The impact of access problems on the information seeking behaviour of graduate students: A process study.

University of Twente
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Master Thesis

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Abstract

This research is focused on the current situation where many scientific research is not being published in open access form. The results show that scholars and graduate students are deprived from information and will have to deal with access problems when searching for scientific literature. As the literature review produced no clear insight in the information seeking behaviour of graduate students, this thesis is set out on finding out what the information seeking behaviour of graduate students is, what effect access problems have on this behaviour and how graduate students can deal with these access problems. The main question of this thesis is: 'To what extent do access problems influence the information seeking behaviour of graduate students?'

This thesis uses a qualitative, empirical research which is based on the results of 11 observations, adjacent interviews and four in-depth interviews. The information seeking behaviour of the participants have been mapped using the seven stages of the Ellis (1989) model, with the revision of Meho & Tibbo (2003). This produced eleven individually based graphs of the process of information seeking. It gave the opportunity to analyse which activities participants use when they search for information and are not faced with access problems, compared with the activities they use when the participants did encounter access problems. Also, the number of articles that are directly access without access problems, with access problems, solved and unsolved access problems are calculated and compared.

The results of this research indicate that graduate students have to deviate from their normal, ideal, path when faced with access problems. Furthermore, the amount of access problems show that graduate students have to deal with access problems in 50 percent of all scientific articles. The conclusion of this thesis is, therefore, that the impact of access problems on the information seeking behaviour of graduate students is large.

Furthermore, the results indicate that many graduate students have a basic level of knowledge, capabilities and skills when it comes to using scientific information sources. The literature review, combined with the results, indicate that there is a correlation between the teachings of the universities and the success of the information seeking of graduate students. Therefore, this thesis argues that the universities are in the position, have the possibilities, and the responsibility, to teach and aid graduate in becoming better researchers.

Keywords: information seeking behaviour, open access, access problems, graduate students

Acknowledgements

In front of you lies my master thesis about the impact of access problems on the information seeking behaviour of graduate students, which I have written for the completion of my study Master Business Administration (track Innovation and Entrepreneurship). The topic for my thesis was not so obvious, and it took a while before I got this angle on this situation. As a former student of a university of applied sciences, following a master on a university is something completely different. Having to work with scientific literature, let alone seeking, selecting and using it on your work, was something completely new. When searching for a topic I recalled that many fellow students, and I myself, never really had a plan or idea when searching for literature and soon it became clear that this subject was not covered in-depth by any scientific disciplines. It gave me the opportunity to start the conversation on an, I believe, important topic and hopefully it will aid students in becoming better researchers.

Next to this, I want to thank some people for their efforts. First I want to thank my lead supervisor Tom de Schryver for his devotion, energy, interesting insights and pleasant cooperation. Also thanks to Kasia Zalewska-Kurek for being enthusiastic and willing, to act as the second supervisor. Next, I would like to thank the 11 participants who let me observe them while they conducted a literature search and the four participants of the in-depth interviews, I could not have done it without you. Furthermore, thanks to Marijke Broekhuis and her colleagues of the Operational Information and Learning Services who helped me to come in touch with several, former, students who had used the IBL service in the past. Also, many thanks to my family, who always supported me no matter what I wanted to do. Next, my close friends who always informed on the progress of my thesis and who contributed by being sparring partners or just someone I could share my ideas with: even in the gym. Last but not least, I would like to thank Marissa Benne who has supported and helped me during my master thesis, providing insights, a helping hand and a listening ear whenever I needed it. Thank you all.

I hope you enjoy reading my master thesis and I hope you will learn more about the impact of access problems of the information seeking behaviour of graduate students.

Yours sincerely,

Jip Jonker

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Contents

1. Introduction

This chapter introduces the thesis subject, starting with the current situation, problem statement and the gap in the literature. It is followed by the research question and sub questions.

