$n(a + \Delta a, t + \Delta t)\Delta a = n(a,t)\Delta a - w(a,t)n(a,t)\Delta t \Delta a + r(a,t)v(t)\Delta t \Delta a$$

After dividing by Δa, $n(a + \Delta a, t + \Delta t)$ expands on the basis of the Taylor theorem for two independent variables, and taking $n(a,t)$ from both parts, we have:

$$\frac{\partial n(a,t)}{\partial a}\Delta a + \frac{\partial n(a,t)}{\partial t}\Delta t = -w(a,t)n(a,t)\Delta t + r(a,t)v(t)\Delta t$$

Dividing into Δa, equal Δt, we get:

$$\left(\frac{\partial}{\partial a} + \frac{\partial}{\partial t}\right) n(a,t) = -[w_1(a,t) + w_2(a,t)] n(a,t) + r(a,t)v(t)$$

This is a differential equation in partial derivatives of von Foster type for all values $a_0 < a < A$.

Adding an initial condition:

$$n(a,0) = n_0(a), \; a_0 \leq a \leq A,$$

where $n_0(a)$ – the known function, and the boundary condition:

$$n(a_0, t) = 0, \; t \geq 0.$$

We have a mathematical model for describing the dynamics of the number and age of personnel. The productivity index was denoted through $\xi(a)$, which characterizes the average value of the scientific product, which is formed by a member of the scientific team by age a in the unit of time, and represent the following optimization criterion:

$$S = \int_0^T \int_{a_0}^{A} \xi(a) n(a,t) da dt \to \max$$

So, that is, a tendency to maximize the overall productivity of the staff as a whole during a determined (fixed) period of time $[0, T]$, that controls the function $w_2(a,t)$. Equations and condition together formulate an optimal control problem for a distributed system of parameters [16].

In order to provide a possibility to dynamically evaluate scientific activity in the current version of the system, we added a diagram that represents the dynamics of the growth of scientist's number of documents, h-index and citation index in one of the scientometric systems. Here the gray columns mean the number of documents, the blue line indicates the value of the h-index, the yellow line indicates the value of citation index. Under each column, the date of the verification of scientometric indices is indicated.

Such diagram is constructed separately for Scopus, Google Scholar and Web of Science. The example of diagram we can see on Fig. 4.

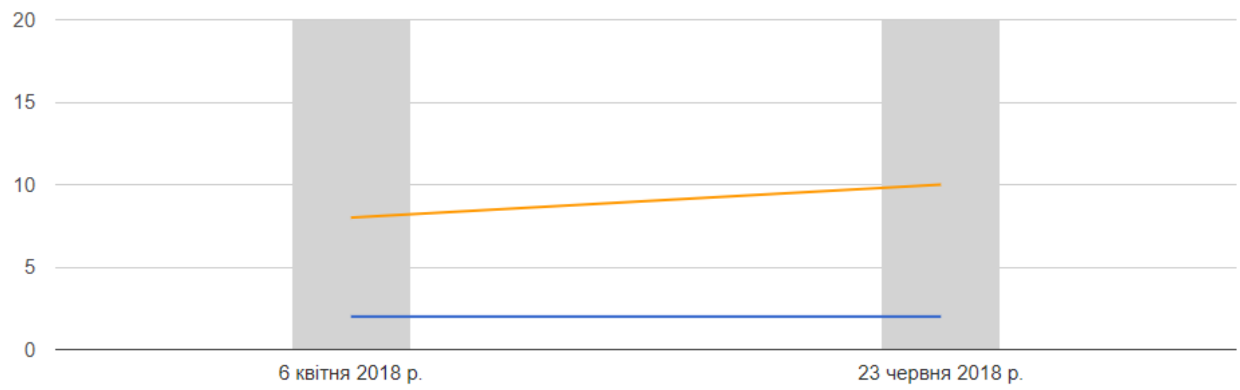


Fig. 4. A diagram displays the growth of author's scientometric indices.

In this way, we plan to get a complete dynamic picture of the author's scientific work in a few years. This will allow to evaluate his scientific activity more qualitatively.

On the tab **"Scientific metrics"**, you can find general university statistics, grouped by scientometric systems, such as:

- the total number of university staff, registered in selected systems, as well as their distribution by departments;
- maximum H-index;
- maximum number of documents in selected system;
- maximum citation index.

The analysis of the scientific activity of KSU scientists' shows the best results of scientists, such as:

- the highest number of publications in Scopus has such scholar as Volodymyr Peschanenko (23),
- the maximum number of citations has Alexander Khodosovtsev (98).
- the most h-index has the teachers of the Chair of Botany (7).

