

# How faculty from Rijeka and Split use Web-based scientific literature: analysis based on four variables

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**Abstract** - We have explored the extent to which faculty use various web sources of scientific literature. The findings were analyzed in relation to four variables: age and gender of study participants; field of science in which they work; their practices of exchanging scientific literature. The questionnaire was sent to employees at the Faculties of Humanities and Social Sciences, as well as to the employees of various science faculties in Croatian cities Split and Rijeka. It was found out that there are significant differences in use of web portals. More than half of participants from the fields of social sciences and humanities use very frequently Croatian portal Hrčak, in relation to only 4% of participants from the field of natural sciences. For participants in humanities the Croatian portals are most important. Scientists from the field of social sciences mostly use foreign portals. Scientists from the field of natural sciences are the most frequent users of pirate portals. It was established that older participants use most frequently Croatian portals. Younger participants most frequently use foreign and pirate portals. Croatian and foreign web portals are most frequently used by female participants, while male participants are most frequent users of pirate portals.

**Keywords** - *web sources of scientific literature; faculty; Hrčak; Google*

## I. INTRODUCTION

Various web sources of scientific literature are available to faculty in Croatia. However, there is not much research about the use of these web sources by faculty. One of the few scientific papers on this topic is written by M. Duić, B. Konjevod and L. Grzunov. In this paper, published in 2017, the research goal was exploring to what extent scientists and teachers at the Faculty of Humanities and Social Sciences, as well as at the Faculty of Science at University of Zagreb, use various web sources of scientific literature [1]. Authors also explored their practices and attitudes related to availability and use of scientific literature accessible on the web. The findings have shown that Google scholar is the most popular web source for finding and accessing literature. Participants often use other web sources, such as, Research Gate, Science Direct, Hrčak, Academia.edu, DOAJ. There were also approximately one fifth of participants who use pirate web portals, such as, Sci-Hub and Library Genesis. It is important to note that huge majority of participants

confirmed that they are not satisfied with the offer of international scientific literature which is available in Croatia through subscription by scientific institutions.

## II. AVAILABILITY OF SCIENTIFIC LITERATURE IN CROATIA

The finding that huge majority of study participants are not satisfied with the offer of scientific literature is alarming. These study participants are members of the most reputable and largest faculties at University of Zagreb and therefore it could be expected that they should have an adequate access to scientific literature. But majority of them claim that there they don't have adequate access[1]. Based on that finding, the following question could be asked: If the faculty doesn't have adequate access to scientific literature, how could they achieve their scientific and teaching goals? The same question could be asked in relation to other faculty members in Croatia. Although there is deficiency of research studies about this topic, it could be assumed that this problem is present not only in most reputable and large Croatian faculties, but in other faculties as well. It is important to notice that this problem of unavailability of scientific literature could be more pronounced in countries, such as Croatia, which doesn't have sufficient financial resources to cover the expenses for expensive subscriptions for web databases containing scientific literature. However, even scientific organizations in economically more developed countries have financial problems with payment of these subscriptions. For example, an advisory council of reputable Harvard University claims that largest scientific publishers have made scientific communication unsustainable and limiting for academic activities. Therefore, the university wants that its scientists publish papers in open access journals [2]. The problem of expensive, unsustainable subscriptions for scientific databases is described in literature as *the publishing crisis*. I. HebrangGrgićdescribes the problem in more detail [3] [4]. She states that long before the advancement of digital publishing, commercial publishers were buying many scientific journals. Their goal was to rise up the prices of journal subscriptions and acquire more profit. Gradually, the high prices have caused canceling of subscriptions by libraries and other institutions. These processes have led to insufficient availability of information for scientists. If some subscribing institution doesn't have enough

