



Information seeking behaviour in the digital environment: information science vs. non-information science students

Informacijsko vedenje v digitalnem okolju: primerjava študentov informacijske znanosti in študentov drugih družboslovnih smeri

Ivana Furi, Kornelija Petr Balog

Oddano: 9. 1. 2016 – Sprejeto: 11. 4. 2016

1.01 Izvirni znanstveni članek

1.01 *Original scientific paper*

UDK 001.102:004.9(497.543)

Abstract

Purpose: The paper presents selected findings of a small-scale pilot study on the actual information-seeking behaviour of the Osijek University students in the digital environment.

Design/Methodology/Approach: A qualitative research was conducted on the sample of six graduate students of different social science disciplines (information sciences, psychology, economy, cultural management) who were asked to perform searches in order to provide answers to several information tasks. The research method used in the research was a think-aloud method where the respondents were asked to verbalise their thoughts and feelings while performing the simulated search tasks. The respondents were video-recorded and the transcripts of video material were subsequently analysed and interpreted.

Research limitations: The small and convenient sample limits the findings.

Originality/Value: The results provide the useful insight into the information behaviour of students in the electronic environment (their search strategy, search steps, feelings, etc.) but surprisingly reveals the poor information seeking skills of information-science students.

Keywords: *students, information seeking behaviour, digital environment, University of Osijek*

Izveček

Namen: Članek predstavlja izbrane rezultate pilotne raziskave manjšega obsega na temo informacijskega vedenja študentov Univerze v Osijeku v digitalnem okolju.

Metodologija/pristop: Kvalitativna raziskava je bila opravljena na vzorcu šestih študentov različnih družboslovnih smeri (informacijska znanost, psihologija, ekonomija, menedžment v kulturi). Študenti so bili naprošeni, da poiščejo odgovor na nekaj informacijskih nalog. Uporabljena je bila metoda glasnega razmišljanja, pri kateri so sodelujoči verbalizirali svoje misli in občutja med iskanjem informacij. Vedenje raziskovanih oseb je bilo posneto z video kamero, transkripti posnetkov pa so bili analizirani in interpretirani.

Omejitve raziskave: Majhen in priročen vzorec omejuje veljavnost ugotovitev raziskave.

Izvirnost/uporabnost: Rezultati dajejo koristen vpogled v informacijsko vedenje študentov v elektronskem okolju (njihovo strategijo, korake pri iskanju, občutke itn.) toda presenetljivo razkrivajo nizko raven poizvedovalnih spretnosti pri študentih informacijske znanosti.

Ključne besede: študenti, informacijsko vedenje, digitalno okolje, Univerza v Osijeku

1 Introduction

The digital environment has brought new ways and practices of human information behaviour. Human information behaviour is an umbrella term that encompasses both information seeking and behaviours that are passive (Case, 2012). The term itself is defined as the study of how people need, seek, give/transfer and use information in different contexts, including the workplace and everyday living (Wilson, 1999; Pettigrew, Fidel & Bruce, 2001).

This paper is concerned with only one aspect of information behaviour – the aspect of seeking – and that of a special socio-economic group – students. A small-scale pilot study on the sample of six graduate Osijek University students was conducted with the aim to obtain insight into the information seeking behaviour of students in the digital environment. The purpose of the study was to offer helpful insights into the information seeking patterns of the Osijek University students not only for the Osijek University library, but also for all other academic libraries within the University of Osijek. In particular, the information behaviour of information science students¹ is of special interest for our study since in future they will assist others to find, evaluate and access information. The main disadvantage of this study is the small size of the sample and the authors suggest that

¹ The term “information science students” in this paper refers to students studying in the field of information and communication sciences primarily those specialising for work in libraries.

more research should be done in this area before any decisive conclusions could be reached.

2 Literature Review

2.1 General coverage of the information seeking behaviour and of the information seeking behaviour of the Google generation

Information seeking behaviour has been studied since the 1950s, but the early studies concentrated primarily on researchers and scientists. The students' information seeking behaviour has been researched only for the last 30 years or so (Weiler, 2005). The literature offers a number of various theories and models of user information behaviour. The most interesting for our research is the study conducted by Carol C. Kuhlthau. Kuhlthau (1991, 1994) introduced the model of Information Search Process (ISP) as a six-stage process of information seeking behaviour. Her model goes beyond the actions of seeking and she looks at the thoughts, feelings, and actions of the seeker. The emphasis is on the cognitive skills – as they increase, so does the information-seeking effectiveness. She not only identified six stages of information searching, but she also identified feelings associated with those stages: (1) initiation (apprehension, uncertainty), (2) selection (optimism), (3) exploration (possible anxiety); (4) formulation (uncertainty fades), (5) collection (increased confidence), (6) search closure (relief and satisfaction or disappointment). Kuhlthau's model is a result of many years of research, mainly with students, and is therefore of particular interest for our pilot-study. Besides Kuhlthau's ISP model another factor is important for the findings of our study – the fact that the subjects of our study are university students.

The notion of children and young people being confident and “expert” computer users has proliferated Western rhetoric in the past 30 years. In fact, 2000s have been especially focused on child computer user discourse, typified by portrayals of “digital natives” or the “net generation”.

The term “digital native” itself derives from a series of articles written since 2001 by US technologist Marc Prensky. Prensky described the young people born since 1980s as “digital natives” due to their innate confidence in using new technologies (e.g. internet, videogames, telephony, etc.) (Prensky, 2001). Prensky even argues that technology becomes essential to the existence of those young people (or iKids as he also calls them) (Prensky, 2008). Following Prensky's lead some other commentators have emerged offering other terms for the description of young generations such as “born digital” (Palfrey & Gasser, 2008), “homo zappiens” (Veen & Vrakking, 2006), and “net savvy” youth (Levin & Arafeh, 2002).

