

Methodology of Research the Library Information Services: The Case of USA University Libraries

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Abstract. The article presents the research methodology of the range of information services provided remotely by libraries of USA leading higher educational establishments. The methodology consists of benchmarking method and pairwise comparisons method on the basis of expert estimates. The authors reviewed the existing approaches to carrying out benchmarking researches and proposed their own concept. Innovation is that a comparative analysis of the results obtained in the process of benchmarking studies and the pairwise comparisons method is held. The library remote information services of higher educational establishments of America are analyzed. The study is based on benchmarking and pairwise comparisons methods that allow to identify the group of library-leaders in providing quality information services.

Keywords: Benchmarking · Library · Consumers of information services · Cloud services · Expert evaluation method

1 Introduction

Today, librarians have not solved the problem of developing a single integrated methodology for assessing the quality of information service, although some attempts in this direction were made. In particular, with sociological studies the evaluation of some library services by users was studied. But still the question remains to analyze the parameters of this assessment. Conducted studies are irregular, and to improve the libraries work, there is a demand on a toolkit for systematic analysis of information services provided by libraries. In our previous studies we found out that such toolkit can be considered a benchmarking methodology, which provides an opportunity to search, evaluate and borrow experience from the best algorithms for the organization of effective work. Benchmarking is a part of systematic and structured approach for finding and implementing the best examples of excellence. In librarianship benchmarking can be used for comparative analysis of one service to others. The purpose of the paper is to define USA libraries-leaders of providing high quality remote information service for users.

2 Background

Benchmarking is widely used in the economic field. Particularly foreign researchers who turn to this methodology should be called: Wann Jong-Wen, Lu Ta-Jung, Lozada Ina, Cangahuala Guillermo [1], Dalalah Doraid, Al-Rawabdeh Wasfi [2], Franses Philip Hans, de Bruijn Bert [3], Kwon He-Boong, Marvel Jon H., Roh James Jungbae [4]. Among the researchers who using benchmarking in the context of librarianship worth noting: Vivas Salas Leonel Orangel, Briceno Sosa Maria Alejandra, Colls Ojeda Janeyra del Carmen [5], Amos H., Hart S. [6].

Let's consider the main advantages of using the benchmarking methodology in library science:

- Firstly, it contributes to the objective analysis of the strengths and weaknesses of the library work. Such monitoring of strengths and weaknesses is carried out in the context of comparison with the standards.
- Secondly, it allows to study and implement new ideas in the organization of information and library work, marketing services and in the other areas of activity to increase their efficiency.
- Thirdly, it ensures an analysis of the activity of library-leaders for the borrowing of innovative technologies.
- Fourthly, it allows the strategic planning of the library institution activities with the use of advanced technologies, implemented by leaders of the area.
- Fifthly, it helps to conduct regular researches that allows to keep up to date with innovations in librarianship and actively implement them in own institution.
- Sixthly, it allows to overcome the conservative principle – to plan from the achieved, based on the analysis of the libraries activity, which constitute a certain competition [7].

By adapting the methodology of benchmarking to improve the management of social institutions activity, research should be directed to the study, borrowing and implementation of the best technologies, innovative processes and methods of work organization in order to create and disseminate information products among own users.

The use of this method allowed us to develop algorithms for system analysis of the activity of the investigated library and the library-leaders. The advantage of this method is the ability to conduct studies to determine the variability of certain trends in a number of parameters of the library activity for a certain time. The experience has shown that using the method of data comparative analysis allows us to concentrate on studying of one parameter at a certain time.

Taking into account the algorithm, defined by R. Kemp [8], the benchmarking comparisons in the study of the library should be carried out in several stages:

1. Identification and definition of object reference comparisons.
2. Selection of standards and experts of benchmarking stage.
3. Identification of suitable methods of information gathering and data collection.
4. Identification of existing inconsistencies and gaps of the investigated library from libraries-competitors for selected indicators.

5. Establishing the desired results and levels of effectiveness of library activity.
6. Informing representatives of all interested parties about the benchmarking results and obtaining consent for their use.
7. Setting goals and objectives of increasing the efficiency of library activity.
8. The development of an action plan to achieve the objectives.
9. Carrying out planned events and analyzing their results. Integration of experience in the work processes of one's own institution.
10. Re-analysis of selected strategies with using benchmarking.