financial power or the institutional will to pay for the subscription, researchers and teachers will stay without access to scientific papers and other materials which they need for their work. They are therefore motivated to find alternative ways for accessing the required literature. One possibility is to ask other Croatian or foreign researchers and teachers to send them literature. Another possibility is that they buy required literature at their own expense which is a legitimate way, but it is probably not financially sustainable. They could also try to find required literature by using free web sources, such as, Croatian portal of open access literature Hrčak [5]. Or they could use international portals, such as, Google Scholar [6], ResearchGate [7]. They could even use pirate, hidden digital libraries. Pirate libraries are digital libraries which contain a huge amount of digital texts often deposited without consent of copyright owners [8]. In these libraries the texts are freely available. They have many users from each part of the world. There are even used by many users from economically more developed, very rich countries [9]. Large and popular pirate digital libraries are Library Genesis [10] and Sci-Hub [11]. In this study we will explore the frequency of faculty's use of all these various web sources of scientific literature.

### III. RESEARCH METHODOLOGY

The research goal of this paper is to explore the faculty' use of various web sources of scientific literature in relation to four variables. The research results were analyzed in relation to the following four variables: age of study participants (participants who don't have more than 39 years; participants who are at least 40 years old); gender of participants; field of science in which participants are working (social sciences, humanities, natural sciences); participants' practices of exchanging scientific literature (how often participants ask other persons to send them scientific literature). To acquire these insights, the questionnaire was sent to employees with teaching and research responsibilities at the two Faculties of social science and humanities in two big Croatian cities - Split and Rijeka [12] [13], as well as to the employees with teaching and research responsibilities of various science faculties in Split and Rijeka [14] [15]. The questionnaire was available on web and at the beginning of July 2017 the request for participating in this survey was sent by e-mail to 642 faculty employees: 281 e-mails for employees in Split, 361 e-mails for employees in Rijeka. During July and August 2017, the questionnaire was completed by 108 employees who work in different domains of knowledge, primarily in natural sciences, social sciences and humanities. About 17% of faculty employees filled the survey. Therefore, the findings acquired through this research are representative.

The questionnaire consisted of 19 questions and some of them contained additional questions. Through these open and closed questions we explored: demographic characteristics of participants (age, gender, work position...); frequency of use of particular web sources (Google Scholar, Research Gate, DOAJ, Hrčak, university library portals, pirate web portals...); frequency of asking other people to send them scientific literature; opinions about topics related to use of web for acquiring scientific

literature: satisfaction with availability of scientific literature in Croatia; opinions about subscription to scientific databases, opinions about open access to scientific literature, etc. The questions were based on literature review, as well as personal insights and experiences about practices and important issues related to the topic. Namely, author of the paper is also a teacher and researcher at Croatian university and therefore had a good opportunity to gain many insights and experiences about faculty practices and opinions related to use of web sources of scientific literature.

The survey was anonymous because it allows participants to give more sincere answers about their practices and opinions. The anonymity is especially important because some delicate questions were asked. For example, participants were asked to express their practices and opinions related to use of illegal, pirate portals. Many findings were acquired through this survey, therefore, in this paper only part of these findings is presented and analyzed: the findings related to four variables mentioned at the beginning of this chapter.

### IV. FINDINGS

Among 108 participants who answered the questionnaire there were about 65% female participants. The majority of study participants are 30 to 39 years old (about 43%). There are about 17% participants that are 40 to 49 years old, about 17% participants that are 50 to 59 years old and about 15% participants that are 20 to 29 years old. The questionnaire was filled by about 35% of participants who work at the University of Split and about 57% of participants who work at the University of Rijeka. It wasn't determined in which institution other study participants are employed. The majority of study participants are working in the field of social sciences (37%), there are about 31% of participants from the field of humanities and 22% of participants from the field of natural sciences. The smallest percentage of participants are working in the fields of technical sciences (about 6%) and interdisciplinary sciences (about 4%).

#### A. Analysis based on first variable: field of science

In Table 1 participants' answers are presented in relation to three fields of science in which majority is working: humanities (30.6% or 33 participants), natural sciences (22.2% or 24 respondents), and social sciences (37% or 40 participants).