On the basis of the consolidated rating, we constructed a diagram that shows the personal contribution of each scientist to the university's scientific activity. The size of the figure is an indicator: the larger the area of the figure is, the greater the contribution of the scientist is.

Fig. 5. A diagram displays the scientist's personal contribution to the university's scientific activity.

On this tab the other example of semantic network can be seen. Similarly to representing of semantic network of co-authors, on the tab "Scientific metrics" it shows a links between groups of scientists, i.e. partner universities. In this way, the nodes are the universities, and the links between them means scientific publication(s), written in co-authorship by scientists from these universities.

You can see the semantic network of partner universities of Kherson State University on the Fig. 6.

For example:

- the link between Kherson State University and University of Huddersfield is link between authors Aleksander Spivakovsky and Sotiris Batsakis – preface of conference ICTERI;
- the link between Kherson State University and Lviv Polytechnic National University is link between authors Aleksander Spivakovsky and Nikitcheno Mykola – preface of conference ICTERI;
- the link between KSU and V.N. Karazin Kharkiv National University is links between next authors: Aleksander Spivakovsky and Grygoriy Zholtkevych – ICTERI (preface); Volodymyr Peschanenko and Grygoriy Zholtkevych – articles written in co-authorship;

Using of semantic networks for representing of partner universities helps in a broader assessment of the work of the University as a whole.

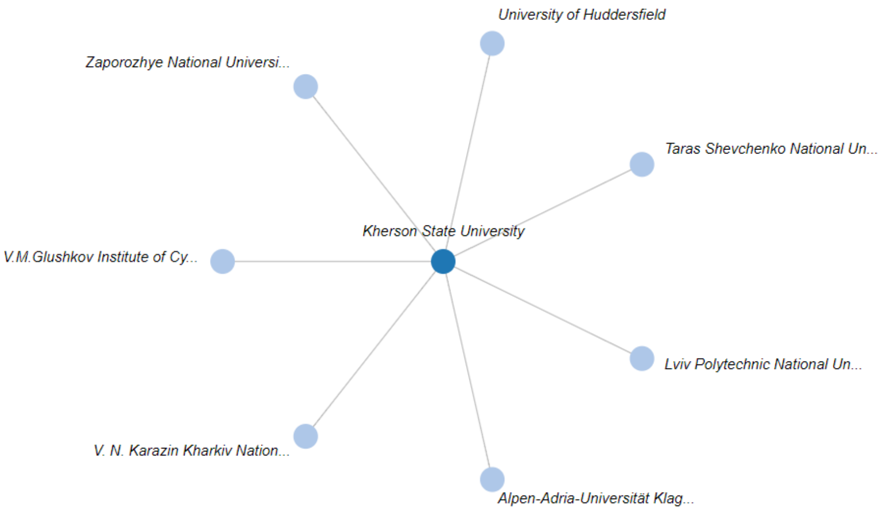


Fig. 6. Semantic network of partner universities of Kherson State University.

Module of analytics.

As mentioned in the previous article [1], we added a module of analytics (written in R language) as a separate part of the system. In our system, we use it for:

- processing a scientometric data array;
- graphical representations of statistical data.

In particular, we used this language opportunity as a time series analysis that allows the theoretical opportunity to apply models to predict the growth of dynamics of university rating.

The diagrams present data showing relation between such scientometric indicators, as the value of h-index in Scopus and the number of papers in Scopus or Google Scholar. The diagram can be displayed within the university or faculty, grouped by departments.

The example of diagram is shown in Fig.7.