1.1 Problem statement

In the year 2000 a movement called Open Access emerged, with the sole purpose of providing *'literature which is digital, online, free of charge, and free of most copyright and licensing restrictions*' (Suber, Open Access, 2003). This initiative has found great support in the academic world where the subscription fees of scientific journals grew out of proportion (Harvard, 2012). As a result, OA has grown exponentially domestic from 1.404 OA journals in 2004 to 11.102 in 2016. The amount of available OA articles in those years grew from, around, 100.000 to almost 2.2 million in 136 countries (DOAJ, 2016) (Morrison, 2015). To put this in context, there are approximately 28.000 journals in the world, producing 1.8 million articles a year (Eveleth, 2014). The European Commission recognizes the potential of OA and it has been anchored as an underlying principle in the main subsidy program for Research and Innovation, Horizon 2020 (EU factsheet, 2013). The Dutch government itself made open science a priority for the Dutch EU-Chairmanship in 2016 (Dekker, 2015), aiming for 60 percent OA in 2018 and 100 percent OA in 2024 of all 42.000 annually Dutch published scientific articles (Dekker, 2015). This is also supported by all Dutch Universities in the Association of Dutch Universities (VSNU, 2014).

The future of knowledge sharing and availability seems bright, but at this current moment it is not yet achieved. It is estimated that more than 20 percent of all scientific publications worldwide are publicly accessible (Woutersen-Windhouwer, 2012) (Jinha, 2010). This combined with universities who struggle to assemble adequate collections, creates a situation where scholars and students are deprived of access to scientific literature needed for their work (Pinter, 2012). The responsibility to teach graduate students how to search and find scientific literature specific literature and deal with access problems, lies with the universities. These institutes can provide students with the knowledge to comprehend necessary research habits and skills through assistance in the literature research process, as this is a significant grounding element for the success of students' research (Rempel, 2010). To help students be more effective and successful in searching and accessing relevant scientific literature, it is important to gain new insights in the literature search behaviour of students, access problems, and how to deal with these problems. This might be to widen the students' knowledge of other, better, available sources via the University library or even pointing them to alternative sources. In

doing so, this thesis is focused on providing the Dutch universities and their information specialists insight in the information seeking behaviour and processes of graduate students and which impact access problem have on this behaviour. Hopefully this aids universities to guide their students in becoming better, more effective, researchers.

1.2 Research goal

As the current situation deprives graduate students access to scientific literature, this thesis is focused on providing a better insight and tools which universities can use to teach and guide their graduate students in dealing with the current situation. This thesis therefore, sets out to find what the information seeking behaviour of graduate students is, what effect access problems have on this behaviour and how graduate students can deal with these access problems. This will be done by observing the information seeking behaviour of graduate students while they are searching for literature and in-depth interviews.

1.3 Research Question

This research is concentrated on finding out:

To what extent do access problems influence the information seeking behaviour of graduate students?

1.4 Sub-questions

To be able to answer the mean research question, this thesis focuses on answering a number of sub-questions:

1. **What is the information seeking behaviour of graduate students?**
   In order to identify access problems, it is important to establish what the information seeking behaviour of graduate students is, which in practice means having a clear picture of the process of searching for literature. In the first sub-question it is important to establish how and where graduate students start when they search for literature, which steps are involved and which methods they use in order to access scientific literature.
2. **Which access problems to graduate students encounter?**
   This sub-question provides an insight on the different access problems a graduate student could encounter.

3. **How many access problems do graduate students encounter?**
   The third sub-question considers the amount of access problems that are encountered, within the observations, compared to the amount of articles which are sought. This statistic provides an idea of the extent on which access problems are a problem.

4. **Which steps do graduate students undertake when dealing with access problems?**
   The fourth and last sub-question regards the steps graduate students undertake when they are faced with access problems. The focus lies on the point at which they encounter an access problem in the information seeking process and which steps are undertaken to access an article which is, in the first instance, not directly available. This side-track in the information seeking behaviour can be compared with the results of the first question and makes it possible to review the impact of an access problem and the difference on this processes when faced with these problems.

1.5 Outline

Before starting the observations and interviews, a literature review will be conducted to clarify the most important subjects of this thesis, the information seeking behaviour of graduate students, access problems and how can be dealt with access problems. After the literature review, the methodology, scale and sample group will be discussed after which the results, discussion, limitations, conclusion and implications for future research will be presented.

2. Literature review

In the literature review the Education Resource Information Centre (ERIC) database has been used as primary information source. The ERIC database is authoritative for education researchers, contains more than 1.5 million records (EBSCOhost, 2016) and is a subscription based database. In this chapter, the findings of the literature review will be presented and discussed in order to select the right methodological approach and to answer the main research question. The information seeking behaviour in general, information seeking behaviour of students and access problems will be discussed.