In the first line of Table 1, we can see how often study participants use web portal Google scholar to access scientific literature. Participants were giving grades from 1 to 5 for this and other statements in questionnaire. Grades 1 and 2 indicate that they never or almost never use Google Scholar, while grades 4 and 5 indicate that they often or very often use that portal. It is important to note that same meaning of grades applies to all survey statements. Already at this first question, answers indicate significant behavior difference between participants from different fields of science. Namely, results indicate that 60% of participants from the field of social sciences often or very often use Google Scholar, in relation to about 37%

of participants from the field of humanities and social sciences. In the second line of Table 1, we can see how often study participants use portal ResearchGate to access scientific literature. There are only about 15% of participants from humanities who often or very often use this portal, in relation to 50% of participants from the field of natural sciences and 65% of participants from the social sciences who are the most frequent users of ResearchGate. In the third line of Table 1, we can see how often participants use portal Hrčak to access scientific literature. About 75% of participants from humanities often or very often use this portal, in relation to 65% of participants from the field of social sciences. Interesting finding is that there is not even one participant from the field of natural sciences who often or very often uses Hrčak. In the fourth line of Table 1, we can see how often participants ask authors to send them their published texts. Participants from the field of social sciences most frequently engage in this activity. There are about 32% of these participants who often or very often ask authors to send them texts. They are followed by participants from the field of natural sciences (25%), while the least inclined to engage in this activity are participants from the field of humanities (about 12%). In the fifth line of Table 1, we can see how often participants ask persons from Croatia who are not authors of requested texts, to send them these texts. Participants from the field of social sciences and natural sciences most frequently engage in this activity. There are about 25% of these participants who often or very often ask persons from Croatia to send them texts. The least inclined to engage in this activity are participants from the field of humanities (about 6%). In the sixth line of Table 1, we can see how often participants ask persons from abroad who are not authors of requested texts, to send them these texts. There are about 25% of participants from the fields of social and natural sciences who often or very often ask persons from abroad to send them texts. There are about 18% of participants from the field of humanities who often or very often ask persons from abroad to send them texts.

In three last lines of Table 1, we can see how often study participants use three types of web portals for accessing scientific literature: Croatian portals, foreign portals, pirate portals. In the seventh line of Table 1, we can see how often participants use Croatian web portals. These portals are mostly used by participants from the fields of humanities and social sciences - about 63% of participants use them often or very often. It is interesting that Croatian portals are often or very often used by only about 4% of participants from the field of natural sciences. In the eighth line of Table 1, we can see how often participants use foreign web portals. These portals are mostly used by participants from the field of social sciences - about 85% of participants from this field use them often or very often, in relation to about 70% of participants from the field of natural sciences and about 48% of participants from the field of humanities. In the ninth line of Table 1, we can see how often participants use pirate web portals. These portals are mostly used by participants from the field of natural sciences - about 33% of participants from this field use them often or very often, in relation to about 27% of participants from the field of

social sciences and about 24% of participants from the field of humanities.

TABLE I. PARTICIPANTS' ANSWERS IN RELATION TO THE FIELD OF SCIENCE IN WHICH THEY ARE WORKING

	Humanities		Natural sciences		Social sciences	
	Sources of literature		Sources of literature		Sources of literature	
	grade 1 & 2	grade 4 & 5	grade 1 & 2	grade 4 & 5	grade 1 & 2	grade 4 & 5
Google Scholar	36.4%	36.4%	37.5%	37.5%	28%	60%
Research Gate	60.6%	15.2%	33.3%	50%	20%	65%
Hrčak	3.1%	75.8%	79.2%	0%	17.5%	65%
Request to auth.	63.6%	12.1%	58.3%	25%	50%	32.5%
Request to pers. in Cro.	72.7%	6.1%	62.5%	25%	52.5%	25%
Req. to persons from ab.	60.6%	18.2	58.3%	25%	55%	27.5%
Croatian web por.	12.1%	63.6%	83.3%	4.2%	17.5%	62.5%
Foreign web por.	21.2%	48.5%	29.2%	70.8%	7.5%	85.1%
Pirate web por.	70.1%	24.2%	58.3%	33.3%	62.5%	27.5%

grade1 = never, gr. 2 = almost never, gr. 4 = often, gr. 5 = very often

#### B. Analysis based on second variable: age of participants

In Table 2 participants' answers are presented in relation to their age. The answers of participants who don't have more than 39 years are presented, in relation to the answers of participants who are at least 40 years old. There are 62 participants (57.4%) who don't have more than 39 years, and there are 38 participants (42.6%) who are at least 40 years old.