A simplified version of the use of benchmarking consists of four sequential steps:

1. Awareness and analysis of the details of one's own activities
 In this phase, problem areas of the library activity are set up, which should be investigated with the help of benchmarking. This enables a critical attitude to the library activity as a whole, individual processes or work of departments. At this stage, a decision is made about the type of benchmarking.
 As practice shows, due to the regular compilation of reports on the library work, every section of its activity is thoroughly analyzed, that allows to identify the weaknesses.
2. Analysis of the processes of other libraries
 Having substantiated the goals, it is necessary actively to look for the best libraries that will serve as standards. The potential standards should be the leaders, but also convenient for the most simple comparability. Thus, the dynamics of specific work indicators is analyzed.
3. Comparison of work results of investigated library with the activity results of the library-leaders. At this stage, the collection of additional data of particular value, the analysis of work content, processes or factors associated with their effectiveness is carried out. The analysis in this case means not only finding the similarities and differences, but also to determine causal relationships.
4. Introduction of qualitative or quantitative changes to overcome the lag.

3 An Own Approach to the Benchmarking Research of Library Information Services

In the research process of information library service, benchmarking methodology was used to analyze the service provided with higher educational establishments of USA library websites. We consider that benchmarking investigation of libraries should be held by the following algorithm (Fig. 1).

1. To identify the maximum amount of libraries. For benchmark comparison, the American higher educational establishments scientific libraries were covered. At this stage the problem areas in libraries activity were setting that should be investigated with the benchmarking method. This enables a critical attitude to the library activity in general, individual processes or department units.

2. Determination of the maximum range of services provided by the library institutions. The comparison of the investigated library processes with the results of library-leaders. Substantiated goals it should actively seek the best libraries that act as benchmarks. Potential benchmarks must be leaders, but inherent to the most simple comparability. In this case the dynamic of specific indicators of work is analyzed.
3. At this stage, the collection of extra data, which are especially valuable, content analysis of library processes or factors related to their efficiency is made. To get the information the method of “competitive intelligence” is used. The application of “competitive intelligence” is carrying out a quick search of necessary information

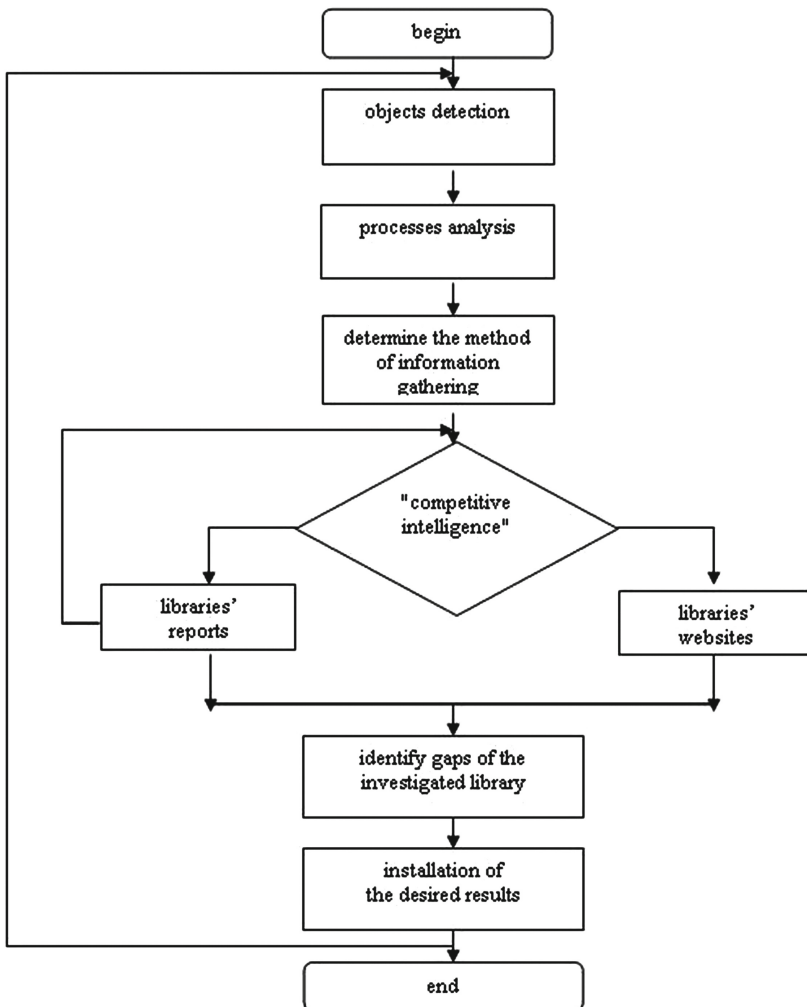


Fig. 1. The algorithm for studying the libraries of USA universities according to benchmarking the methodology.

and proper analysis, using legal methods of collecting and processing information, based on open source to obtain it.