In addition, some authors use expressions such as “generation M” (media), “generation V” (virtual) or “generation C” (connected, creative and click) when they refer to the young people of the 2000s (Veen & Vrakking, 2006; Roberts, Foehr & Rideout, 2005).

There has been a much talk in academic circles about the research skills, or the lack of thereof, in members of the so-called Google Generation (young people born after 1993) (Nicholas, Rowlands, Clark & Williams, 2011). These young people, who are now students, or are due to arrive at University in the next few years, grew up in an environment dominated by the internet and mobile devices. Their behaviour differs from the behaviour of previous, older, generations who gained their knowledge in a traditional way – through books and libraries, and who often relied on the help of a mediator such as a librarian. These young people are unique because their birth coincides with the introduction of the graphical web that resembles the internet of today. When they are described, they are often portrayed as a “multitasking generation” (Wallis, 2006; Foehr, 2006) since it is likely that their being exposed to online media early in life may have helped to develop good parallel processing skills. However, another question is whether sequential processing abilities, necessary for ordinary reading, are being similarly developed (Rowlands, Nicholas, Williams, Huntington & Fieldhouse, 2008). In addition, those young people are often described as a “collaborative generation” (Tapscott & Williams, 2008) eager to work together toward a common goal and share content.

The findings of a Pew Research Center resulting from a comprehensive research of US teachers and instructors reveal that the majority of teachers (77%) believe that the internet and digital search tools have had a “mostly positive” impact on their students’ research habits. However, 87% say these technologies are creating an “easily distracted generation with short attention spans” (Purcell et al., 2012). Among the more positive impact of digital environment on their students’ research habits and skills teachers and instructors see: the best students access a greater depth and breadth of information topics that interest them and many students become self-reliant researchers (Purcell et al., 2012). However, there are some drawbacks such as the overdependence on search engines, especially Google. This stereotype about the Google generation is further confirmed by the OCLC (College students’ perceptions of the libraries and information resources, 2006) survey that 89% of college students use search engines to begin an information search (while only 2% start with a library web site). In addition, younger students have difficulty in recognizing the quality information (Graham & Metaxas, 2003); students possess potentially diminished critical thinking skills, and majority borrows the work of others with ease (Purcell et al., 2012). The issue of plagiarism is especially problematic and educational institutions must find ways how best

to deal with the generation “why-not” (Straw, 2002). When it comes to libraries, college students still use libraries but they are using them less (and reading less) since they first began using internet research tools (College students’ perceptions of the libraries and information resources, 2006). In addition, they still primary connect libraries with “books”, and are in most cases oblivious to massive investment in digital resources on libraries’ side.

Many stereotypes are connected with the term “Google generations” and the UK CIBER study unveils some of those misconceptions. The study revealed that some of the myths related to younger generations might not necessarily be true. For example, the study found no evidence that the young generations have zero tolerance for delay and that their information needs must be fulfilled immediately. In addition, the study has shown that the statement about young people preferring quick information in the form of easily digested chunks is not true for the participants of the study. Instead, students in the study exhibited a strong tendency toward the shallow, horizontal, “flicking” behaviour. The research also confirmed that young people, although very skilled at using new technology, are not expert searchers (Rowlands et al., 2008). Furthermore, Pew Research Center brings data about reading in the US in 2013 and according to them almost eight in ten young adults (age 18–29) read either a book in print, in e-form or listened to an audio book (79%). Indeed, this age group in comparison with other older age groups is the group that read the most. They read most print books (73%), but they also read most e-books (37%) (Zickuhr & Rainie, 2014).

The CIBER study described new forms of human digital information behaviour, which can be characterized as horizontal, bouncing, checking, diverse and viewing in nature. According to authors, users are “promiscuous, diverse and volatile” and libraries must move away from mere counting download statistics and start monitoring the actual information seeking behaviour of their users (Rowlands et al., 2008).

2.2 Studies of the disciplinary differences

Many factors can affect the information behaviour but according to Case (2012), the occupations (disciplines) have been the most common factor for the investigation of information seeking and information behaviour in general. However, many authors have examined the effect of the discipline on information behaviour with inconclusive results (Junni, 2007; Kerins, Madden & Fulton, 2004; Korobili, Malliari & Zapounidou, 2011; Sadler & Given, 2007). On the other hand, in her comprehensive review of the literature on graduate students’ information seeking behaviour Amy Catalano (2013) found some common features for gradu-

ate students' information behaviour and claims that graduate students usually first consult a faculty member/advisor when embarking on a research project (see also Catalano, 2010; George et al., 2006). Closely following consultation with the faculty, the internet is the next most cited starting point for most graduate students (Earp, 2008; George et al., 2006; Korobili et al., 2011). However, even though many students will give preference to the internet, some studies note that students acknowledge that the sources found on the internet can be unreliable (George et al., 2006; Kerins et al., 2004) and will consult references provided by the faculty (Korobili et al., 2011). In addition, some studies found that most students did not like to use the web for research. These students felt that they could find more reliable resources within the databases provided by the library (Junni, 2007). Meanwhile, Kayongo and Helm (2010) found that graduate students perceive librarians less important than the resources provided by the library and will ask for assistance only on rare occasions.