In the first line of Table 2, we can see how often study participants use portal Google scholar for accessing scientific literature. Younger participants use considerably more often this portal - about 53% of younger participants (up to 39 years of age) often or very often use this portal, in relation to about 34% of the older participants (40 years of age and older). In the second line of Table 2, we can see how often participants use portal ResearchGate for accessing scientific literature. About 50% of younger participants often or very often use this portal, in relation to 33% of older participants. In the third line of Table 2, we can see how often participants use portal Hrčak for accessing scientific literature. Here, the situation is somewhat different. There are about 56% of older participants who often or very often use this portal, in relation to 47% of younger participants. In the fourth line of Table 2, we can see how often participants ask authors to send them their published texts. In this activity there is also primacy of older participants of which 33% often or very often ask authors, in relation to about 15% of younger participants. Older participants are also more inclined to ask texts from people who are not authors, but who could have them. Namely, in the fifth line of Table 2,

we can see how often participants ask persons from Croatia who are not authors of requested texts, to send them these texts. About 24% of older participants often or very often ask them for texts, in relation to about 13% of younger participants.

In the sixth line of Table 2, we can see how often study participants ask persons from abroad who are not authors of requested texts, to send them these texts. About 33% of older participants often or very often ask them for texts, in relation to about 16% of younger participants. In the seventh line of Table 2, we can see how often participants use pirate web portal Sci-Hub. Younger participants are much more often using this portal - about 24% of younger participants use it often or very often, in relation to about 9% of older participants. In the eighth line of Table 2, we can see how often participants use pirate web portal Library Genesis. It is interesting that this portal is used evenly by young and old participants - about 15% of all participants use it often or very often.

TABLE II. PARTICIPANTS' ANSWERS IN RELATION TO THEIR AGE

	Participants who don't have more than 39 years		Participants who are at least 40 years old	
	Sources of lit. grade 1 & 2	grade 4 & 5	Sources of lit. grade 1 & 2	grade 4 & 5
Google Scholar	25.8%	53.2%	50%	34.8%
ResearchGate	29.1%	50%	52.2%	32.6%
Hrčak	35.5%	46.8%	23.9%	56.5%
Request to authors	62.9%	14.5%	52%	32.6%
Request to per. in Cr.	62.9%	12.9%	63.1%	23.9%
Req. to per. from abroad	64.5	16.3	52.2	32.6
Sci-Hub	59.7%	24.2%	76.1%	8.7%
Library Genesis	75.8%	14.5%	84.8%	15.2%
Croatian web portals	40.3%	41.9%	26.1%	52.2%
Foreign web portals	14.5%	71%	26.1%	63.1%
Pirate web portals	59.7%	30.6%	71.7%	17.4%

grade1 = never, gr. 2 = almost never, gr. 4 = often, gr. 5 = very often

In three last lines of Table 2, we can see how often study participants use the following types of web portals for accessing scientific literature: Croatian portals, foreign portals, pirate portals. In the ninth line of Table 2, we can see how often they use Croatian web portals. These portals are mostly used by older participants - about 52% of older participants use them often or very often, in relation to about 42% of younger participants. In the tenth line of Table 2, we can see how often participants use foreign web portals. In opposition to Croatian portals, the foreign portals are mostly used by younger participants - 71% of younger participants use them often or very often, in relation to about 62% of older participants. In the eleventh line of Table 2, we can see how often participants use pirate web portals. These portals are also mostly used by younger participants - about 31% of younger

participants use them often or very often, in relation to about 17% of older participants.

