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HEURISTIC EVALUATION OF UNIVERSITY LIBRARIES' MOBILE WEBSITES IN POLAND

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KEYWORDS: Mobile websites. University libraries in Poland. Heuristic evaluation. Benchmarking. User interface. Mobile device. Mobile phone.

ABSTRACT: **Thesis/Objective** – the issue of evaluation of university mobile services has not been broadly explored, especially in Poland. Such research is worth conducting, as more and more users of library websites – students in particular – use mobile devices while searching required information. Mobile versions of university websites have not become very popular in Poland as of yet. Of the 10 largest university libraries of this kind, only 4 have a mobile version. The paper presents the evaluation of their quality and benchmarking with a view to identifying the best practices. **Research method** – the quality-heuristic method and benchmarking were used. The research questionnaire covered both the content as well as the functioning of the services. **Results and conclusions** – The service of the library of the University of Torun turned out to be the best; the remaining ones appeared to be a little less attractive mainly due to their limitations linked with information availability. None of the services, however, received the maximum score. Research results show the elements which still offer room for improvement.

INTRODUCTION

Over the recent years, in Poland, a considerable growth of mobile device users has been observed. The possession of a smartphone is declared by 58% of Poles aged 15+, which gives ca. 19 million devices. The number of users varied depending on the age groups, which should not come as a surprise. The highest rate is noted in the 15-19 age group (91%) and 20-29 (88%) (Mikowska, 2015). Research conducted by Gemius SA shows that despite an increasing importance of the role of PCs in the process of consumption of the web content (approx. 77% in 2016 and 2017), nearly a double growth of popularity of mobile devices can be observed (gemiusRanking PL, 2016). This allows to make the assumption that the process will accelerate; therefore, an adjustment of the online resources of libraries is of great importance to ensure proper interfacing with the "little" devices.

The above-mentioned electronic services may be provided in two ways. The first is by making available a dedicated mobile application by the relevant institution. Applications are prepared for different platforms using different programming languages. Designing them requires specialist knowledge and very often considerable financial expenditures (it must have at least two versions for the leading mobile systems: Android and iOS), which are limited in the majority of libraries. Such applications also require the users to install and manage disc space of the device in use. As an advantage, we can mention here an integration of some of the functions with the smartphone interface system (e.g. facilitated content disclosure) and a possibility of offline operation. The other option is to make available a special version of the web service, adapted to operate on mobile devices. The mobile device operates on different platforms and is handled by different browsers dedicated to mobile devices. So, we now have Internet solutions, which can be depicted as dedicated and responsive services.

Dedicated mobile sites were created solely for presentation on mobile devices and they are prefixed with an "m." or "mobile." in the WWW address; responsive services (RWD - Responsive Web Design) automatically adapt to the resolution and size of the screen and they do not need to have a separate WWW address. For the purpose of the article, the notion, "mobile web services", shall be solely construed as a website browsed using mobile devices (smartphone, tablet), regardless of their technology.

LITERATURE REVIEW

There have been very few studies evaluating the usability of mobile library websites. Most of them used usability testing methods to evaluate the library mobile websites. For example, Pendell and Bowman (2012) used usability testing to evaluate the Portland State University Library's mobile site. Yeh and Fontenelle (2012) conducted an evaluation of a science university library's mobile website. Rosario, Ascher, and Cunningham (2012) applied usability testing method to evaluate the mobile website of a university health sciences library in order to help redesign the mobile website. Fung, Chiu, Ko, Ho, Lo (2016) used the heuristics of Nielsen in their expert comparative studies of usability of three university libraries. Torres-Pérez, Méndez-Rodríguez, Orduna-Malea (2016) analysed the services provided by libraries of universities rated among the top 50 in 2014 in the *Ranking of Web Universities* with a view to their mobility. It turned out that libraries of the world's best universities make sure their services are widely available also through mobile devices and such sites are offered by 88% of these institutions. Also, analysed during the research was the content of the mobile sites with a view to access to library services. In Poland, the situation is not so good; mobile sites of libraries are not very popular as yet and hence not very widely used.

Evaluations of mobile libraries available globally are based on the test of their usability or on a heuristic method focusing on the criteria linked with their usability. The authors of this paper have not identified such research where the content of the mobile libraries would be analysed, which emphasises the availability of different library and information services; their usability was also analysed. It was decided that the usability, availability and quality of information are of vital importance. Therefore, in their research, they attempted to use an expert evaluation with respect to the content and functional aspects of the services.

METHODOLOGY

The purpose of the research was to compare the quality of the mobile versions of WWW sites of selected Polish university libraries. The notion

of *quality* is construed according to ISO 9000:2000 definition contained in a document entitled: Quality management systems -- Fundamentals and vocabulary, i.e. as a"… degree to which a collection of inherent properties satisfies the requirements". A heuristic and qualitative method was applied in it in combination with benchmarking. The method is also applied to evaluate different Internet and library services. The most widely known are heuristics of Jakob Nielsen concerning usability. Heuristics evaluation (Nielsen & Molich, 1990; Nielsen, 1992) is a usability inspection method for identifying the usability problems of a user interface design. Some researchers suggest to adapt heuristic evaluation to mobile context (de Lima Salgado & Freire, 2014;).

Library websites, also the mobile ones, in addition to usability, should also contain suitable content, ensure user access to required services and information. Therefore, we extended the heuristics concerning usability in the research questionnaire to include criteria related to the site content. The evaluation questionnaire was partly based on the criteria selected on the basis of characteristics proposed for the evaluation of library services by Sapa (2005), who established a list of criteria divided into two parts. The first part concerning the portal content is made up of 12 groups of features subject to evaluation. The other part is focused on usability and comprises 9 groups of the evaluated features (see: Attachment A). Either of the groups was divided into a number of detailed criteria. When constructing the questionnaire of this research, initially the main focus was on the analysis and adaptation of the mobile services to the requirements of evaluation of the Sapa criteria of content evaluation. A decision was taken to carry out the survey based on a questionnaire whose aim was to determine what kind of the services and information offered by traditional Internet university library services the user expects when using the equivalent of the services in the mobile version. The proper questionnaire comprised questions, or more precisely services or information, which is usually presented on the University library portal. The respondents provided answers to the question whether "A feature is important/useful?" while using the portal on the mobile phone. The possible answers included "Yes" or "No". Option "Don't know" was not included for it not to be overused where the respondent does not use the mobile device-based services very often. (A sample questionnaire constitutes Appendix B). The purpose of the questionnaire was an attempt at establishing the priority of services and information contained in the library web services for its potential mobile users. Seventy-eight different level student respondents participated in the survey – both regular and extramural students. The results were to provide a basis for the development of the form of evaluation of the university library portals based on the needs of their potential users. The respondents were selected randomly.