4. Due to reporting about the work of the library, thoroughly every area of its activity has been analyzed, to determine weaknesses. Publicly available library reports serve as a reliable source for the analysis and comparison of library processes.
5. However, not all libraries place free access reports. Besides, these documents contain only statistics. So for a comparative analysis were used library websites as an open source of providing remote service for users.
6. Based on the information services provided by libraries via a web-site, the library-leaders as an example to follow of best practice were defined. The obtained data will overcome the lag in the information service.
7. The introduction of innovative services in the library, to which is used benchmarking methodology, will contribute to the modernization of library information service. The use of benchmarking methodology for effective management of the library should be systematic. Therefore, it is necessary to carry out continuous monitoring of other libraries and information institutions to identify and implement innovative technologies in the work of one's own library.

It was found that USA higher educational establishments scientific libraries provide the following range of remote services:

- electronic catalog;
- institutional repository;
- access to pre-paid databases;
- virtual reference;
- interactive communication services (skype, on-line assistant, etc.);
- electronic delivery of documents (EDD);
- multimedia resources;
- tools for help professionals;
- bibliographic managers;
- cloud services;
- recommended resources (guidance to public information resources in the Internet: databases, on-line journals, web-services).

4 The Research of Remote Information Services of USA University Libraries

Within the research, 19 library websites of higher educational establishments of the United States of America were analyzed. For comparative analysis, the amount of the libraries was divided into several groups. Binghamton University Library took the first place among the libraries in the group A (Fig. 2).

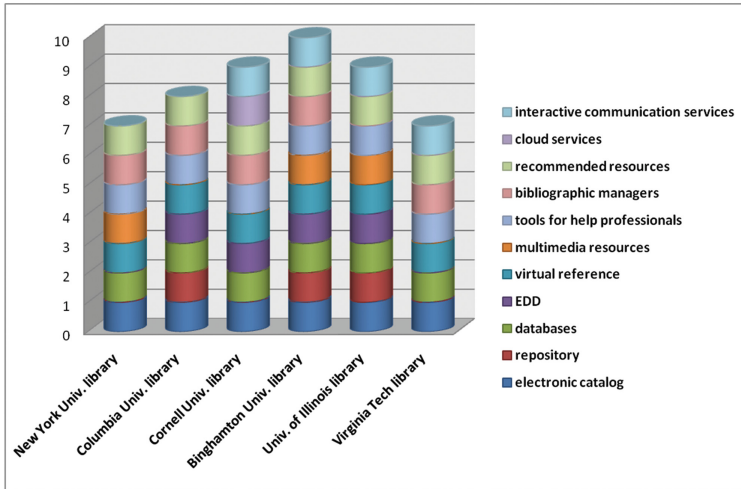


Fig. 2. The comparison of the libraries in the group A.

By the composition of library information services, the championship got Case Western Reserve University, and Brown University of Washington (Fig. 3).

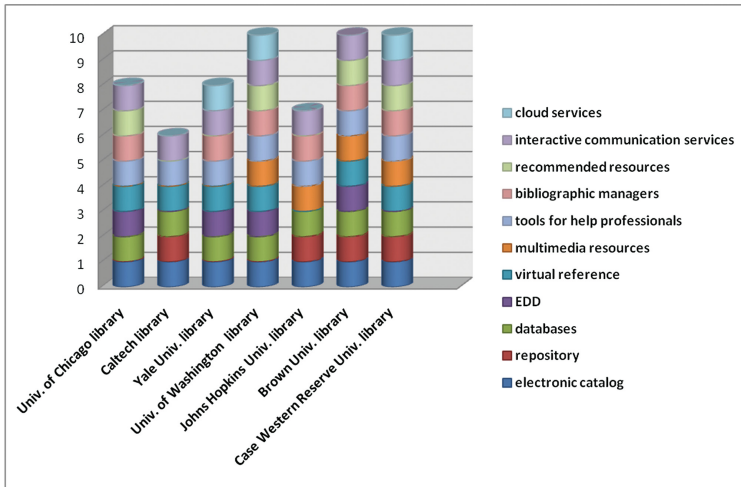


Fig. 3. The comparison of the libraries in the group B.