2.1 Information seeking behaviour

The bases of information seeking behaviour, in general, can be traced back to the early hunter-gatherer cultures and is referred to by Bates (2002) as information farming or information foraging (Bates, 2002). In the beginning it was the possibility to collect information from family or friends and gradually evolved, with the growth of digital possibilities, to a process where humans engage with each other to change their state of knowledge (Marchionini, 1995). Even though there are scientists just as Bates and Marchionini who define the information seeking process, Matusiak (2006) found that many researchers do not wish, or want, to give a definition to this process as it is too difficult to identify all he different components of the process, as there as so many formats, sources, types of information, access points and search strategies (Matusiak, 2006). Therefore, this thesis adopts the general and cautious opinion of Rice, McCreadie and Chang (2001) that '*information seeking consists of activities between recognition of information need and the acquisition of relevant information'* (Matusiak, 2006, p. 480) (Rice, McCreadie, & Chang, 2001).'

Information seeking behaviour is a process as such, and several scientists have tried to develop a process theory. Ellis (1989) was the first to model the process of information seeking behaviour. The model still upholds in the modern, internet, era and is used in a number of scientific fields (Ge, 2010). The model introduces six fundamental stages in the information seeking process: starting, chaining, browsing, differentiating, monitoring and extracting (Ge, 2010) (Ellis, 1989) and are not necessarily sequential[1]. In 2003, Meho & Tibbo revised the Ellis model and added a seventh stage in the information seeking behaviour; networking. In addition,

[1] (Ellis, 1989) extracted from (Ge, 2010)

they developed a model including the four overall search processes: searching, accessing, processing and ending (Meho & Tibbo, 2003)[2].

After Ellis (1989), Wilson, Ford, Ellis & Foster (1999) identified information seeking as a series of uncertainties which, eventually, leads to solving a problem. In solving this problem, Wilson et al. (2002), developed a four stages model: problem identification, problem definition, problem resolution and solution statement. They concluded that, more information has to be gathered to resolve the uncertainty before the researcher can move on to the next step. In their work, they also established that giving information seekers a certain pattern which they could follow, improves the accuracy and amount of information acquired (Wilson, Ellis, Ford, & Foster, 1999).

Kuhlthau (2004) developed a six stage information search process, selection, exploration, formulation, collecting relevant sources of information and presentation, and supported the findings of Wilson et al. (1999) that information seeking behaviour was a result of uncertainty. It was assumed that, at any stage of the process, more information has to be gathered in order to remove the uncertainty of that step and to be able to move to a next one. The uncertainty of the seekers does decrease as the completion of the search process is coming to its end (Kuhlthau, 2004)[3].

2.2 Information seeking behaviour of graduate students

When looking at the information seeking behaviour of students, it appears that is has been subject of changes due to the influence of the internet (Omidian & Seifi Maleki, 2013). Where students used to be bounded by the capabilities of their universities' collection, the internet has given them a much larger searching area and information quantity. The opportunities and the possibility to search for literature whenever and wherever, combined with its quantity, has made the internet the number one information resource available (Nkomo, 2009).

However, the internet seems to have drawbacks as students appear to be comfortable in technological resources, but struggle with finding the right information, how to use certain tools and find the right, credible, source (Qayyum & Smith, 2015) (Rowlands, et al., 2008)[4] (Griffiths & Brophy, 2005). In a study by Kennedy, Judd, Churchward, Gray & Krause (2008), students, who seem to be comfortable in the usage of the technology, still wanted training from their

[2] (Meho & Tibbo, 2003) extracted from (Ge, 2010)
[3] (Kuhlthau, 2004) extracted from (Matusiak, 2006)
[4] (Rowlands, et al., 2008) extracted from (Qayyum & Smith, 2015)

university to improve their skills (Kennedy, Judd, Churchward, Gray, & Krause, 2008)[5] and Cull (2011) even recommends universities to set aside more time to develop the necessary skills needed by students, as many do not seem to have the proper level (Cull, 2011)[6].