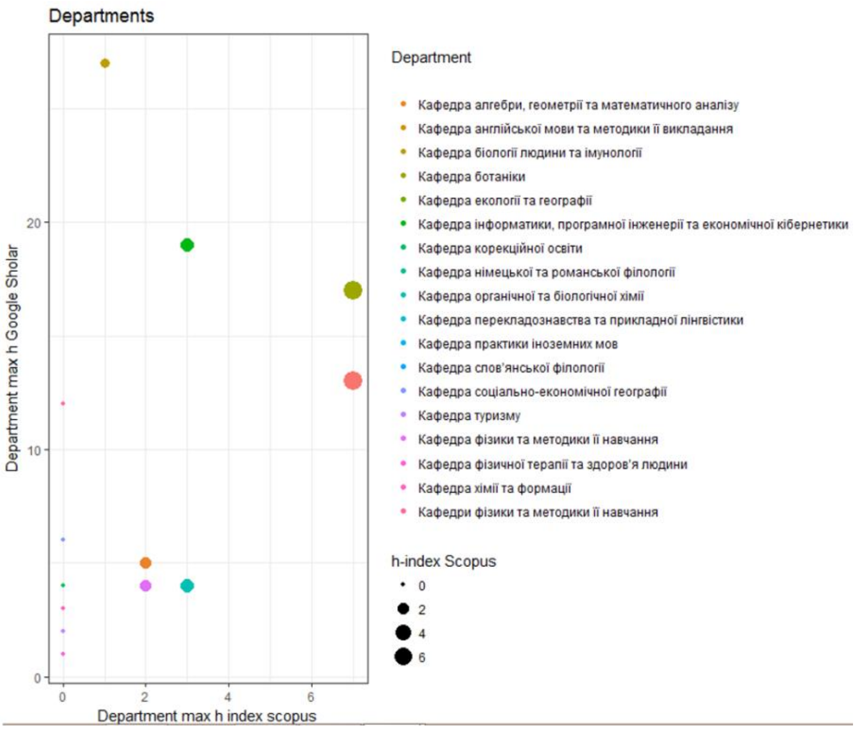


Fig.7. Diagram of relation between department Google Scholar max h-index and Scopus within university

As it is evident from the diagrams, the best result is one, located most right and high.

Another option for using module in R is possibility to get a variety of statistical tables, such as the table of universities and the number of the scientists, whose articles were written in co-authorship with the KSU's scientists; the table shows the general information about set of scientometric indicators of scientists, and total number of registered users on each department and faculty, etc.

Thus, the graphical and table representation of statistical data makes the process of perception of information easier. Moreover, the R language provides an opportunity to analyze the relations between indicators.

The main task of developing system was the realization of the possibility of automated construction of the rating of scientometric indicators for the evaluation of scientific activity not only in Kherson State University, but in any university. Thus, our system allows constructing a rating of scientists, research groups and organizations (as well as their structural subdivisions) by using the API (Application Programming Interface)

The system provides access by request in such form:

http://publication.kspu.edu/api/v1/teacher?option=[orcid_id|scopus_id| google_scholar_id| name| & value= [search_value].

By specifying the search parameters in the request (some scientometric system and scientist's id in it), we will get a list in the json format that looks like this:


```
{
  "google_scholar_account": {
    "h_index": 6,
    "revision": "2018-02-17 16:32:01",
    "total_citations": 104
  },
  "google_scholar_id": "EJeHijAAAAAJ",
  "name": "\u0422\u0430\u0440\u0430\u0441\u0456\u0447
\u042e\u043b\u0456\u044f
\u0413\u043d\u0435\u0434\u0456\u0457\u0432\u043d\u0430",
  "orcid": "0000-0002-6201-4569",
  "scopus_account": {
    "h_index": 2,
    "revision": "2018-02-17 16:32:01",
    "total_citations": 11,
    "total_documents": 7
  },
  "scopus_id": "56436890300",
  "status": 200
}
```


Fig.8. The example of the list in json

Consequently, API using makes possible to build a rating either for individual scientists, research groups, and for any university (as well as its structural subdivisions) by writing its own json parser for processing the received data.

8. TOOLS AND TECHNOLOGIES

The solutions for automatic construction of ratings require the use of certain products and technologies:

– Json.

It is used in the system for the exchange of data for third-party systems. Thus, our system can be a source of data for other resources. It implements the data exchange via json requests.

These are universal data structures. Nearly all modern programming languages support them in any form. It is logical to assume that a data format, independent from the programming language, should be based on these structures [13].

– R language.

R is a programming language and free software environment for statistical computing, data analysis and their graphical representation. R provides a wide variety of statistical and graphical techniques, and is highly extensible.

Similarly to the previous version, one of the most important algorithms used in the system is Levenstein algorithm [7].

This algorithm is used for solving the problem of determining belonging the scientist to a particular organization, which arises at changing of the organization's name, its spelling errors in the article, the change of scientists their place of work, etc. [6].

9. CONCLUSIONS

The article presents our experience in developing system of automatic construction of ratings of scientific organizations based on their scientometric indicators in Scopus and Google Scholar, based on the algorithm of constructing ratings of scientific publications by the presence/absence in various ratings based on their scientometric indicators, proposed in our previous article. In the current version of the interaction with Web of Science was realized.

Data source of the system is open information provided by such scientometric systems as Scopus, Google Scholar and Web of Science. Another data source for building a rating of university’s teaching staff is KSU Feedback service.