The results of the survey show the popularity and hence the level of priority (desirability) of a particular feature by the users. Each feature is provided with the number of "Yes" responses for particular characteristics and percentage share of positive answers. During the analysis, it was decided to assume as important those features whose popularity among the respondents was 75% and higher, i.e. responses chosen by the vast majority. Twelve features were identified based on this method and subsequently the selection was narrowed down to 5 most important ones, i.e. which were popular at least among ca. 90% of the respondents. The first seven (starting from the minimum threshold) is of informational nature and includes i.e. phone and address data (80.8%), information concerning use of the online catalogue (75,6%), rules of making the library resources available (79,5%) and information about the facilities for individuals with special needs (78,2%). This group also comprised the possibility of making copies using the Internet (75,6%) and access to non-public online digital resources (80,8%). The information on the access to electronic resources of public nature as well as information on access to online public digital resources gained popularity at the level of 89,7%, which demonstrates the users' interest in using legal and professional sources of information. The most common and basic features were those forming indispensable part of the library service, especially at the academic level. We refer here to the possibility of logging into a library account (94,9%) and having comprehensive access and service of the online catalogue (97,4% and 92,3% respectively). The above-quoted results allow to create and make precise the definition of a single group of evaluation criteria catalogue (content evaluation), which, in the subsequent parts of the paper, will be used to evaluate the quality of the selected services. Other criteria groups are formed on the basis of analysis of the features distinguished by the individual authors – mainly Sapa (2005), Nielsen (1992), Nielsen and Molich (1990), Nielsen and Budiu (2013) and GNOME, whose application seems to be best suited to the needs of mobile service quality evaluation (See: Appendix C).

Benchmarking is also used for evaluation. Utilised in this project is competitive benchmarking as typically with competitors in the same field. Each criterion was evaluated on a scale from 0 to 2, where 0 – lack of feature, 1 – feature partially satisfied, 2 – feature fulfilled. The qualitative and heuristic evaluation form is composed of 5 group criteria comprising detailed categories in the form of declarations (features). The results obtained on a particular group of criteria were summarised and compared to the maximum score for a particular group in a numeric and percentage form.

Ten Polish university libraries, which have an obligatory library copy, were selected for the research, but it turned out that only 4 have a mobile version of the web service, and therefore the mobile services of the following four libraries were subject to evaluation: Main Library of Ma-

ria Curie-Skłodowska University (BGUMCS), Library of Lodz University (BUL), University Library in Torun (BUwT) and Main Library of Opole University (BGUO).

The main test tool was Samsung Galaxy S7 Edge (SM-G935F) with Android version 7.0 (Nougat). Important parameters were the size of the display, i.e. 5.5″ and its resolution equal to 1440x2560px. The tested browser was Google Chrome version 58. Another device was Apple iPhone 5s (A1387) with iOS version 10.3.1. It has a display of 4″ and resolution of 640x1136px. The browser used for testing was a systemic browser Safari. The last device was Apple iPad of the 4th generation (A1460) with iOS version 10.3.1. The screen was 9.7″ with the resolution of 1536x2048px. In this case, the browser used in the test was also Safari. The research was carried out from 28 April to 9 May 2017 and was based on three research tools, i.e. two smartphones and tablet.

ANALYSIS — EVALUATION OF THE MOBILE WEBSITES

1. Site appearance

The website is the institution's showcase. It is important for it to construct positive associations, suggest that the library is modern and that it provides professional services at a high level.

1.1. Attractive artwork

A response to the aforesaid criterion are subjective impressions of the individual using the service and they depend to a large extent on personal preferences of the recipient. Nevertheless, at the moment there are general models applied in all types of services. The contemporary service should be simple, transparent, with few decorations and its mobile version should be as close to the desktop application as possible. These features in addition to the general impression linked with the use of the service were taken into account during the evaluation of attractiveness of the graphical design and artwork.

The highest score, i.e. 6, was achieved in this category by BUL. It is so because the BUL application is a mobile device dedicated portal, independent of the traditional services, and its graphical design reminds of a simple mobile application with a simple breakdown into individual services. Additionally, the entire portal is fairly coherent in the shades of blue and white.

The BUwT service scored 5 points and during the research, it launched a new version alluding to the change of the brand image of the university. The portal is dominated by the white colour and the colours of the university, i.e. blue with yellow decorations. All of the portal elements are

coherent. One point was deducted during the iPhone application evaluation, as the service logo and the button were overlapping, which spoilt the aesthetic quality. Additionally, the meta search engine was not displayed in a correct manner.

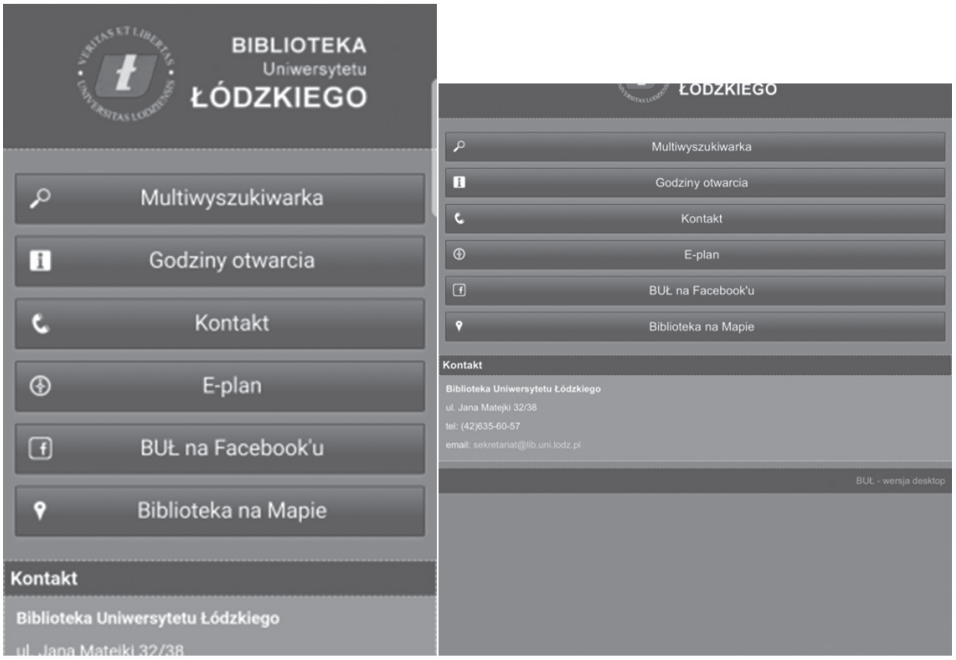

Chart 1. Home page of BUL mobile services (from the left: S7, iPad)
Source: BUL services (own materials).