Graduate information science students are expected to be expert searchers of all kinds of information in all formats since their primary purpose is to help others locate and access necessary information. At the same time, the research on information behaviour of information science students shows that they exhibit behaviour similar to that of general population. For example, they favour online resources and popular search engines (Bronstein, 2010; Krakowska, 2013; Saunders et al., 2015; Tanacković, Lacović & Stanarević, 2012; Togia & Korobili, 2014). The most recent study (Saunders et al., 2015) showed extremely high reliance on classmates as sources of information in a number of countries (France, Switzerland, Poland, Singapore, Turkey, Portugal, Bulgaria, Lithuania and Croatia) which is also consistent with previous study of students in Greece (Togia & Korobili, 2014). Some studies also show a high reliance on course readings (Saunders et al., 2015), library catalogues and library shelves (Tanacković et al., 2012; Togia & Korobili, 2014) or research databases (Saunders et al., 2015). However, information science students tend to demonstrate also lack of information literacy skills, and at the same time, demonstrate overestimation of their own abilities. According to research from the domain of psychology, people who are incompetent, particularly in the areas in which people commonly have some orientation, tend to believe that their skills are above the average and to overestimate their performance (Ehrlinger, Johnson, Banner, Dunning & Kruger, 2008). The study by Gross and Latham (2007) also demonstrated the association between low-level skills and an inflated self-view of ability. Some studies in the information science domain uncovered low information literacy skills among students. Conway (2011) found that both undergraduate and post-graduate information science students in Australia have problems with basic information literacy skills, with students averaging a score of 73% on a survey test. Undergraduate students in particular find initial stages of research to be difficult (Campello & Abreu, 2005; Conway,

2011) and often express negative feelings at that stage. Some other studies that compared information science students' information seeking knowledge and skills against the skills of students of some other disciplines found, surprisingly, that information science students had the lowest success rate (although they were very fast in finishing the tasks) (Andrić, Idrbek & Kotur, 2006; Shahvar & Tang, 2014). The poor information literacy results prompted Campello and Abreu (2005) to conclude that future information science workers are not sufficiently prepared to perform the kind of search tasks for which they will be expected to act as mediators for others.

When it comes to information behaviour of psychology students or students of economics, not many studies could be found. Their information behaviour is usually studied within the broader discipline or the field (social sciences or soft-sciences). Sloan and McPhee (2013) included psychology students in their study (next to sociology and women's studies students) and found that 89% psychology students (graduate and post-graduate) started their research with a known database, and only 11% used library catalogue for that purpose. The Google Scholar was also a relatively popular source within psychology students who used it in slightly less than 40% cases. Citation analysis of final undergraduate papers of psychology majors at the Faculty of Humanities and Social Sciences at the University of Osijek shows that psychology students are the most frequent users of online databases at that institution and that the usage of databases gradually increases with time (e.g. from 1,67% in academic year 2009/2010 to 43.18% in 2013/2014). In 2013/2014, they cited the internet sources in 29,39% cases. In comparison, information science students cited only 5.65% sources from online databases in the academic year 2013/2014, whereas the internet sources were used in high 59,45% (Barišić & Bobinac, 2015).

Lombardo and Miree (2002) examined perceptions and actual use of print and electronic resources by business students. They found that students were still highly dependent on Web resources, but also that the students, after being exposed to an information literacy class, began to realize the downsides of the information freely available on the Web. The study of 3rd year students of Economics, Finance and Marketing in Australia revealed that students used library online resources for both study and work. Nevertheless, when asked which resources they would use most frequently, students reported a preference for free resources available on the Web, followed by online information resources provided by the workplace, and then university library online information resources (Costa, 2009).

Although this review of literature shows some common information behaviour across disciplines, it is still important to note that behaviour, even within disci-

plines, can vary widely (Jamali & Nicholas, 2008). In addition, it is worth pointing out that a study, conducted on a very large sample, reported no statistically significant differences in information seeking behaviour between the disciplines (Korobili et al., 2011).

3 Research

3.1 Research Objectives

The purpose of this small pilot-study was to learn about the information seeking behaviour of the Osijek University students. In particular, we wanted to test the information seeking abilities of information science students and compare them to abilities of students coming from non-information science field.

Some earlier studies of information science students found that their information seeking abilities are not at the level of excellence they should be considering their future profession. We wanted to test that and started our study with assumptions that information science students differ in their information behaviour from other students in the sample. In addition, since all students in our sample belong to the so-called Google generation, we also wanted to see whether they all share some common information behaviour traits. Finally, we wanted to find out whether all students in our sample exhibit the same type of feelings during the search process as described by Carol Kuhlthau's ISP model.

The study was conducted with the following research questions in mind:

- RQ1: Do information science students need less time and fewer clicks to finish the search tasks than non-information students?
- RQ2: Do information-science students have a higher success rate at solving tasks?
- RQ3: Do all students in the sample choose Google as the first step in their research?
- RQ4: Are there differences in the chosen search strategy between information science and non-information science students?
- RQ5: Are information science students more successful in retrieving relevant information sources than other students in the sample?
- RQ6: Are there differences in perceptions of information seeking behaviour between information science and non-information science students (what they think they do, and what they actually do)?
- RQ7: Do students in the sample undergo the similar range of feelings consistent with Kuhlthau's ISP model?

3.2 Sample and Methodology

Our sample (result of a convenience sampling) consisted of six social science graduate students of the the University of Osijek: three information sciences students, and one psychology and economy student respectively, and a student of cultural management. Our intention was to contrast the information science students' information seeking behaviour to that of other social science disciplines students and therefore our participants were regarded as two separate groups: the information science (IS) students, and non-information science (non-IS) students.

The methodology used in this study is a combination of a survey and the observation. The survey was used in the initial stage of the study when we wanted to find out about the participants' perceptions of their knowledge and skills of retrieving the information in the digital environment. The survey contained several demographic questions, but also questions regarding students' information literacy educational background and self-perception statements connected with information sources and estimation of their information seeking expertise. Each of our participants was first asked to fill out of the survey, and then moved to the second part of the research.

The second part of the study, the observation, was conducted through the think-aloud approach. Verbal protocols have been extensively used as a method by many researchers of information behaviour (e.g. Kuhlthau, 1983; Yang, 1997; Branch, 2001) because they offer a rich source of qualitative data. The think-aloud technique is one mode of cognitive assessment that is viewed as particularly useful in understanding the products as well as the processes of cognition. In a standard think-aloud method, participants of the research verbalize their thoughts while performing some (simulated) task, and responses are then recorded for subsequent analysis (Davison, Vogel & Coffman, 1997).