The easy-to-use internet has changed the communication patterns and information retrieval of university students (Omidian & Seifi Maleki, 2013) and have scientists concerned as the competencies are learned by the unevaluated, unthinking over-usage of internet resources (Graham & Metaxas, 2003) (Head & Eisenberg, 2009) (Nicholas & Huntington, 2009). Students use the internet resources to – get in, get the answer and get out – (Thompson, 2013)[7] and concentrate on a small amount of, particular, search engines and general websites, while researchers with more experience also use other channels like online databases and online document delivery services (Nkomo, 2009) (Omidian & Seifi Maleki, 2013). Students seem to lack the understanding of search logic, how to expand results, narrow a search, make use of headings and are even unaware of how various search engines display and organize their results (ERIAL, 2013)[8]. It, therefore, appears that students have much to learn for effective and correct usage of the internet for their academic work.

Due to the extensive use and quick uprising of internet resources, scientists are not as familiar with the information seeking behaviour of students or other groups as before (Nkomo, 2009) and it is even claimed by Jansen and Pooch (2001) that this has resulted in a completely new pattern of information seeking behaviour (Jansen & Pooch, 2001), which have deemed many earlier executed, scientific, literature out of date. This situation and changing environment has resulted in a gap in the literature (Nkomo, 2009), which this thesis will try to make smaller, for a bit, in understanding the information seeking patterns and behaviour of graduate students.

A study by Griggiths & Brophy (2005) shows that the students of that generation, who grew up with computers and quick technological changes, find online searching difficult and eventually conclude that students do not use advanced search features when using the library catalogue. These catalogues are, to wit, originally designed for expert researchers (Griffiths & Brophy, 2005)[9]. Use of sources external to the university library, such as Google Scholar, could even impact the search results and effectiveness of search strategies in a negative way as students tend to use the same keywords and strategies in the library catalogue as in external databases,

[5] (Kennedy, Judd, Churchward, Gray, & Krause, 2008) extracted from (Qayym & Smith, 2015)
[6] (Cull, 2011) extracted from (Qayyum & Smith, 2015)
[7] (Thompson, 2013) extracted from (Qayyum & Smith, 2015)
[8] (ERIAL, 2013) extracted from (Georgas, 2014)
[9] (Griffiths & Brophy, 2005) extracted from (Willson & Given, 2014)

even though each system has its own unique features (Novotny, 2004)[10] (Willson & Given, 2014).

A study by Kußmann, Elbeshausen, Mandl & Womser-Hacker (2012) analysed the collaborative processes of students in information seeking behaviour. They found that students are more efficient when working together in the information seeking process and that students use two different search strategies: scanning and reading. The scanning strategy consists of reading the headings and single words on the page of the document, instead of reading it all. The reading strategy consisted of reading much of the entire document. Eventually, it appeared, that the scanning strategy was characterized by a high recall but found more articles which were not so relevant, and the searching strategy had a higher precision with more relevant documents but due to higher reading time, found less articles (Kußmann, Elbeshausen, Mandl, & Womser-Hacker, 2012).

And last, a study by Chai (2007) found that each student has' their own method or way of retrieving information as students seek to retrieve information as effective and efficient as possible. The study also found that students with high grades *"often have an independent, more efficient, information gathering pattern and tend to ask fellow students for help"*, vice versa, students with medium to low grades often ask librarians for their help, and "*consult a librarian or a lecturer more than a fellow student when seeking help with search terminology"* (Chai, 2007, p. 490). This might be an interesting field and subgroup for Universities to focus on; as students might be more successful in information seeking when they are more self-reliance.

2.3 Access problems

Researchers are having problems to access certain sources (Meho & Tibbo, 2003). Although sometimes researchers can obtain needed sources by contacting the source of the information directly, government agencies, individuals etc., some sources stay inaccessible due to funding issues or restrictions from the publisher (Oppenheim, 2008) or government (Meho & Tibbo, 2003) of a particular article. These access problems make researchers resort to other sources or methods, for obtaining information and it often means making use of secondary sources (Meho & Tibbo, 2003). Even when universities are subscribed to a number of databases and have access to Google Scholar, many students struggle with finding the right information, selecting and using the right tool (Qayyum & Smith, 2015). Therefor it seems, that the student's information searching results might not only be subject on funding issues, but also on the

[10] (Novotny, 2004) extracted from (Willson & Given, 2014)

information sharing of the information seeking process from their university. Tackling the impact of access problem might just start by teaching students how to correctly use the universities' databases.