On this list of the libraries, the leader is Rutgers University Library (Fig. 4).

Benchmarking technology allowed to identify the library-leaders of the United States of America that provide a wide range of the remote library services (Fig. 5).

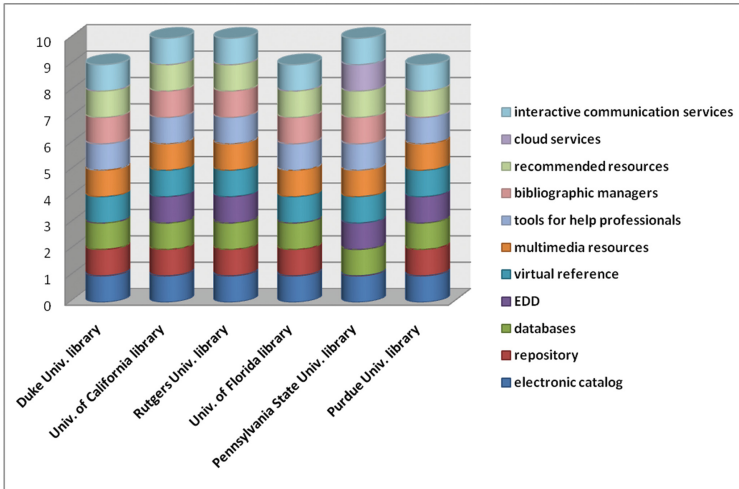


Fig. 4. The comparison of the libraries in the group C.

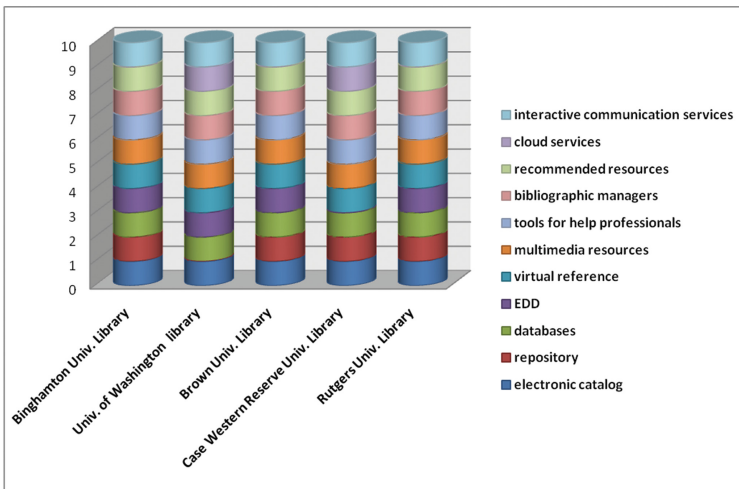


Fig. 5. The comparison of library-leaders.

5 Summarizing the Results of the Research with the Benchmarking Methodology

It was found that USA universities libraries provide users with the ability to use the system of electronic catalogs; repository, which stores theses, articles, abstracts of the university employees; and a wide range of pre-paid and free of charge databases. The decisive fact is that the USA library practice the individual approach to assist the researchers – the curator of a particular area of knowledge, which is guided in an

appropriate range of information resources is used. The website provides supervisor (subject guide) contact information: the phone number, e-mail and skype.

This provides powerful information support of scientific staff of the university. The users are suggested to use the open reference resources, on-line journals collections that are available on the Internet. Cloud services include provision of access to full texts of documents from the library collections via OverDrive service for a certain period of time, which essentially plays the role of an electronic loan. It is proposed to use bibliographic management tools, access to which is provided from libraries websites to improve the efficiency of information support of scientific researches.

The weak point is the lack of promotional library multimedia materials. However, the audio and video documents are hosted in the library catalog collections. There is an electronic document delivery service (EDD) – the user is given the opportunity to receive the electronic documents on his own email. Every library website includes a virtual reference service and chat – instant messaging users with a contact person in the library.