The participants were asked to find the information that answers three simulated search tasks. Search tasks were designed in a way that one was supposed to be solved by searching the internet, the second by some of the scholarly databases, and the third by using the library's OPAC. The Croatian Ministry of Science, Education and Sport subscribes to a number of online databases from all fields and all institutions of higher education have access to those databases, but the access is IP address regulated. From that reason, the study was conducted within the premises of the Faculty of Humanities and Social Sciences in Osijek. All search tasks were created taking into consideration the subject of study of our participants. Therefore, information science students had the search tasks focusing on the area of information sciences, whereas for the other three participants were created

tasks for the areas of economy, psychology and cultural management (App. 1). All participants were asked to solve the simulated search-tasks and describe orally what they were doing, as well as how they were feeling at various stages of the task solving. The participants individually solved tasks and it took on average between 15–20 minutes to solve all three tasks. All participants were video-recorded, and the recordings were subsequently transcribed and analysed. The consequent analysis of the data looked into the time span needed for the completion of the tasks, the number of clicks, sequence of steps and sources used at each step, emotions that appeared during searching and success at solving a task. Ideally, the most successful students would solve tasks in the shortest amount of time, with fewest clicks, and offer correct solutions to the tasks. However, higher weight was given to locating the correct sources of information (e.g. databases if the search task required), than to time and/or clicks necessary for completing the task.

The research was conducted in September 2014. All the participants gave their permission to be video-recorded for the purposes of this research.

4 Findings

Our first two research questions dealt with possible differences in the efficiency of task solving between information science and non-information science students. The answers to these questions were obtained through the main part of our research which involved the think-aloud approach. The participants were invited to solve search tasks individually. Their search process was video-recorded to capture the time and number of clicks needed for the task solution, as well as their search strategy and a cognitive process that motivated their actions while searching. Table 1 gives data about the duration, number of clicks, number of search steps and sub-steps, and the outcome of the search tasks for information science and non-information science students.

As we can see from Table 1, the information science students demonstrated better search results only at task 3 that dealt with OPAC search (they were quicker, with fewer number of clicks, and all three students solved their search tasks). In other situations that required searches on the internet or in scholarly databases, they scored lower than non-information science students: they needed more time, more clicks, and more steps to solve the task; and they were not always successful at that either. On the average, each information science student took 14 minutes to solve the search tasks whereas a non-information science student needed only 11; the information science student had 112 clicks, whereas the non-information science student had only 66; the information science student had 8 steps and 7 sub-

steps, whereas the non-information student had 5 steps and 3 sub-steps. Still, information science students managed to solve similar number of search tasks as non-information science students: the information science students solved four (out of nine search tasks), whereas the non-information science students solved five tasks.

Table 1: Search task comparative data for information science and non- information science students

Task	Information science students		Non-information science students	
Task 1	Time	00:00:15:23	Time	00:00:10:41
	No of clicks	108	No of clicks	60
	Steps (sub-steps)	12(3)	Steps (sub-steps)	4(7)
	Task solved	0/3	Task solved	3/3
Task 2	Time	00:00:24:11	Time	00:00:14:36
	No of clicks	194	No of clicks	91
	Steps (sub-steps)	8(14)	Steps (sub-steps)	9(2)
	Task solved	1,5/3	Task solved	1/3
Task 3	Time	00:00:03:24	Time	00:00:07:28
	No of clicks	35	No of clicks	47
	Steps (sub-steps)	4(4)	Steps (sub-steps)	4(1)
	Task solved	3/3	Task solved	1/3

Table 2 illustrates the first step in the search process of the respondents. The data show that almost all respondents started all three searches with Google, regardless whether they were looking for an unknown source, or they actually wanted to go to the web page of their faculty library. Only one student, the student of psychology, started with the web page of her faculty with the intention to go to the library web page. This particular strategy was applied for the second search task, which required the use of scholarly databases and student used the library web page and its resources and links in order to solve the task.

Table 2: *First step in search process of information science and non-information science students*

	Information science students									Non-information science students								
	1 st student			2 nd student			3 rd student			Economics			Cultural management			Psychology		
Task	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Start pg.	G*	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	FHSS**	G

* G – Google

** FHSS – Faculty of Humanities and Social Sciences

The closer analysis of search strategies of our participants revealed that all participants in our sample, regardless of the discipline of study, apply the following search strategy:

First step: search engine (primarily Google)

Second step: searching the selected information source (following the hyperlinks or supplying the search terms in the database command line).

(Repetition of the first and second steps, if required)

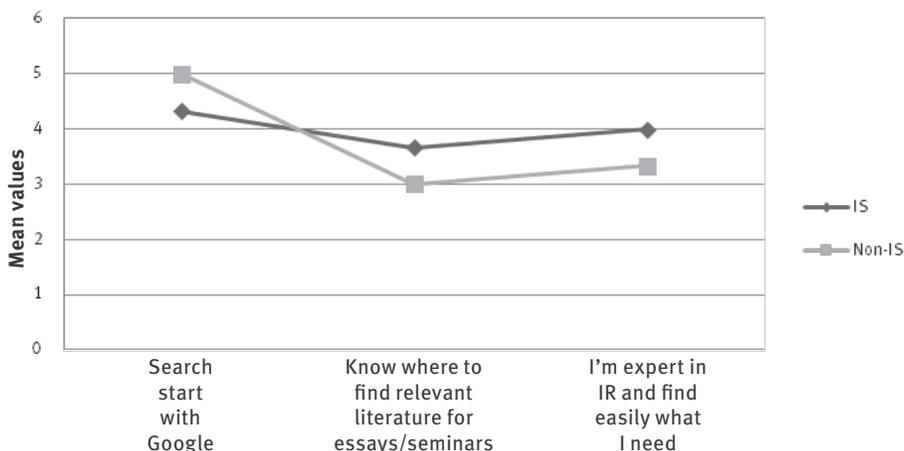
It is also interesting to describe the information sources used by the respondents. The first search task required looking for information on the web. The information science students all managed to retrieve the right information source (via Google), but were unable to find the correct answer on that web page. On the other hand, all non-information science students retrieved reliable and relevant web sources and solved the task successfully.