Due to the, earlier mentioned, gap (Nkomo, 2009) in the literature on the current information seeking behaviour of students, there is no data available on the impact of access problems in this matter. This gap in the literature shows that there is no in-depth understanding of how is dealt with access problems in internet information seeking behaviour and how this influences the process of searching for literature. Although searching and processing of literature in the context of information seeking behaviour is documented, the process of dealing with access problems has been simply noted as a point where the researcher can or cannot access the literature in question.

The information seeking behaviour model of Ellis (1989) and Meho & Tibbo (2003) do bring up the point of access problems, see attachment 1, but only put it into context as it being a yes or no process, after which the searcher should just goes back to the search-for-information process. In their model, the information seeker moves from the seven steps of searching for scientific literature, to the accessing stage. In this stage, the information seeker's activities are simply summarized as yes, the information can be accessed, or, no, the information cannot be accessed. In the case of an access problem, the no, information seekers simply have to go back to the searching activities. However, this thesis will show that there are specific activities which belong in the stage of accessing information. It therefor seems that the proliferation of new and different, internet, sources and the possibilities and obstacles for accessing them, gives way to a situation where there is still much research to be done (Chowdhury, Gibb, & Landoni, 2011).

2.4 Literature conclusion

The accessible literature gives way to a number of conclusions. First of all, the information seeking behaviour has been broadly modelled and its theorem is not up to date. A reason behind this phenomenon might be the continuous change of technological developments information seeking behaviour is subject to. Furthermore, the information seeking behaviour of students is not modelled or known at all, but research does show that students have problems searching for scientific literature, making use of databases and only have basic knowledge and experience with databases. Lastly access problems as such, are to some extent, known, but have not been modelled or examined. The impact and consequences of such studies seem to be logical: more input for information specialists on how students seek information, how and where to improve student's information seeking behaviour, a higher quality of student's and universities' output.

It also improves the level, knowledge and experience of students who, after graduation, pursue a career as a researcher. However, all in all, the theory shows that the information seeking behaviour of students and the impact the current literature access situation has on it, has not been a priority in scientific literature.

3. Methodology

This chapter features the presentation of the research design and data collection. Furthermore, it discusses and evaluates the research design.

3.1 Research design

In this study it is important to see and view the process of dealing with access problems of students. To gain this insight, this study uses a process study. In a process study, understanding of patterns is of the essence, these patterns are about the sequence of processes, or phases, which occur to produce a result (Langley, 1999) (Rogers, 1995). The patterns this study aims to understand, are the sequence of processes students use to search for literature and, if encountered, which sequence of processes students use to deal with access problems. To be able to map the processes, the information seeking behaviour of graduate students will be catalogued with the help of the seven processes of Ellis' (1989) model. With this model, it is possible to map the patterns of processes and view the information seeking behaviour of graduate students and how this process differs, or changes, when students are faced with an access problem.

One of the most suitable research methods for pattern and processes is a qualitative data gathering to illustrate the feelings, attitudes, processes and perceptions of participants (Babbie, 2007). Our capacities as social actors give people the opportunity to understand people's behaviour, when using the correct approach, it is possible to give meaning to these actions (Hammersley & Atkinson, 1989). Observations, are, therefore, the most obvious method to the development of a theory, or extension of a theory, as its capacity depicts the perspectives and activities of actors, and provides the opportunity to interpret the world in the same way they do. It allows the observer to gain the understanding of a phenomena when studying it and begin to develop a study of the phenomenon using the perspectives and activities of the actors, that provides much more evidence of the plausibility of different lines of analysis than is possible, or available in survey research (Hammersley & Atkinson, 1989). To ensure that observed activities and perspectives are such as the observer has interpreted, the observations will be followed up by an interview in which the observed is talked over. This is to gain more insight and explain the actions of the actors and undo any interpreting errors or faults (Van de Ven & Poole, 2005).

3.2 Data collection

3.2.1 Context

In this research, graduate students are the study objects, because they have experience with searching for literature, as opposed to bachelor students, and are in the final steps of their study. In their career as students, they have gained insight in literature research by attending normal colleges as well as special organized colleges from information specialists and gained experience through college assignments. This should have provided them with the knowledge of knowing what to look for, how scientific literature can be used, where to find it and how to find it (Kurbanoglu, et al., 2015). To gain insight in the information seeking behaviour, the access problems and its influence, I selected students which have a research assignment in which they can focus on a clear searching area within the literature. Therefor the participants of this study, have to either, be following a course for which they have to conduct a literature search for or, be busy doing research for their master thesis.