Thus, by selecting the library-standard, the detailed analysis of the services provided to users was made. Benchmarking is not a blind imitation of the work of another institution, its main task – to borrow best practices and adaptation in the studied library. It was considered that not all innovations can facilitate the efficient work of one’s own library. Each proposal should be thoroughly considered, taking into account the realities of one’s own library. Some ideas that at first sight did not deserve of imitation, after some rethinking and improvement had been revalued and their implementation contributed to achieving significant results.

6 Verification of the Results Using the Saati Pairwise Comparisons Method

The results of the research, conducted by benchmarking method were checked with an expert evaluation method. Let’s consider the results of this test on the example of the group C with the criterion “repository” (Table 1).

Table 1. The matrix of pairwise comparisons of alternatives for the criterion “repository”.

Alternatives	Univ. of California	Rutgers Univ.	Univ. of Florida	Duke Univ.	Pennsylvania State Univ.	Purdue Univ.
Univ. of California	1,00	1,00	1,00	3,00	3,00	5,00
Rutgers Univ.	1,00	1,00	1,00	3,00	3,00	5,00
Univ. of Florida	1,00	1,00	1,00	3,00	3,00	5,00
Duke Univ.	0,33	0,33	0,33	1,00	1,00	3,00
Pennsylvania State Univ.	0,33	0,33	0,33	1,00	1,00	3,00
Purdue Univ.	0,20	0,20	0,20	0,33	0,33	1,00

According to this criterion this library service is compared for determination of the providing of users with remote information resources.

On the basis of an expert assessment method, it was determined the weight coefficients for service “repository” and constructed a matrix.

The results of calculating the weights of alternatives for the criterion “repository” are shown in the Table 1.

Elements of the table columns obtained with normalization of appropriate elements (Table 2).

Table 2. The weight of alternatives according to the criterion “repository”.

Alternatives	Univ. of California	Rutgers Univ.	Univ. of Florida	Duke Univ.	Pennsylvania State Univ.	Purdue Univ.	Weight of alternative
Univ. of California	0,259	0,259	0,259	0,265	0,265	0,227	0,2554
Rutgers Univ.	0,259	0,259	0,259	0,265	0,265	0,227	0,2554
Univ. of Florida	0,259	0,259	0,259	0,265	0,265	0,227	0,2554
Duke Univ.	0,086	0,086	0,086	0,088	0,088	0,136	0,0952
Pennsylvania State Univ.	0,086	0,086	0,086	0,088	0,088	0,136	0,0952
Purdue Univ.	0,052	0,052	0,052	0,029	0,029	0,045	0,0432

Thus, by the criterion “repository” may be offered University of California library, Rutgers University library and University of Florida library (Fig. 6), because they have the same and more than the other libraries the weight value – 0.2554.

For the matrix of pairwise comparisons, based on the criterion “repository” the following parameters were calculated:

- evaluation of the largest eigenvalue, which is calculated according to the formula:

$$\lambda_{\max} = \sum_{i=1}^n w_i s_i \tag{1}$$

where w_i – weight alternative with a number i , s_i – sum of the elements of column number i matrix of pairwise comparisons, n – number of alternatives.

$$\lambda_{\max} = 0.2554 \cdot 3.87 + 0.2554 \cdot 3.87 + 0.2554 \cdot 3.87 + 0.0952 \cdot 11.33 + 0.0952 \cdot 11.33 + 0.0432 \cdot 22 = 6.073; \tag{2}$$

- the index of consistency

$$CI = \frac{\lambda_{\max} - n}{n - 1} = \frac{6.073 - 6}{6 - 1} = 0.0146; \tag{3}$$