The second search-task, the one that required the usage of scholarly databases, revealed that information science students were all aware that they needed to consult the databases in order to solve it. Consequently, they all landed on the web page of the Croatian Centre for Online Databases (gateway to nationally licenced scholarly databases by the Croatian Ministry of Science, Education, and Sport). However, one student managed to retrieve the required article, while the second one solved the task only partially – she found an article that was thematically close to the one required by the task. The third IS student chose the wrong database and did not solve the task correctly. When it comes to non-information science students, psychology and cultural management students realized that

they needed to consult databases to solve the task. Cultural management student chose Hrčak, the central portal of Croatian scientific journals that follows the Open Access Initiative (Hrčak, 2016) whereas the psychology student went straight to the Croatian Centre for Online Databases webpage. Even though only the psychology student managed to find the relevant peer-reviewed article, it is still positive that the cultural management student was aware of the type of source required to consult for this type of task. Only the student of economy failed completely, not recognizing the right source of information for finding peer-reviewed articles.

The third task required students to search library's OPACs. Information science students all recognized which source they should use, whereas the non-information students mostly did not. The economy and psychology students searched the web with varying results (economy student solved the task, psychology student did not), not realizing that the best information source to use would be a library online catalogue. It is also important to stress out that our respondents confessed that they all got some basic instruction and training about research strategies and information literacy skills (usage of libraries, scholarly databases, citation styles, etc.). Our initial survey revealed that majority of our participants obtained their research knowledge and skills through a compulsory course (one or more) on research skills and scientific work (5 participants). Four participants obtained that knowledge and skills on their own, as well. Three participants took an elective course (one or more) on these topics, and only two participants obtained that knowledge either through the library or from their colleagues and friends.

Picture 1 illustrates the differences in perception of participants' information retrieval (IR) knowledge and skills (mean values on the Likert scale 1–5, with 1 being the lowest, and 5 being the highest level of agreement). Information science students tend to perceive themselves as somewhat expert searchers (mean value 4) who only sometimes start their research with the Google search engine (mean value 4,33), and have minor difficulties in finding relevant information for essays/seminars (mean value 3,66). On the other hand, non-information science students believe that they always start their searches with Google (mean value 5), do not see themselves as expert searchers (mean value 3,33), and tend to have more difficulties in finding relevant information sources for essays/seminars (mean value 3).



Picture 1: Participants' perception of their IR knowledge and skills

During the research our participants expressed their feelings and emotions regarding the search tasks or/and applied search strategies, as well as the obstacles they encountered while searching for right answers. Our participants, similarly to Kuhlthau's ISP model, experienced various feelings while performing the searches. Almost all participants demonstrated feelings of uncertainty, apprehension, and even frustration (with the exception of one information science student who solved the task without any problems) in connection to second search task (database search). Frustration was also an extremely dominant feeling among the information science students in relation to first search task (internet search). Depending on the search outcomes, our participants demonstrated the confidence and satisfaction or disappointment and frustration. Optimism was never detected, in any stage of the search process. Students of information sciences showed their feelings, especially frustration and disappointment, whereas the students of economy and cultural management seemed to be emotionally detached from the whole process.

5 Discussion and conclusions

This paper presents findings of a small pilot-study of the University of Osijek graduate students' information behaviour in the digital environment. More specifically, information behaviour of information science and non-information science students was contrasted with several objectives in mind. First, we wanted to find out whether graduate information science students possess the necessary knowledge and skills in locating information that will be required for their future

professions. To get the better view of their search skills we compared their skills with those of some other graduate students in the field of social sciences. In addition, we wanted to obtain information about the students' information literacy skills, which might be beneficial for academic libraries of the University of Osijek and their information literacy programmes. This pilot-study was also conducted to test the methodology – we chose the combination of a survey and observation. Observation was conducted through the think-aloud approach of simulated search-tasks. The think-aloud technique was chosen because it gives the best insight into the respondents' cognitive processes during the search process and as such is frequently used in the research of information behaviour. The qualitative observation data were combined by the data from the initial survey in order to better understand the background of students' information behaviour during the simulated search tasks, but also to find out about students' self-perceptions.

When we take into consideration the task-solving part of our research, we notice that the information science students needed more time, more clicks and more steps/sub-steps to solve the search tasks. However, they were almost as successful as the non-information science students in retrieving the required information (sources) (IS were successful in four and non-IS in five out of total nine search tasks). These results are consistent with earlier studies (Andrić et al., 2006; Shahvar & Tang, 2014) that found that information science students were either too impatient to solve the task, applied too many clicks and made therefore many mistakes or even had lower success rate in finding answers than the other respondent groups. Another dominant behaviour spotted in the earlier study of Andrić et al. (2006) was overconfidence of information science students. In the earlier study, the initial overconfidence of information students lead to the superficiality in approach to search tasks – students did not take enough time to read the task thoroughly and/or think about the possible search strategy. As a result, they failed in completing the task. In our study, our participants' subjective perception of their IR skills and knowledge differed for our two groups of respondents: information science students' graded themselves relatively high (mean score 4), whereas the non- information science students' were fairly modest and graded themselves lower (3,3). This indicates that the information science students have a certain level of confidence (unfortunately, uncorroborated by later search results), because of the programme of study they completed. At the same time, non-information science students were very critical and assigned themselves lower grades feeling that they were not sufficiently exposed to instruction in this area. In addition, those students were more aware of their search strategies and all confirmed that they always started their research with Google. In this respect, our findings are consistent with the findings of other studies that found the connection between low-level skills and inflated self-view of abilities (Ehrlinger et al., 2008; Gross & Latham, 2007). At the same time, we could argue

that the behaviour of information science students may also be the characteristic of the young and impatient members of the Google generation, that is “easily distracted” and “with short attention spans” (Purcell et al., 2012). Meanwhile, non-information science students are also members of the Google generation and they were much more realistic about their search strategies and abilities.