Other services scored 4 points. Both are quite simple. The leading colours are white, blue and various shades of grey, and they nicely blend with the image of the university prompting a modern image of the institution. The downside are issues linked with the display of the meta search engine and a poor quality of graphical elements in the BGUMCS, while the BGUO portal contained tiles in some places displayed as a long list, one after the other, even if they represent a number of subcategories (e.g. the working hours broken down into faculty libraries).

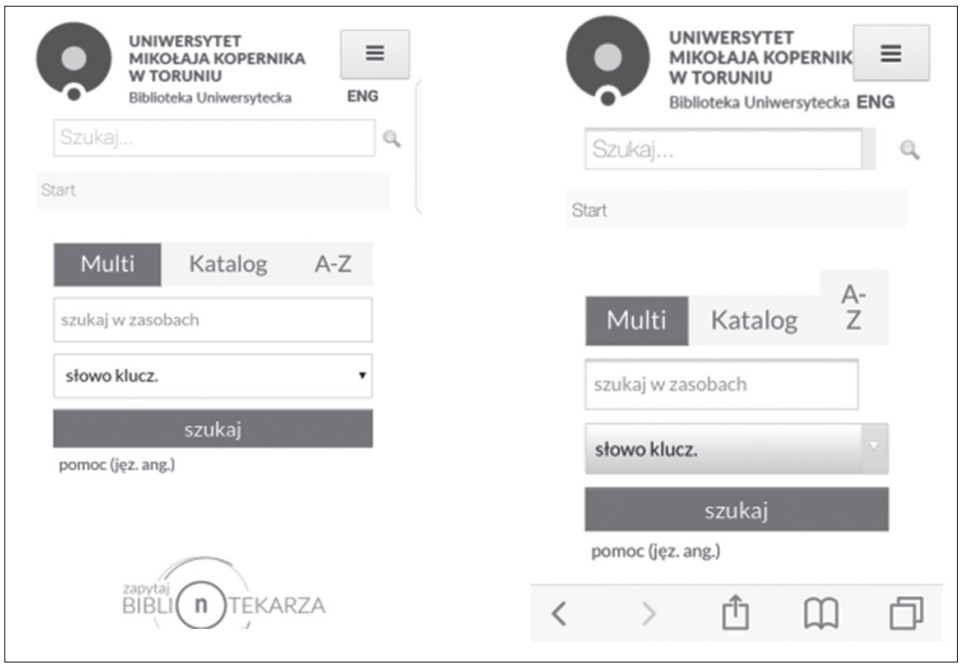

Chart 2. Home page of the main BUwT portal (from the left: S7, iPhone)
Source: BUwT portal (own materials).

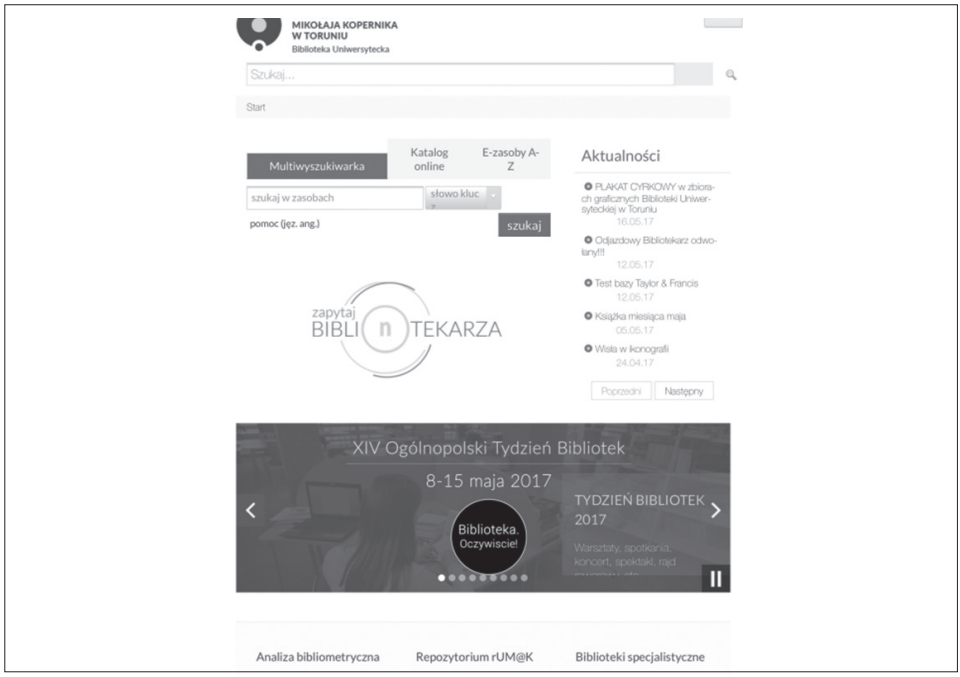

Chart 3. Home page of the BUwT mobile portal (iPad)
Source: BUwT portal (own materials).