As the participants were asked to choose the location which would suit them best, six observations took place during a skype session, three in a library of the concerned university and two on internships company location, during the period between 11 June and 10 July. Ten of the eleven participants were observed searching literature for their master thesis, one participant for a college assignment. Of the participants, six were in the beginning of their master thesis, formulating their focus and searching for interesting literature, three participants were in the middle stage, gathering data and finishing their theoretical framework and two participants were at the end stage, writing results, implications, conclusions and putting on finishing touches.

Before the observations, students were informed that the observation is focused on the information seeking behaviour of graduate students, further information of the focus on access problems and impact on the information seeking behaviour was stated after the observation and before the joining interview. All four in-depth interviews took place in the same time period, of which two took place in the library of the concerned university and two in a skype session.

3.2.2 Sample size and pilot study

As this research follows a qualitative research design with observations and interviews, it is not searching for generalizable data as output; it searches for a rich and diverse image of the situation at hand. Therefore, a total of 11 students from three different universities and from different studies participated in this study. A pilot study of three observations and joining interviews were conducted to test the data gathering method.

The outcomes of the pilot study raised the question whether it is possible to achieve a rich and diverse composition of the situation, as it showed that students seem to be indifferent in coping with access problems. When the participants encountered access problems, they just used other articles because it takes more effort than they are willing to take, to try and bypass or deal with access problems.

To ensure a rich and diverse image, the library institution IBL (Information and Learning Services) of the University of Twente, has been asked for contact information of (former) students who have applied for an article or book which they could not access. As it seems that these (former) students are motivated to bypass and deal with access problems, they are asked to partake in an interview in which they are asked how they deal, or have dealt, with access problems and its influence. Due to the low amount of (former) students who applied for such a request, four interviews have been conducted and from now on will be referred to as the in-depth interviews.

3.2.3 Observations

To achieve the highest possible level of reliability and validity of the participant's observations (Cooper & Schindler, 2014), this study pursues to make the circumstances for the observations of the information seeking behaviour as naturalistic as possible for the participant (Holloway, 2005). Meaning that the setting, in which the participant is observed, should approach the normal place and situation, in which the participant normally searches for literature, as much as possible, as it seems that observations have a certain effect of self-presentation on participants (Franke & Kaul, 1978) (Holloway, 2005). To tackle this problem, participants are asked to choose the setting and place of the observation and the observant does not ask questions, nor comments on the participant's information seeking process during the observation. The duration of all observations is one hour, excluding the joining interview. Also, all observations, joining interviews and in-depth interviews, are recorded on video for data analysis and put apart on paper using the document of attachment 2. Before beginning with the observations a number of details from the participant should be known:

- What is the goal of the research: which data is the participant searching for?
- Does the participant already gathered, obtained or received information on this subject?
- Is the research done for a college assignment or master thesis?
- In which stage of his or her assignment is the student? (At the beginning, middle of end?)

During and after the observations, the model of Ellis (1989), with the revision of Meho & Tibbo (2003), on information seeking behaviour, is used to map the process of how graduate students search for information. This model, with its 2003 revision, is chosen as it has the most steps, seven in regard to the six of Kuhlthau (2004), and should therefor give the opportunity to defragment the process as far as possible. This would provide this thesis with a well-documented insight on the steps of the information seeking behaviour of students. The exact steps and order in which the participants use the seven steps of Ellis will be visualized with individual graphs. This provides a deep understanding of the strategy and process the participants use to seek information. The exact steps of each participant's information seeking process will be mapped using these seven:

1. *Starting*: identifying a source of interest which would be best for the information needed.
2. *Differentiating*: the choice of using a particular source for information.
3. *Extracting*: is the process of going through a particular source, or sources, and finding, and identifying relevant information.
4. *Browsing*: using the table of contents, abstracts, summaries subject headings and persons, etc. to identify materials of interest.
5. *Chaining*: following citations or references from one source or material, such as an article or book, to identify materials of interest.
6. *Monitoring*: keeping track in a particular area, by keeping up to date with a particular journal, magazine, book, newspaper etc. (Ellis, 1989)
7. *Networking*: communicating and maintaining a relationship with a range of people, such as colleagues, friends, members of ethnic organizations, government officials etc. to gather information or to build collections. (Meho & Tibbo, 2003)