Almost identical search strategy of our respondents is another shared feature and as such an additional element that puts them in the same category (i.e. the Google generation).

On the other hand, if we look closely into the type of information sources used in our sample, we can clearly see that information science students demonstrated a high level of awareness of quality and relevant sources. It is true that they completely failed on the first task where they managed to retrieve the right web page, but were unable to concentrate and find the correct answer. As for the other two search tasks when they were required to use scholarly databases and libraries’ OPACs, they all knew where to go. Even if they did start with Google search engine. Therefore, we can say that the data obtained through our study indicated that the information science students might not be so information illiterate as was the case in some earlier studies (Campello & Abreu, 2005; Conway, 2011). However, more research should be done to investigate this assumption in more detail.

This initial overconfidence, after the failure to find answers to the very first search task lead to the high degree of frustration on the part of information science students. In addition, they were obviously embarrassed by their lack of initial success which may have influenced their concentration later on. Our recorded data definitely confirm an extremely high level of emotional distress expressed in the form of either disappointment or frustration with their failure to find answers quickly and with ease. On the other hand, other, non-information science students were not nearly as emotionally engaged in this experiment, as were the information science students.

We detected further discrepancies between what information science students think they do, and what they really do when searching online. For instance, our results show that five out of six participants in our study used Google search engine as the starting point for their search (only a psychology student once started with the faculty web page, and not Google), but in the initial survey only one information science student thought that she always started her research with Google search engine. Other two information science students indicated that they only occasionally started with Google. This further confirms that our students indeed demonstrate features of the Google generation as was found in other numerous studies (College students’ perceptions of the libraries and infor-

mation resources, 2006; Bronstein, 2010; Krakowska, 2013; Saunders et al., 2015; Tanacković et al., 2012; Togia & Korobili, 2014).

Our initial survey shows that our participants obtained their information literacy skills in various ways. The most frequent is through one (or more) obligatory course within the curriculum, followed by elective courses offered by the faculty. Very often, participants gain this knowledge on their own. However, they rarely obtain it through the library. We must point out here that all 17 academic libraries of the University of Osijek offer individual library instruction, out of which eight libraries offer information literacy (IL) classes embedded into one of the compulsory courses at their academic institution, and five libraries organize IL workshops for their users. In addition, five libraries have prepared an online manual, and two libraries have it in a printed form (Petr Balog, Zetović & Plaščak, 2014). With all that in mind, we cannot help but ask why only a couple of students obtain their information literacy skills through libraries? On the other hand, since we chose a qualitative method of research, our sample is rather small. Still, we think that these findings are indicative and that libraries must either change something in their approach or become more proactive in attracting students to their IL classes.

These search results offered the unique insight into the information use, and, more specifically, information seeking behaviour of the Osijek University social science students. Considering the size of the sample more comprehensive studies should be done before any conclusions could be drawn. However, our findings indicate that information science students demonstrate features characteristic for the members of the Google generation. At the same time, they also demonstrated satisfactory level of information literacy – they were familiar with relevant information sources and knew where to look when they were given search tasks. However, the psychology student demonstrated almost the same level of information literacy, and was more realistic in the self-perception about her information literacy skills. In our opinion, this also means that information science department at the University of Osijek should consider introducing more complex search tasks within the final year courses which should raise the students' awareness about the need to approach such tasks with more caution and thoughtfulness, and help them turn into good information specialists.

Information science students in our sample had slightly lower success rate than non-information science students, but this research made them aware of their flaws and misconceptions, which was visible in the level of their frustration when they encountered difficulties in finding answers. This study has also shown that more information behaviour research of students within disciplines taught at the University of Osijek would be beneficial for all academic libraries of the Uni-

versity and help them tailor the information literacy workshops for students of various disciplines in future.

References

- Andrić, B., Idlbek, R. & Kotur, B. (2006). WebPAC Gradske i sveučilišne knjižnice Osijek: studija uporabljivosti. *Vjesnik bibliotekara Hrvatske*, 49(2), 50–61.
- Barišić, D. & Bobinac, I. (2015). *Citatna analiza završnih radova studenata Filozofskog fakulteta u Osijeku: akademska godina 2013./2014.: pilot-projekt 2014./2015.* Osijek: Filozofski fakultet. Unpublished document.
- Branch, J. L. (2001). Junior high students think alouds generating information-seeking process data using concurrent verbal protocols. *Library and information science research*, 23(2), 107–122.
- Bronstein, J. (2010). Selecting and using information sources: source preferences and information pathways of Israeli library and information science students. *Information research*, 15(4), paper 447. Retrieved 9. 3. 2016 from: <http://www.informationr.net/ir/15-4/paper447.html>
- Campello, B., & Abreu, V. L. F. G. (2005). Information literacy and the education of school librarians. *School libraries worldwide*, 11(1), 37–52.
- Case, D. O. (2012). *Looking for information: a survey of research on information seeking, needs, and behavior* (3rd ed.). Bingley, UK: Emerald.
- Catalano, A. (2010). Using ACRL standards to assess the information literacy of graduate students in an education program. *Evidence based library and information practice*, 5(4), 21–38. Retrieved 11. 3. 2016 from: <http://ejournals.library.ualberta.ca/index.php/EBLIP/article/view/8878/7526>
- Catalano, A. (2013). Patterns of graduate students' information seeking behavior: a meta-synthesis of the literature. *Journal of documentation*, 69(2), 243–274.
- College students' perceptions of the libraries and information resources: a report to the OCLC membership.* (2006). Dublin, OH: OCLC Online Computer Library Center.
- Conway, K. (2011). How prepared are students for postgraduate study? A comparison of the information literacy skills of commencing undergraduate and postgraduate information studies students at Curtin University. *Australian academic and research libraries*, 42(2), 121–135.
- Costa, C. (2009). Use of online information resources by RMIT University economics, finance, and marketing students participating in cooperative education program. *Australian academic and research libraries*, 40(1), 36–49.
- Davison, G. C., Vogel, R. S. & Coffman, S. G. (1997). Think-aloud approaches to cognitive assessment and the articulated thoughts in simulated situations paradigm. *Journal of consulting and clinical psychology*, 65(6), 950–958.
- Earp, V. J. (2008). Information source preferences of education graduate students. *Behavioral and social sciences librarian*, 27(2), 73–91.