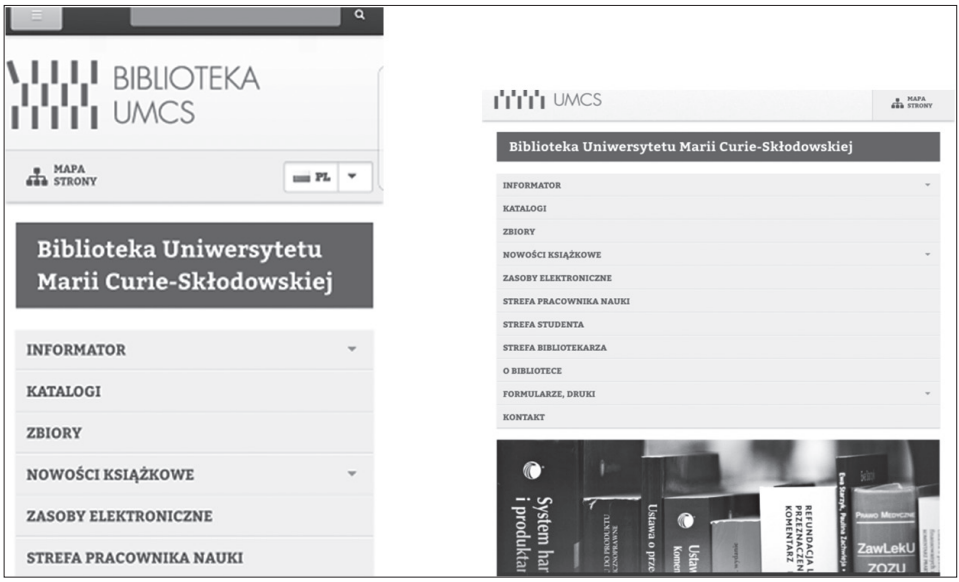

Chart 4. Home page of the BGUMCS mobile portal (from the left S7, iPad)
Source: BGUMCS portal (own materials).

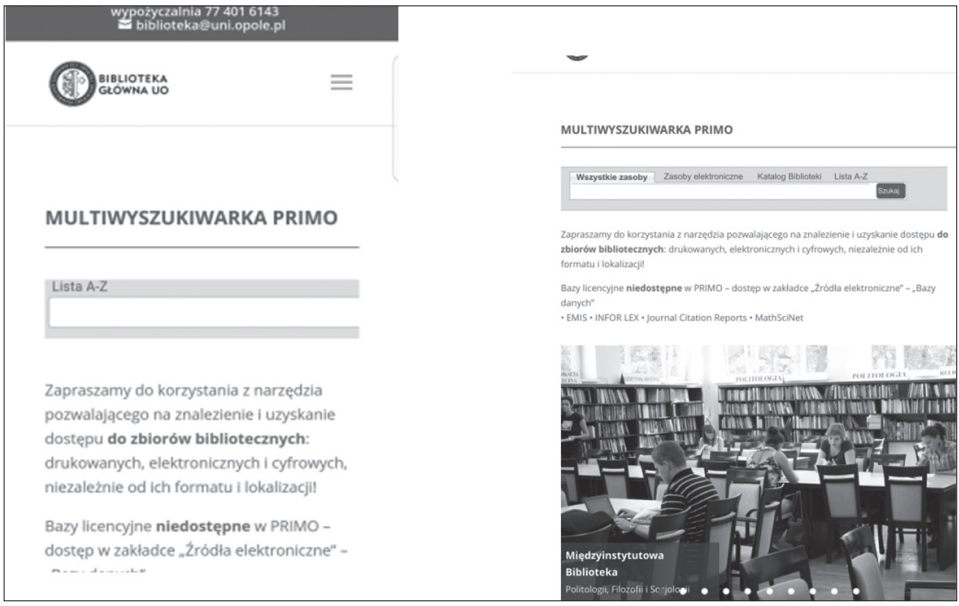

Chart 5. Home page of the BGUO mobile portal (from the left S7, iPad)
Source: BGUO portal (own materials).

1.2. Proper contrast between the background and the text

All services scored the highest in this category obtaining the maximum number of points i.e. 6.

1.3. Graphical elements and high-quality illustrations

Also in this category, the portals received the same number of points this time, i.e. 3. Each of the portals has the same problem, namely a regression of quality of all graphical elements except for the function and interface elements.

1.4. The most important information is also available in the area of a single screen

The scope of elements offered by the evaluated portals in a single screen of the start page is similar. The highest, maximum scope was received by BUL and BUwT. Although the BGUO portal has the same solution as BUwT, its functioning is burdened with minor issues. Access to the menu is problem–free; differences can be seen when using the resources using the search engine. Its field on the main test device is cut half way through and instead of 4 selection options there is only one, i.e. the *A-Z List*. On the other hand, on the iPhone, in order to see the entire field, it is necessary to zoom out the page or to scroll it to the side. All selection operations are available; however, the user, seeing that the page fits the screen width, may not regard it as necessary to change to page view and hence decide that the tool is incomplete. The greatest reservations are raised with respect to one of the screens of the BGUMCS portal. On the top of it, there is a bar with the menu button and a search field. This library portal is part of the university web portal and the above-mentioned tools concern the entire portal. The search field is an external browser of the university portal and the menu is only in part a library portal, which will be discussed in detail later on. Only in the middle of the screen there is a menu equivalent which is not part of the portal and on the first screen there is only half of it. The search engine does not even fit the area of the other full screen of smartphone.

2. Navigation

2.1. Logical menu layout

The aspects determining the usefulness of the menu is the name of categories and sub-categories as well as the depth of creation. The category names should clearly indicate their content. The width and depth should fall within the smaller yet transparent value range without rendering the navigation difficult. The menu layout is understandable for the user (expert) in each of the analysed services and therefore all of them received 6 points.

2.2. Suitable size of buttons

The size of the function buttons on the portals which are also adapted to mobile devices is correct for all institutions subject to evaluation. Regardless of the device, the function buttons were easy and comfortable to use.

2.3. Intuitive page service

Considered in this criterion were different aspect of operation of the mobile service. Special attention was drawn to the elements which were not correctly operating which can distort intuitive use of the portal. The BGUO portal received 6 points, next was the BUwT portal with 4 points while the BGUMCS and BUL sites scored 3 each. The BUwT portal lost 2 points due to incomplete operation of the menu. It consists of subcategories which, if selected, display a list of their further subdivision. This solution does not work on the devices with iOS. It is inconvenient and requires the performance of a larger number of steps, which has an adverse effect on both intuitive handling and comfort of work with the portal. The main problem with the intuitive nature of the BGUMCS is the exposure at the top of the browser page, which is the internal browser of the university portal. The majority of users will think, and quite rightly, that it is a tool handling the library resources. The button, which is next to it, covers the menu and, as mentioned before, it mainly concerns the content of the entire portal and not only the part intended for the library. The loss of 3 points by BUL is due to the manner of initiation of the mobile application. The aforesaid process is not automatic, the application does not recognise the device type used to access the site, or these mechanisms handle too small a scope of variables focusing on mobile phones in a traditional sense without a touchscreen. So, the Google browser navigates the user to the traditional version of the application. Navigation to the version dedicated to mobile devices is by selecting a smartphone icon in the right-hand corner of the site.