- the index of the sequence of ratios

$$CR = \frac{CI}{RI} = \frac{0.0146}{1.24} = 0.0118 \tag{4}$$

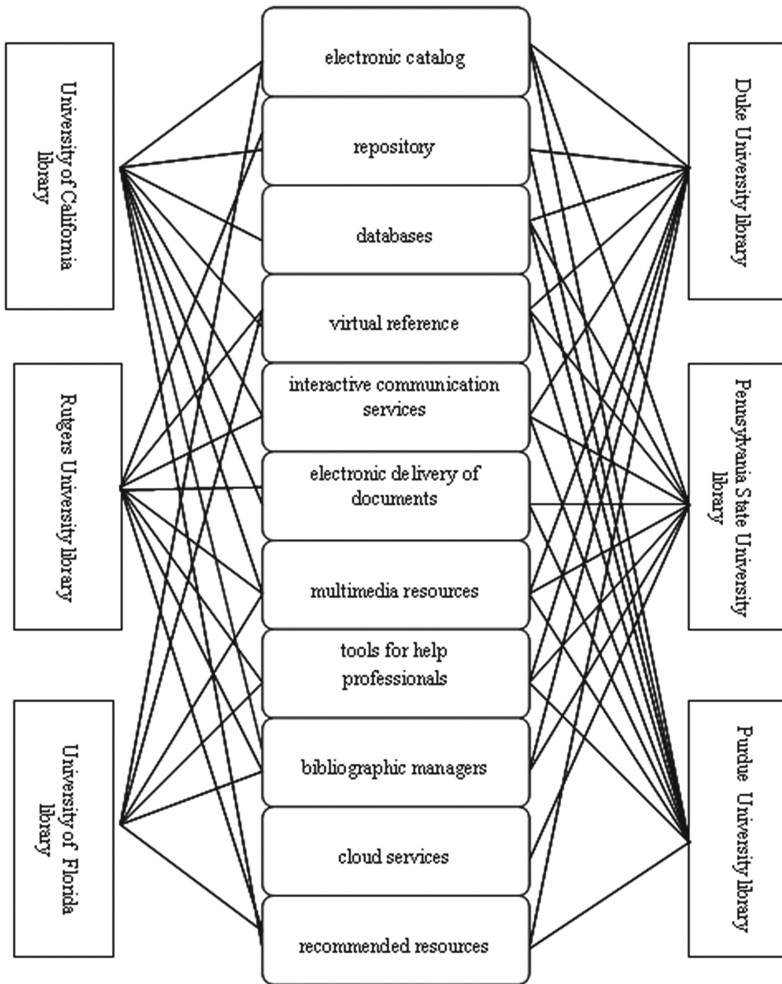


Fig. 6. The comparative analysis of the library information services in the group C.

Here $RI = 1,24$ – random index for $n = 6$, value of which is the same for all further calculations of the weights of alternatives. As $CR = 1.18\% < 10\%$ the matrix of pairwise comparisons is considered consistent.

7 Conclusions

According to the results of our research, the use of benchmarking methods in the study of libraries contributes to the improvement of the following directions of its activities:

- satisfying the information needs of the library users and the demand on document-information resources of the library;

- socio-communicative relations of the library with the external environment;
- improving quality and expanding the range of services;
- the use of modern technologies;
- traditional library activities in an innovative mode;
- creating a positive image of the institution.

Thus, using the benchmarking and pairwise comparisons methods, among 19 USA universities academic libraries were identified the leaders in providing the most comprehensive list of library and information services. The results, obtained on the basis of the benchmarking libraries, have been confirmed with expert evaluation method, which gives reason to keep using benchmarking method in librarianship studies.

References

1. Wann, J.-W., Lu, T.-J., Lozada, I., Cangahuala, G.: University-based incubators' performance evaluation: a benchmarking approach. *Benchmarking Int. J.* **24**(1), 34–49 (2017)
2. Dalalah, D., Al-Rawabdeh, W.: Benchmarking the utility theory: a data envelopment approach. *Benchmarking Int. J.* **24**(2), 318–340 (2017)
3. Franses, P.H., Bruijn, B.: Benchmarking judgmentally adjusted forecasts. *Int. J. Fin. Econ.* **22**(1), 3–11 (2017)
4. Kwon, H.-B., Marvel, J.H., Roh, J.J.: Three-stage performance modeling using DEA-BPNN for better practice benchmarking. *Expert Syst. Appl.* **71**(1), 429–441 (2017)
5. Salas, L.O.V., Sosa, M.A.B., del Carmen, J., Ojeda, C.: Benchmarking applied to catalog of library services at the University of Los Andes. *Visión Gerencial* **1**, 59–72 (2017)
6. Amos, H., Hart, S.: International collaboration for quality: a case study of fostering collaboration across an international network of University Libraries through an activity based benchmarking project. In: 34th Annual IATUL Conference Proceedings, Purdue e-Pubs (2013)
7. Rzheuskiy, A., Kunanets, N.: The concept of benchmarking in the librarianship. *Coll. Sci. Works Econ. Sci.* **10**, 17–24 (2014)
8. Camp, R.C.: *Benchmarking. The Search for Industry Best Practices that Lead to Superior Performance*. ASQC Industry Press, Milwaukee (1989)