Ehrlinger, J., Johnson, K., Banner, M., Dunning, D., & Kruger, J. (2008). Why the unskilled are unaware: further explorations of (absent) self-insight among the incompetent. *Organizational behavior and human decision processes*, 105(1), 98–121.

Foehr, U. G. (2006). *Media multitasking among American youth: prevalence, predictors and pairings*. Menlo Park, CA: Henry J. Kaiser Family Foundation.

George, C., Bright, A., Hurlbert, T., Linke, E. C., St. Clair, G. & Stein, J. (2006). Scholarly use of information: graduate students' information-seeking behaviour. *Information research*, 11(4), paper 272. Retrieved 11.3.2016 from: <http://www.informationr.net/ir/11-4/paper272.html>

Graham, L. & Metaxas, P. T. (2003). "Of course it's true; I saw it on the internet!": critical thinking in the internet era. *Communications of the ACM*, 46(5), 70–75.

Gross, M. & Latham, D. (2007). Attaining information literacy: an investigation of the relationship between skill level, self estimates of skill, and library anxiety. *Library and information science research*, 29(3), 332–353.

Hrčak: portal znanstvenih časopisa Republike Hrvatske. (2016). Zagreb: Srce. Retrieved 11. 4. 2016 from: <http://hrcak.srce.hr/>

Jamali, H. R. & Nicholas, D. (2008). Information seeking behaviour of physicists and astronomers. *Aslib proceedings*, 60(5), 444–462.

Junni, P. (2007). Students seeking information for their masters' theses: the effect of the Internet. *Information research*, 12(2), paper 305. Retrieved 9. 3. 2016 from: <http://InformationR.net/ir/12-2/paper305.html>

Kayongo, J. & Helm, C. (2010). Graduate students and the library: a survey of research practices and library use at the University of Notre Dame. *Reference and user services quarterly*, 49(4), 341–349.

Kerins, G., Madden, R. & Fulton, C. (2004). Information seeking and students studying for professional careers: the cases of engineering and law students in Ireland. *Information research*, 10(1), paper 208. Retrieved 9. 3. 2016 from: <http://InformationR.net/ir/10-1/paper208.html>

Korobili, S., Malliari, A. & Zapounidou, S. (2011). Factors that influence information seeking behavior: the case of Greek graduate students. *Journal of academic librarianship*, 37(2), 155–165.

Krakowska, M. (2013). Information literacy skills assessment of LIS students: a case study at the Jagiellonian University. In S. Kurbanoglu et al. (Eds.), *Worldwide commonalities and challenges in information literacy research and practice* (pp. 617–624). Cham: Springer International Publishing.

Kuhlthau, C. C. (1983). *The research process: case studies and interventions with high school seniors in advanced placement English classes using Kelly's theory of constructs*. Doctoral dissertation. New Brunswick, NJ: Rutgers University.

Kuhlthau, C. C. (1991). Inside the search process: information seeking from the user's perspective. *Journal of the American Society for Information Science*, 42(5), 361–371.

Kuhlthau, C. C. (1994). Students and the information search process: zones of intervention for librarians. *Advances in librarianship*, 18, 57–72.

- Levin, D. & Arafeh, S. (2002). *The digital disconnect: the widening gap between internet-savvy students and their schools*. Washington, DC: Pew Internet and American Life Project.
- Lombardo, S. & Miree, C. (2002). Caught in the web: the impact of library instruction on business students' perceptions and use of print and online resources. *College and research libraries*, 64(1), 6–22.
- Nicholas, D., Rowlands, I., Clark, D. & Williams, P. (2011). Google generation II: web behaviour experiments with the BBC. *Aslib proceedings*, 63(1), 28–45.
- Palfrey, J. & Gasser, U. (2008). *Born digital: understanding the first generation of digital natives*. New York, NY: Basic Books.
- Petr Balog, K., Zetović, J. & Plaščak, B. (2014). Knjižnice u službi informacijskog opismenjavanja: stanje u visokoškolskim knjižnicama osječkog Sveučilišta. In I. H. Grgić & V. Špac (Eds.), *Knjižnice: kamo i kako dalje?* (pp. 215–230). Zagreb: Hrvatsko knjižničarsko društvo.
- Pettigrew, K. E., Fidel, R. & Bruce, H. (2001). Conceptual frameworks in information behaviour. *Annual review of science and technology*, 35(1), 43–78.
- Prensky, M. (2001). Digital natives, digital immigrants. *On the horizon*, 9(5), 1–6.
- Prensky, M. (2008, May 22). *The 21st-century digital learner: how tech-obsessed iKids would improve our schools* [Web log post]. Retrieved 6. 3. 2016 from: <http://www.edutopia.org/ikid-digital-learner-technology-2008>
- Purcell, K., Rainie, L., Heaps, A., Buchanan, J., Friedrich, L., Jacklin, A., ... Zickuhr, K. (2012). *How teens do research in the digital world: a survey of Advanced Placement and National Writing Project teachers finds that teens' research habits are changing in the digital age*. Washington, DC: Pew Internet and American Life Project.
- Roberts, D. F., Foehr, U. G. & Rideout, V. (2005). *Generation M: media in the lives of 8–18 year-olds*. Menlo Park, CA: Henry J. Kaiser Family Foundation.
- Rowlands, I., Nicholas, D., Williams, P., Huntington, P. & Fieldhouse, M. (2008). The Google generation: the information behaviour of the researcher of the future. *Aslib proceedings*, 60(4), 290–310.
- Sadler, E. & Given, L. M. (2007). Affordance theory: a framework for graduate students' information behavior. *Journal of documentation*, 63(1), 115–141.
- Saunders, L., Kurbanoglu, S., Boustany, J., Dogan, G., Becker, P., Blumer, E., ... Todorova, T. Y. (2015). Information behaviors and information literacy skills of LIS students: an international perspective. *Journal of education for library and information science*, 56(Supplement 1), S80–S99.
- Shahvar, S. S. & Tang, R. (2014). Collaborative information seeking (CIS) behavior of LIS students and undergraduate students: an exploratory case study. *Proceedings of the American Society for Information Science and Technology*, 51(1), 1–4.
- Sloan, M. & McPhee, K. (2013). Information seeking in context: results of graduate student interviews. *Partnership: the Canadian journal of library and information practice and research*, 8(1).
- Straw, D. (2002). The plagiarism of generation “why not?”. *Community college week*, 14(24), 4–7.
- Tanackovic, S. F., Lacovic, D. & Stanarevic, S. (2012). LIS students seeking information for their final papers: small-scale study at the Faculty of Philosophy in Osijek. *Libraries in*