3. Functionality

The notion of service functionality may be linked with technical issues invisible for the users as well as their efficient handling. To this end the functionalities where the most intuitive service is particularly important were examined.

3.1. The site starts and responds quickly

With respect to quickness of operation, all mobile services are similar. Each portal scored 6 in this category, which means quick and efficient operation. This may change when using data transmission in the mobile network where throughput depends on the current reach of the network.

3.2. Easy-to-find functions/services/information

As emphasised in the preceding parts, during the use of the library services on a smartphone, the important thing is fast and possibly simple reaching of the searched content. To determine how easy it is to reach certain functions or information, the portals in questions were verified with a view to three criteria such as: possibility to use a language in the portal, finding the search field enabling the search of the library catalogue, navigating to the online catalogue page and finding the contact number to library information.

Table 1

Detailed presentation of the criterion of easy finding the required function/service/information

Searched functionality	**Test device**			**Evaluated Institution**
	Galaxy	iPhone	iPad	
Possibility of changing the language into English	+	+	+	BGUMSC
	-	-	-	BUL
	+	+/-	+	BUwT
	-	-	-	BGUO
Catalogue access	+	+	+	BGUMSC
	+	+	+	BUL
	+	+	+	BUwT
	-	+	+	BGUO
Library information number	-	-	-	BGUMSC
	+	+	+	BUL
	+	+	+	BUwT
	+	+	+	BGUO

Source: Own materials.

Table no. 1 represents the results of evaluation of the portals with a view to the discussed criterion. If finding the information or function was possible, the portal received a plus (+); a negative result was marked as a minus (-). Some of the functionalities did not work/were not displayed correctly or displayed in an incomplete manner. It has to be emphasised that the feature in question focuses solely on search activity and not on the evaluation of the operation of individual elements. The above-mentioned cases shall be provided with a comment.

3.3. Online catalogue service through a meta search engine

The meta search engine can be found in any of the evaluated portals. BGUMCS and BGUO use PRIMO while BUL and BUwT – EBSCOHOST. The operating rules are the same for the user; the meta search engines han-

dle both the licensed resources as well as the library catalogue. In each institution, ordering a book from the own library displays a traditional version of the online catalogue, which, as opposed to the viewing mode in the meta search engine, does not require zooming only when using the tablet and even then, it depends on the preferences and possibilities of the user. A disadvantage, in this case, is an erroneous display of the meta search engine on the BGUO portal when using a device with Android where the option of change to local catalogue search only is not displayed prior to the commencement of the search. To this end, the function of result narrowing has to be used.

3.4. Use of the online catalogue does not require zooming

As mentioned before, the service of the library catalogue is possible through the meta search engine. Only the ordering, reservation and other services linked with the user account require logging in and operation of full catalogue versions, as none of the institutions decided to introduce a solution serving mobile devices. Only the tablet does not require zooming in, but still it is not very convenient.

4 Contents (selected questionnaire characteristics)

Public institutions such as libraries are operated to serve their users. Presented below are the expectations of the users with respect to the portal content and the way they were handled upon introduction and making them available within the scope of mobile portals.

4.1. Availability of phone and address data

To fully utilise the resources of the majority of libraries, they have to be visited in person. Therefore, the respondents observed the need for obtaining basic information about the library. Of course, all the institution makes their phone and address data in the mobile service and finding them does not cause any problem; therefore, each of the evaluated libraries scored the maximum number of points.

4.2. Availability of information concerning facilities for individuals with special needs

The awareness concerning difficulties encountered by the disables is continually growing. The respondents consider it important for institutions such as libraries to provide information on the level of adaptation of the infrastructure and services to the level of needs of individuals with varied levels and kinds of disabilities. Unfortunately, not all of the evaluated institutions were able to fulfil this task. There is no information on the mobile BUL portal; the BGUO site only provides information concerning

the disabled-friendly nature of the web portal. Other portals contain a description of architectural as well as hardware solutions representing a wide range of adaptations of parent organisations to the needs of the disabled.

4.3. Availability of information on copying services on the Internet

To facilitate the use of their resources, some of the libraries introduced a possibility of copying through the Internet. It is another type of information, which cannot be found on the BUL and BGUO portals; the other site though contains some of the elements in the form of information about the price of the scan and a digital photograph on the price list. There is no information on how copies are ordered and delivered to the user. BGUMCS enables making copies through the Internet, but finding relevant information is difficult, as the price list is given in the PDF format. The friendliest portal in this regard is the BuwT portal, which contains the information about prices and technical details regarding making copies and what is most important the form used to order them.

4.4. Access to the online catalogue

Availability of the library online catalogue is a service, which is most required of the academic level library and therefore all the institutions subject to evaluation make such an access possible. The best tool to this end are meta search engines; with them, the resources search process is available through the interface adapted to mobile devices. However, a comprehensive catalogue service (login, account management, order) takes place in its traditional version due to which the comfort of work on a mobile device (especially the smartphone) deteriorates significantly. The most difficult part is access to the catalogue from the level of the home page of the BUL portal because it lacks a suitable link. Only after the search has been completed and publication record open we will see the link: *See in the catalogue.* Other portals have the link in their menus.

4.5. Availability of online catalogue user instruction

Such an instruction is not to be found in any of the portals subject to evaluation. In each case, the instruction on how to use the catalogue is given in the tab entitled *Help*, unfortunately available only in the desktop version. Only on the BGUO catalogue main site, short search guidelines were included, which do not require opening the *Help* tab and are well seen on any of the devices, as the font size used is suitably bigger.

4.6. Availability of information about the possibility of accessing the resources of public nature

Information about the possibility of accessing the open resources is offered by all the portals subject to evaluation except for BUL. Public re-

sources are indicated in various parts of the portals; however, they are usually central and distributed catalogues, repositories of maternal units, references and digital libraries.