Our system was designed in such a way that it is possible to deploy it in other universities, and to customize it for their specific individual goals and tasks. Our system enables to build an automatic rating based on scientometric indicators by using Application Programming Interface (API).

Today the system is used to build a consolidated rating of scientists of Kherson State University and its structural units. Based on this rating it is possible to build a diagram that shows the actual state of scientific activity in university.

Using our system provides a possibility to make a general conclusion about scientific and teaching activity of university’s staff.

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РЕЙТИНГОВА СИСТЕМА ДЛЯ НАУКОМЕТРИЧНИХ ПОКАЗНИКІВ УНІВЕРСИТЕТІВ: ОСНОВНІ АСПЕКТИ, РОЗРОБКА, РЕАЛІЗАЦІЯ

Сьогодні інформаційні технології є одним з основних способів формування і створення ефективних інструментів для організування взаємодії та опрацювання великої кількості інформації. У наш час академічні установи повинні спиратися на спеціальні дослідження, аналіз накопичених досягнень і на цій основі розробляти прогнози, визначати тенденції та перспективи розвитку наукової чи іншої галузі й оцінити її потенціал. Сьогодні багато інформаційних систем намагаються створити методи і технології опрацювання та збереження інформації про діяльність учених.

У статті наведено короткий огляд рейтингових систем для обліково-метричних показників закладів вищої освіти. На нашу думку, інформація про наукову діяльність університету повинна бути представлена у формі рейтингу, що дає можливість аналізувати розвиток у різних напрямах та змінах. Ключовою ідеєю статті є представлення нашого досвіду у створенні системи автоматичної побудови рейтингів наукових організацій на основі їх наукометричних показників у Scopus, Google Scholar та Web of Science.

Філософія системи полягає у забезпеченні відкритих даних різних науково-вимірювальних систем, можливості розгортати її в інших організаціях та налаштовувати на індивідуальні цілі й завдання.

Описано нові сервіси, що використовуються в системі. Розширено частину «Структура системи». У ній подано опис усіх вкладок сайту системи, приклад списку авторських публікацій, представлено використання семантичної мережі для відображення відносин між авторами. Також ми подаємо математичну модель, що використовується в нашій системі для аналітичного аналізу, і спеціальні діаграми, розроблені в системі для відображення особистого внеску вченого в наукову діяльність університету.

Ключові слова: наукова діяльність, інформаційні системи, наукометричні системи, бібліометричні системи, науково-вимірювальні показники, автоматичні рейтинги.

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СИСТЕМЫ РЕЙТИНГА ДЛЯ НАУКОМЕТРИЧЕСКИХ ПОКАЗАТЕЛЕЙ УНИВЕРСИТЕТОВ: ОСНОВНЫЕ АСПЕКТЫ, РАЗРАБОТКА, РЕАЛИЗАЦИЯ

Сегодня информационные технологии являются одним из основных способов организации и создания эффективных инструментов для организации взаимодействия и обработки большого количества информации. В настоящее время академическим учреждениям необходимо опираться на специальные исследования, анализ накопленных достижений и на этой основе разрабатывать прогнозы, выявлять тенденции и перспективы развития научной или иной отрасли и оценивать ее потенциал. Сегодня многие информационные системы пытаются создать методы и технологии обработки и сохранения информации о деятельности ученых.

В статье дается краткий обзор рейтинговых систем наукометрических показателей вузов. По нашему мнению, информация о научной деятельности университета должна быть представлена в форме рейтинга, что дает возможность анализировать развитие по разным направлениям и изменениям. Ключевой идеей статьи является представление нашего опыта по разработке системы автоматического построения рейтингов научных организаций на основе их наукометрических показателей в Scopus, Google Scholar и Web of Science.

Философия системы заключается в предоставлении открытых данных различных наукометрических систем, возможности развертывания ее в других организациях и настройки ее для индивидуальных целей и задач.

Описаны новые сервисы, которые используются в системе. Часть «Структура системы» была расширена. В этой части добавлено краткое описание всех вкладок системного сайта, пример списка авторских публикаций, описано использование семантической сети для представления отношений между авторами. Также мы описали математическую модель, которая используется в нашей системе для некоторого аналитического анализа, и специальные диаграммы, которые были разработаны в системе для отображения личного вклада ученого в научную деятельность университета.

Ключевые слова: научная деятельность, информационные системы, наукометрические системы, библиометрические системы, наукометрические показатели, автоматические рейтинги.