the digital age (LIDA) proceedings, 12. Zadar: University of Zadar, Department of Information Sciences. Retrieved 9. 3. 2016 from: <http://ozk.unizd.hr/proceedings/index.php/lida/issue/view/1>

Tapscott, D. & Williams, A. (2008). *Wikinomics: how mass collaboration changes everything*. New York, NY: Atlantic Books.

Togia, A. & Korobili, S. (2014). Information seeking behavior of LIS students: the case of Greece. In *BOBCATSSS 2014 proceedings* (pp. 245–252). Retrieved 9. 3. 2016 from: <http://proceedings.bobcatsss2014.hb.se/issue/view/55>

Veen, W. & Vrakking, B. (2006). *Homo zappiens: growing up in a digital age*. London: Network Continuum Education.

Wallis, C. (2006, Mar. 27). The multitasking generation. *Time magazine*, 167(13), 48–55.

Weiler, A. (2005). Information seeking behavior in generation y students: motivation, critical thinking, and learning theory. *Journal of academic librarianship*, 31(1), 46–53.

Wilson, T. D. (1999). Models in information behavior research. *Journal of documentation*, 55(3), 249–270.

Yang, S. C. (1997). Information seeking as problem-solving using a qualitative approach to uncover the novice learners' information-seeking processed in a Perseus hypertext system. *Library and information science research*, 19(1), 71–94.

Zickuhr, K. & Rainie, L. (2014). *A snapshot of reading in America in 2013*. Washington, DC: Pew Internet. Retrieved 9. 3. 2016 from: <http://www.pewinternet.org/2014/01/16/a-snapshot-of-reading-in-america-in-2013/>

Appendix 1

Search tasks for the students of information sciences:

1. When did the first IFLA (International Federation of Library Associations and Institutions) conference take place?
2. You need to find a scholarly (peer-reviewed) paper on the quality measurement in libraries that focuses on the SERVQUAL instrument. The authors of the paper are Coolen Cook and Bruce Thompson.
3. For your exam you need to read the book “*Informacijska pismenost*” (*Information literacy*) by Sonja Špiranec. Where in Osijek can you find this book?

Search tasks for the economy student:

1. You are about to finish the university and start looking for a job. For that, you need to know how to write a good CV and a job application. Where can you find the instruction how to do that?
2. You are writing a seminar paper on business communication and negotiation. You need to find a scholarly (peer-reviewed) paper on negotiation strategies.

3. For your exam you need to read the book “**Kultura i povijest: socio-kulturno antropološki aspekti hijerarhizacije kulture**” (*Culture and history: social and cultural anthropological aspects of cultural hierarchy*) by Snježana Čolić. You want to know the number of pages.

Search tasks for the psychology student:

1. You are about to finish the university and start looking for a job. For that, you need to know how to write a good CV and a job application. Where can you find the instruction how to do that?
2. You are writing a seminar paper on the influence of computers on pre-school children. You need to find a scholarly (peer-reviewed) paper on the influence of computers on the cognitive development of pre-school children.
3. You have decided to read “**War and Peace**” by L. Tolstoy and want to know how many pages there are.

Search tasks for the student of cultural management:

1. You are about to finish the university and start looking for a job. For that, you need to know how to write a good CV and a job application. Where can you find the instruction how to do that?
2. You are writing a seminar paper on the higher education funding. You need to find a scholarly (peer-reviewed) paper on the influence of the HE funding from private sources on the University quality.
3. For your exam you need to read the book “**Pravo na pobunu: uvod u anatomiju građanskog otpora**” (*Right to rebellion: introduction to the anatomy of the civil resistance*) by Srećko Horvat. Where in Osijek can you find this book?

Ivana Furi

Academy of Arts in Osijek, Josip Juraj Strossmayer University of Osijek, Kralja Petra Svačića 1/F, 31000 Osijek, Croatia
e-mail: ivana.furi@gmail.com

dr. Kornelija Petr Balog

Faculty of Humanities and Social Sciences, Josip Juraj Strossmayer University of Osijek, L. Jägera 9, 31000 Osijek, Croatia
e-mail: kpetr@ffos.hr