4.7. Access to public online digital resources

The relevant information concerning such resources can be found in all public portals except for BUL. Unfortunately, none of the institutions ventured to create a suitable place within the structure of its portals where access to such resources would be provided. It is located in various places.

4.8. Availability of non-public online digital resources

Information about the resources available under the licence, or subscription, proved very worthwhile as in the case of public resources. The libraries make such resources available to authorised users, i.e. users with active reader account or computers connected to university network. Access to non-public resources may be obtained from the meta search engines of each institution but additionally relevant information can be found in the portal content. Again, BUL does not provide separate information while BGUO subscribes certain resources, which can be searched outside the meta search engine.

5. Information quality

Information and services available through the web service should be useful and of quality high enough for the user to be able to use them without any difficulty and to provide information at a suitable quality level, adequate for he needs.

5.1. Availability of basic information concerning library operation

The opening hours and rules for the provision of services have been qualified as basic information. Such information can be found in all the services except that the BUL portal does not provide access to the rules.

5.2. Availability of information concerning services offered by the library

In order to determine the level of satisfaction of the aforesaid characteristics with a view to the information concerning search upon request, contact form *Ask librarian* and information about new items (Table no. 2).

The BUL and BGUO portals scored 0 although the latter one offers the *Ask librarian* option. Other portals scored 1 because BGUMCS lacks contact form and BUwT's does not provide information about the search service.

Table 2
Detailed presentation of the criterion of easy finding the required function/service/information

	Evaluated institution			
Searched information	BGUMCS	BUL	BUwT	BGUO
Searches	+	-	-	-
Ask librarian	-	-	+	+
New items information	+	-	+	-

Source: Own materials.

Final results

It is clear that each of the institutions made mistakes when developing their portals, which are reflected in the final result of the research. The final evaluation was presented in stages. As first were presented the results achieved by the portals in individual groups of features. In the end, the score was totalled – thus, the best among the university library mobile portals qualified for the research was selected. Scored points were expressed as a percentage of the maximum number of points to be won.

1. Site appearance

With regard to site appearance, the highest score was obtained by BUL, i.e. 87,5% (21/24p.) of criteria satisfaction. The poorest result was achieved by BGUMCS with 66,7% (16p.) satisfaction, which was not a bad result after all.

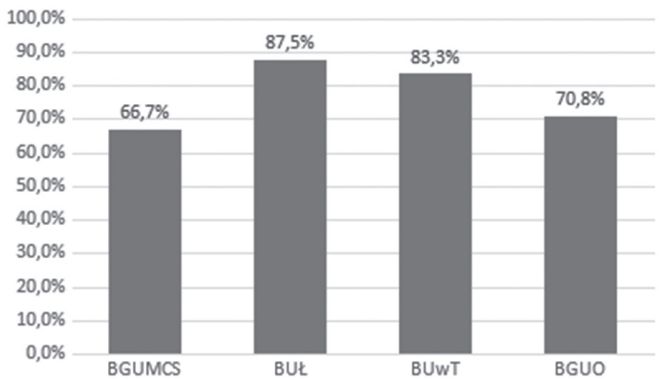

Chart 6. Level of satisfaction of the site appearance criteria by the portal subject to evaluation
Source: Own materials.

2. Navigation

The most navigation friendly portal is the one developed by BGUO. It scored the maximum, i.e. 18 points staying far ahead of the "worst" por-

tals of BGUMCS and BUL, exceeding them by nearly 17 percentage points. It has to be emphasised that all of the evaluated portals are easy to navigate and intuitive – they reached over 80% satisfaction level.

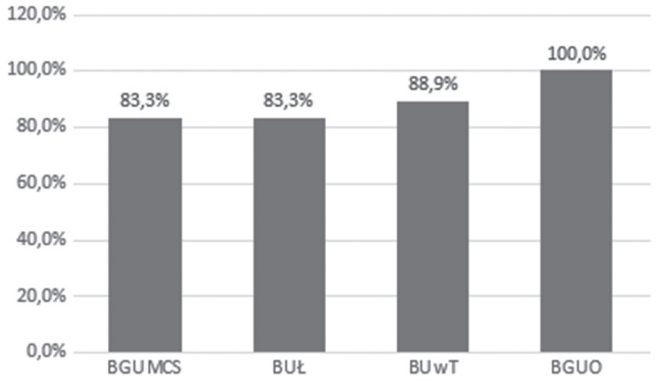

Chart 7. The level of satisfaction of the navigation criteria by the evaluated portals
Source: Own materials.

3. Functionality

Also in this regard, the portals do not differ dramatically. The difference between the best (BUL – 83,3%) and the worst (BGUO – 70%) portal is a little over 13 percentage points. It is worth noting that none of the portals subject to evaluation satisfied the evaluation criteria fully and a significant issue was linked with the contact scaling on smartphones.

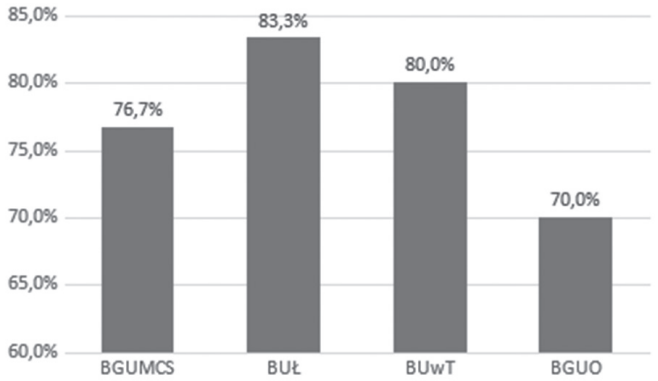

Chart 8. Level of satisfaction of the functionality criteria by the portals subject to evaluation
Source: Own materials.

4. Content

Content requirements of the potential portal users proved to be difficult to satisfy when using a mobile service. The responsive portals did best in

this regard and did not differ significantly depending on the device they were used on. The best among them was the BUwT portal with the user satisfaction level at 83,3%. The second best was BGUMCS portal with 68,8% satisfaction. The BGUO portal scored 50%, and BUL 37,5%. The first one is highly deficient; however, the BUL portal is much below expectations of the modern users of the library mobile portal.