3.2.4 Interviews joining the observations

To explain and correctly map the observations, it will be feedback in the interview that directly follows the observation (Van de Ven & Poole, 2005). In this interview the observed information seeking behaviour, access problems and actions, or lack of action, the student has taken in response to these access problems, are analysed and discussed. The form of these questions is important as it is critical that the reaction should be as explanatory as possible, to understand the actions of the participant. Therefor open questions are preferred as they tend to be more fulsome and a cascade compared to other questions (Holloway, 2005). Particular focus lies on:

- Which sources does the participant know and use?
- Why has the participant used these sources?
- How did the participant learned of these source and to use these sources?
- Does the participant use or follows a particular literature search process?

- Why did the participant handle the access problem(s) in the way he/she did?
- How many access problems does the participant encounter?
- Has the participant ever reacted differently to access problems besides the observed way?
- How satisfied is the participant with the information he/she has found?

On the basis of the observation other questions may be relevant and differ per participant.

3.2.5 In-depth interviews

The in-depth interviews are focused on the same questions and data of the observations and joining interviews. The difference compared to the observations and interviews is that observations were not possible as some of the interviewees are former students. Focus therefor lies on getting an as rich and well-formed picture of the interviewee's processes and actions. Special focus lies on the motivation and ways, these (former) students were using to deal with access problems and which other possibilities they have discovered, used or know about.

3.3 Evaluating the research design

The essence of this study depends on the extent to which the findings reflect the situation. In observational studies, the key to finding the best reflection of the observed situation is depended on the validity and reliability of the research itself. Both are an indicator on the accuracy of the research: it tells us whether the study is presenting a true and clear picture of the observed situation (Fox, 1998). To achieve this there are four terms, or pillars, which should be used in observational research (Lincoln & Guba, 1985) (Bryman & Bell, 2011):

- Credibility; how truthful is the finding? This is related to the internal validity of the research. In this study it is used to state the exact parameters: when, where and who was observed? To ensure there are no misunderstandings in what is observed, it will be feedback in the subsequent interview in which the observed is compared with the described information seeking behaviour, access problems and ways the participants dealt with them.
- Transferability; can the findings be generalised? This is a hard nut to crack for a qualitative research method as the sampling might not be strictly representative: it is aimed at maximising the diversity to gain an as rich picture as possible (Fox, 1998). Lincoln and Guba (1985) argue in this case, that research should be very cautious when claiming transferability and state that no claims should even be made about the applicability without other settings. It is therefore the responsibility of other researchers

to investigate other settings, to demonstrate the transferability and applicability elsewhere.

- Dependability; could the findings be replicated? This will be ensured through auditing, in which, during all observations and interviews, notes and data analyse decisions, records are kept. In this research two other academic students, will be asked to act as peers to develop dependability. When talking about dependability in qualitative research, a word of caution should be mentioned as it assumes a part of an unchanging world, which is not possible to ensure in the information seeking behaviour, where changes are going fast during the up-rise of open access and technological innovations. All the observer can do, therefore, is try to predict as much of these changes as possible and account for them when analysing the data (Lincoln & Guba, 1985).
- Confirmability; can we rule out research bias? This is also called the objectivity / intra-observer reliability (Fox, 1998) and is reached through justifying of the activities, interpretations and actions that I made during the research and the feedback of the participants in the interviews. This also, will be subject to two other academic students to ensure that possible biases are recognised and dealt with (Fox, 1998).

3.4 Presenting the results

In order to gain insight in the information seeking behaviour of the graduate students, the data of the observations, joining interviews and the in-depth interviews, were combined. This offers an overview and insight into the characteristics and motives of the information seeking behaviour. To provide a clear picture of the impact of access problems, the order in which the results are presented, derogate from the literature review. This means that the used sources and type of encountered access problems are presented first. Secondly, the amount of access problems in relation to the searched articles are presented. Thirdly, the information seeking behaviour of all participants is presented an individual base. Followed up by the actions participants have taken to deal with the encountered access problems.