### C. Analysis based on third variable: gender of participants

In Table 3 participants' answers are presented in relation to their gender. There were 65.7% or 71 female participants and 34.3% or 37 male participants. In the first line of Table 3, we can see how often participants use portal Google scholar for accessing scientific literature. Female participants are the most frequent users of this portal - about 53% of female participants often or very often use Google scholar, in relation to about 30% of male participants. In the second line of Table 3, we can see how often participants use portal ResearchGate for accessing scientific literature. Female participants are also the most frequent users of this portal. There are about 51% of female participants who often or very often use ResearchGate, in relation to about 27% of male participants. In the third line of Table 3, we can see how often participants use portal Hrčak for accessing scientific literature. The difference in favor of female participants is even more pronounced. It is used often or very often by 62% of female participants, in relation to about 30% of male participants.

TABLE III. PARTICIPANTS' ANSWERS IN RELATION TO THEIR GENDER

	Woman		Man	
	Sources of literature grade 1 & 2	grade 4 & 5	Sources of literature grade 1 & 2	grade 4 & 5
Google Scholar	25.4%	53.5%	56.8%	29.7%
ResearchGate	31%	50.7%	54.1%	27%
Hrčak	21.1%	62%	48.7%	29.7%
Croatian web portals	22.5%	59.2%	56.8%	21.6%
Foreign web portals	9.9%	74.7%	37.8%	54.1%
Pirate web portals	73.2%	19.7%	48.7%	35.1%

grade1 = never, gr. 2 = almost never, gr. 4 = often, gr. 5 = very often

In three last lines of Table 3, we can see how often study participants use three types of web portals to access scientific literature: Croatian portals, foreign portals, pirate portals. In the fourth line of Table 3, we can see how often they use Croatian web portals. These portals are mostly used by female participants - about 59% of female participants use them often or very often, in relation to about 22% of male participants. In the fifth line of Table 3, we can see how often participants use foreign web portals. It is interesting that these portals are also considerably more often used by female participants - about 75% of female participants use them often or very often, in relation to about 54% of male participants. In the sixth line of Table 3, we can see how often participants use pirate web portals. These portals are more often used by male participants - about 35% of male participants use

them often or very often, in relation to about 20% of female participants.

#### D. Analysis based on fourth variable: practices of exchanging scientific literature

In Table 4 participants' answers are presented in relation to the frequency with which they are asking other people to send them scientific literature. In "Part 1a" and "Part 1b" of Table 4, we can see characteristics and answers of participants who almost never or never ask other people to send them scientific literature. There are 38.9% of participants who belong to this group, i.e., 42 participants who answered with grades 1 and 2, the following question: How often they ask other people to send them literature? In "Part 2a" and "Part 2b" of Table 4, we can see characteristics and answers of participants who often or very often ask other people to send them scientific literature. There are about 9.3% of participants who belong to this group, i.e., 10 participants who answered with grades 4 and 5, the following question: How often they ask other people to send them literature?

TABLE IV. PARTICIPANTS' ANSWERS IN RELATION TO THEIR PRACTICES OF EXCHANGING SCIENTIFIC LITERATURE

	Part 1a. Participants who never or almost never ask others to send them scientific literature		Part 2a. Participants who often or very often ask others to send them scientific literature	
	Participants' characteristics		Participants' characteristics	
Woman	64.3%		90%	
Man	35.7%		10%	
Social sciences	28.6%		60%	
Humanities	31%		10%	
Natural sciences	26.2%		30%	
	Part 1b. Sources of literature		Part 2b. Sources of literature	
	grade 1 & 2	grade 4 & 5	grade 1 & 2	grade 4 & 5
Google Scholar	45.24%	31%	10%	70%
ResearchGate	45.2%	33.3%	20%	70%
Sci-hub	76.2%	16.7%	60%	0%
Croatian web portals	42.9%	38.1%	10%	70%
Foreign web portals	33.3%	52.4%	10%	80%
Pirate web portals	73.8%	16.7%	60%	20%