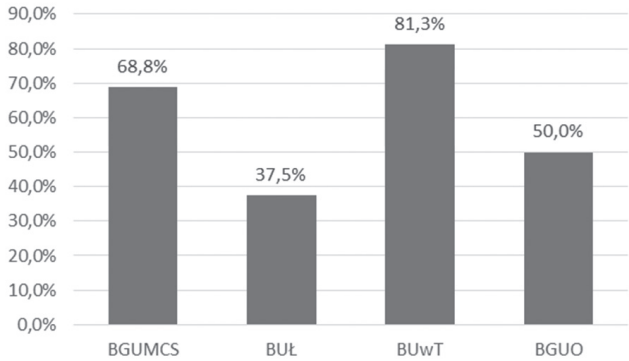

Chart 9. Level of satisfaction of the content requirements by the evaluated portals
Source: Own materials.

5. Information quality

The quality of information in nearly all the services is on a high, more or less the same level, which is 75%. Only the BGUO portal had a poorer result, i.e. 50%. Based on the foregoing, it can be said that the information contained in the service is incomplete and has certain lacks, which may be annoying for some of the users.

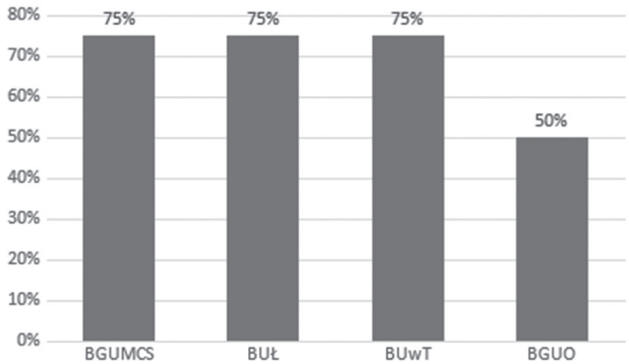

Chart 10. Level of criteria satisfaction by the evaluated portals with regard to information quality
Source: Own materials.

The qualitative and heuristic score is given in Appendix C.

6. Final results

Chart no. 11 presents the results achieved by the individual portals in all of the categories subject to evaluation. The breakdown also enables an even better comparison of the results in individual categories.

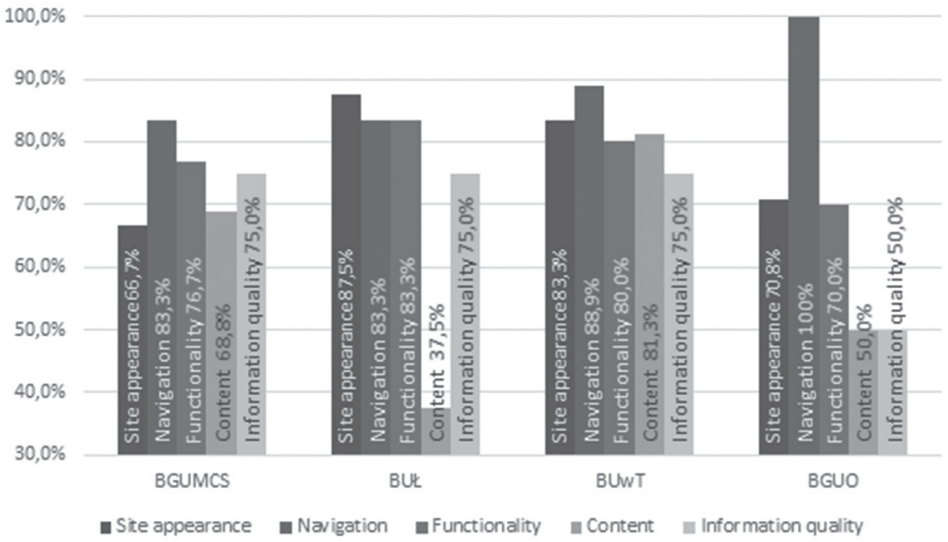

Chart 11. A comparison of the criteria satisfaction level within the evaluated categories for the individual portals

Source: Own materials.

Table 3

The final score achieved by the portal subject to evaluation

Name of the evaluated institution	BGUMCS	BUL	BUwT	BGUO
Evaluation score	68	70	76	66
Maximum score to be achieved: 92				
Score in percentages	approx. 73,9%	approx. 76,1%	approx. 82,6%	approx. 71,7%

Source: Own materials.

The portal, which scored the best, was that of the University Library in Torun (BUwT) with the final result of 76 points (82,6%) although it scored the highest only in one of the criteria, i.e. the content. However, considerable deficiencies of other portals in this regard enabled the portal from Torun to gain a considerable advantage. The second was the portal of the Lodz University Library (BUL) with 70 points (i.e. 76,1% of the maximum score). It did well in the research because it is the only service dedicated to mobile devices. It was also one of the reasons it did not win because the content of the mobile version was reduced to an absolute minimum.

Other services representing the Main Library of Maria Curie-Skłodowska University (BGUMCS) and the Main Library of Opole University (BGUO) had similar results, i.e. 68 and 66, respectively, which is 73,9% and 71,7% of the total number. The BGUO portal represents a higher level of technical and visual aspects while BGUMCS focused on the issues linked with information availability.

Discussion

In view of the general, mobile access to information, libraries are required to respond to the trend so the users can utilise the content and resources offered by them with pleasure and so they wish to do it again and again. Taking the results of the evaluations into account, it can be said that they will be able to face the challenge. Despite differences, all of the portals had results above 70%, which should be regarded as a success. It means that the level of services that will satisfy the needs of the majority of users and what follows will enable to build their positive experience and opinion linked with access to information.

Contribution and Limitations

This study has significant contributions to both the academics and practitioners. For academics, this study provides one of the first research studies on the quality evaluation of mobile university libraries in Poland. For researchers, it may be an invaluable material showing the key criteria for an evaluation of the usefulness of the university library mobile services containing guidelines with respect to their use and application. It also shows the requirements of the university library mobile portal users with respect to content. For practitioners, our findings also provide insight on how to design better library mobile websites. The conducted research enabled to identify the positive and negative aspects of the evaluated portals and to determine the difficulties a user may encounter while using the library portals on a smartphone or tablet. Looking at the evaluation results in individual criteria groups, certain tendencies can be observed affecting the attractiveness and quality of the mobile portals. They may, therefore, be helpful when creating them in the future. This study also has its limitations. Not all university libraries with a view to their site mobility were subject to research – only selected libraries were analysed, i.e. the largest ones. In addition, this study is exploratory in nature and subjective to our judgement, though we are experienced users and some of the selected criteria were consulted with the library site users.

CONCLUSION

Our model of quality assessment criteria and benchmarking methods are utilised to evaluate the usability of mobile library websites. The questionnaire results show that users attach considerable importance to the content provided by the mobile portals of university libraries. Therefore, in addition to the usability evaluation, it is also worth looking at certain content values of each portal. As a result, we showed the leader among the evaluated sites and provided some suggestions for improving the mobile websites. Finally, we also discussed the theoretical contributions and practical implications of this study, the limitations, and the future research directions.

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Appendix A – R. Sapa Criteria

Part I Content

1. Library and traditional resources on the WWW site
2. OPAC
3. Electronic resources available online solely for the authorised users
4. Electronic resources publicly available
5. Information services
6. Handling of the process linked with obtaining resources unavailable in a given library
7. Education and instruction
8. Scientific and professional activity
9. Communication space
10. Library and service promotion
11. Customer (user) service
12. University virtual information environment element

Part II Usability

1. Transparency
2. Communicativeness
3. Coherence and consistence
4. Prevention
5. Navigation tools
6. Skilfulness
7. Sequentiality
8. Flexibility
9. Up-to-datedness

Appendix B – Results of the questionnaire

Characteristics subject to evaluation	No, of "YES" responses	Demand for characteristics [in %]
Online catalogue availability	76	97,4%
Possibility of logging to the library account	74	94,9%
Comprehensive nature of handling of the online catalogue (search, reading descriptions, ordering)	72	92,3%
Information about the possibility of accessing the electronic resources publicly available	70	89,7%
Public, online availability of digital resources (books, magazines)	70	89,7%
Online availability of resources (books, magazines) which are not publicly available (solely academic staff and students)	63	80,8%
Basic phone and address data	63	80,8%
Information about the rules of resource availability	62	79,5%
Information about facilities and solutions intended for specific user groups	61	78,2%
Internet copying services	59	75,6%
Online catalogue use instruction	59	75,6%
Information about the subjects, profile and scope of publicly available databases	59	75,6%
It system use instruction (use of digital resources and electronic databases)	58	74,4%
Organisation of access to information enabling search of books and magazines in other libraries	57	73,1%
Reference to a repository (collection) of research papers by academic staff	55	70,5%
Information concerning availability of electronic resources which cannot be publicly accessed (solely for the academic Staff and students)	54	69,2%
Instruction for the use of the library system (i.e. the network of libraries: main and faculty libraries)	54	69,2%
Information concerning use of the resources and collections	51	65,4%
Organisation of access to information search tools in the WWW environment	51	65,4%
Access to the sites of other universities	51	65,4%
Information concerning the right and duties of the user	49	62,8%
Information about the profile, subjects and scope of publicly unavailable databases (solely for academic staff and students)	48	61,5%
Organisation of access to WWW portals of other libraries	46	59,0%
Information on information services prided by the library	44	56,4%
Availability of materials for the media	41	52,6%
Information about new items available in traditional and electronic version	39	50,0%
Current information on library events	35	44,9%
Presentation of the structure of operation (sections) of the library (with a brief description)	29	37,2%
Presenting the structure of library staff	16	20,5%

Appendix C – Catalogue of research evaluation criteria:

1. Site appearance
    1. Attractive artwork.
    2. Adequate contrast between the background and the text.
    3. Graphical elements and high-quality illustration.
    4. Key information available within a single screen.
2. Navigation
    1. Logical menu layout.
    2. Suitable size of function keys.
    3. Intuitive use.
3. Functionality
    1. Site starts quickly and is responsive.
    2. The required function/service/information is easy to find.
    3. Using the site does not require change of its size.
    4. Use of the online catalogue does not require zooming in.
    5. Use of the catalogue through a meta search engine.
4. Content
    1. Availability of phone and address data.
    2. Availability of information about facilities for users with special needs.
    3. Availability of information about copying services through the Internet.
    4. Online access to the catalogue.
    5. Availability of online catalogue use instruction.
    6. Availability of information about a possibility of accessing the public electronic resources.
    7. Online access to public digital resources.
    8. Online access to non-public digital resources.
5. Information quality
    1. Availability of basic information about library operation.
    2. Availability of information about information services provided by the library.

Artykuł w wersji poprawionej wpłynął do Redakcji 23 maja 2018 r.

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ANALIZA HEURYSTYCZNA MOBILNYCH STRON INTERNETOWYCH POLSKICH BIBLIOTEK UNIWERSYTECKICH

SŁOWA KLUCZOWE: Mobilne strony internetowe. Biblioteki uniwersyteckie w Polsce. Analiza heurystyczna. Benchmarking. Interfejs użytkownika. Urządzenie mobilne. Telefon komórkowy.

ABSTRAKT: **Teza/cel artykułu** – Zagadnienie oceny uniwersyteckich usług mobilnych nie zostało jeszcze dokładnie zbadane, zwłaszcza w Polsce. Takie badania należy jednak prowadzić, ponieważ coraz więcej użytkowników stron internetowych bibliotek uniwersyteckich – a przede wszystkim studentów – korzysta z urządzeń mobilnych w poszukiwaniu potrzebnych informacji. Mobilne wersje uniwersyteckich stron internetowych nie stały się w Polsce do tej pory szczególnie powszechne. Tylko 4 z 10 największych polskich bibliotek uniwersyteckich posiada mobilne strony internetowe. W artykule przedstawiono analizę ich jakości w celu rozpoznania najlepszych rozwiązań. **Metoda badań** – Zastosowano metodę jakościowo-heurystyczną i benchmarking. Kwestionariusz badania obejmował zarówno zawartość stron internetowych, jak i funkcjonowanie usług. **Wyniki i wnioski** – najlepsze usługi mobilne świadczy Biblioteka Uniwersytecka w Toruniu; pozostałe strony bibliotek okazały się mniej atrakcyjne, głównie z powodu ograniczeń związanych z dostępnością informacji. Jednak żaden z ocenianych serwisów nie otrzymał maksymalnej liczby punktów. Wyniki badań pokazują, które elementy mobilnych stron bibliotek wymagają poprawy.