grade 1 = never, gr. 2 = almost never, gr. 4 = often, gr. 5 = very often

In "Part 1a" of Table 4, we can see characteristics of participants who never or almost never ask other people to send them scientific literature: female - 64.3%; in the field of social sciences - about 28%; in the field of humanities - 31%; in the field of natural sciences - about 26%. In "Part 2a" of Table 4, we can see the characteristics of participants who often or very often ask other people to send them scientific literature: female - 90%; in the field

of social sciences - about 60%; in the field of humanities - 10%; in the field of natural sciences - about 30%. From these findings it is evident that there are considerable differences in characteristics of participants who never or almost never ask other people to send them scientific literature, in relation to characteristics of participants who often or very often ask other people to send them scientific literature.

In "Part 1b" and "Part 2b" of Table 4, we can see answers of participants about the use of particular web portals. We can see that participants, who never or almost never ask other people to send them scientific literature, considerably less often use almost all web portals, in relation to participants who often or very often ask other people to send them scientific literature. Participants who never or almost never ask other people to send them scientific literature are using pirate portals with the similar frequency with which these portals are used by participants who often or very often ask other people to send them scientific literature.

## V. CONCLUSION

Findings indicate that there are significant differences in using web portals, in relation to various groups of study participants. For example, more than 60% of participants from the fields of social sciences and humanities often and very often use Croatian portal Hrčak, in relation to minor 4% of participants from the field of natural sciences. This finding could be explained in various ways: maybe the portal Hrčak doesn't contain many journals from the field of natural sciences; maybe many scientists from that field don't know about existence of Hrčak. Also, the significant factor in explanation of this finding could be that research topics of scientists from the field of natural sciences are more general, less connected with a specific region or country. Namely, they explore natural phenomena which are similar or same in the whole world. Therefore, it is natural that these scientists are primarily oriented to international web portals which contain literature from the whole world.

Another interesting finding is that scientists from the field of social sciences are most frequent users of foreign portals. The pirate web portals are the only portals which are not used most frequently by scientists from the field of social sciences. They use pirate web portals with the similar frequency as scientists from the humanities, while scientists from the field of natural sciences are the most frequent users of pirate portals.

It was also established that older participants are using Croatian portals about 10% more often than younger participants. In opposition to this finding, younger participants are more often using foreign and pirate portals. It is possible that different groups of users have different levels of knowledge about the existence of various types of web portals. This could be an explanation why there is a significant difference in level of use of different types of portals. For example, it could be assumed that many members of scientific community

don't know about the existence of pirate web portals. Another possible explanation could be a difference in attitudes toward acceptability of use of pirate portals. Older participants may be more disinclined to use them because of their illegal status or possible consequences.

Surprising finding is that Croatian web portals are often and most often used by about 60% of female participants and only by about 20% of male participants. There are also considerably more female participants who often or more often use foreign portals, while male participants are more frequent users of pirate portals. Another interesting finding is that female participants are significantly more inclined to ask other people to send them scientific literature. Among the study participants who often and very often ask other people to send them texts, the huge majority are female participants - 90%.

In this research, we didn't explore reasons and circumstances which could explain why there are considerable differences in behavior between various groups of participants. Further research could help to identify and explain these reasons and circumstances. Other aspects could also be explored. For example, practices and opinions of the faculty from other fields of science: art, technical or biomedicine fields.

If we synthesize insights about the most frequent users of three different types of web portals, then these users can be described as: a) the most frequent users of Croatian web portals are participants from the field of social sciences and humanities, participants of older age and female participants; b) the most frequent users of foreign web portals are participants from the field of social sciences, participants of younger age and female participants; c) the most frequent users of pirate web portals are participants from the field of natural sciences, participants of younger age and male participants.

Of course, there also are other profiles of users of these portals, but this compact description of the most frequent users of particular types of portals, could be helpful as a foundation for thinking about how to prepare and conduct additional research about users. It could also be helpful to create activities of building and enhancing specific web portals.

We hope that insights from this research will be helpful for the creation of better web portals and other information sources and for finding new ways to expand the circle of their users. We also hope that these results will be stimulating and helpful for further research on related topics.

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