4. Results

4.1 Used sources

Because of the limited time of the observation, one hour, participants were asked, after the observation, which sources they use for gathering scientific literature, besides the observed used sources. Results of the used sources are presented in table 1, together with the results of the in-depth interviews. In total 18 different sources were used and mentioned by all 15 participants. However, as can be seen in both figures, the average amount of known sources is low, only 3.7 per participant. The amount of used sources might be lower, as the participant's recall not to use all sources one a regular base. One participant only used one source, Google Scholar, which is also the only sources all participants have in common. The top three, besides Google Scholar, consists of Scopus, 12 users, and Science Direct with 5 users. The participants stated that Google Scholar and Scopus where the two main sources for scientific literature which were taught at their university to use. The two other participants were made aware of other sources by teachers. On a last, quite remarkable, note, one student from the IBL service admitted to make use of illegal Belarus and Russian websites to gain access to scientific articles. The sites were, respectfully, Library Genesis (gen.lib.rus.ec) and Sci-Hub (sci-hub.bz).

	Observation / Interview															
Source	1	2	3	4	5	6	7	8	9	10	11	i1	i2	i3	i4	**Amount**
Google Scholar	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	15
Scopus	■	■		■	■		■	■	■	■		■	■	■	■	12
Sciencedirect	■							■	■	■					■	5
Pubmed									■			■	■			3
LISA		■			■	■										3
Researchgate		■				■									■	3
Web of Science						■		■								2
FindUT						■					■					2
Ebscohost		■					■									2
Clinicalkey	■															1
Springer		■														1
Wikipedia		■														1
Narcis						■										1
ERIC						■										1
Bing								■								1
Orbis									■							1
Sci-Hub													■			1
Library Genesis													■			1

Table 1. Used sources by all participants

4.2 Type of access problems encountered

Access problems is a subject mentioned only rarely in scientific literature. The results of the gathered data show that access problems can be divided into two possible obstacles.

4.2.1 Paywall

The most regular encountered access problem regards hitting a paywall. When searching for literature, the participants use their VPN connection to receive the full capabilities of the databases of their university. When accessing an interesting article, they then stumble on the restrictions of their universities' subscription, where it appears that an amount of the database is not included in the subscription or certain titles are not yet available. As the participants are students, they unanimously admitted never to have paid for scientific literature and are not willing to do this in the future. One participant's company paid for literature, but this is an exception. Reasons for this, told by the participants, are because they do not have the funds to buy literature, they do not know if this document is really useful and they all state that they have always found many other articles or books on the same subject, therefor they did not see the need of paying for it. Hence, when articles are only available after paying for it, the participants and maybe students in general, will not be using them in their work. Open access would be the solution for this.

4.2.2 Availability

The second access problem regards the availability of scientific articles in the databases. Databases like Scopus, Web of Science etc., will provide the user, after a search query, with a certain amount of documents that are listed in the database. However, as the document is listed in the database, it is not necessarily linked to an actual, full text, source. Sometimes documents are not uploaded yet or even published, but do exist in the database, as abstract or with only its title. This will provide the searcher with a miss-hit and costs time and effort for an interesting source of information which is not available. In some cases, Google Scholar can help out when the document is published or released, in this matter it appears that some databases are not, yet, up to date.

4.3 The information seeking behaviour of the participants

To map the information seeking behaviour processes and patterns of the participants, the Ellis (1989) model, with the revision of Meho & Tibbo (2003), was used. The usage of the different stages is presented in table 2. The stages of starting, browsing and chaining were only used on the general search, differentiating and extracting were the only stages used in the general search as well as when access problems were encountered. Networking was not used in the general

search; only when participants had to deal with access problems. Monitoring was never used by any participants.

	Activity		
Seven steps of Ellis:	Searching for articles	Access problem	Not Used
1. Starting	✓	×	×
2. Differentiating	✓	✓	×
3. Extracting	✓	✓	×
4. Browsing	✓	×	×
5. Chaining	✓	×	×
6. Monitoring	×	×	✓
7. Networking	×	✓	×

Table 2. Use of the seven information seeking behaviour steps of Ellis (1989)

The exact, mapped, information seeking behaviour of each individual participant can be seen in the 11 line graphs, shown on pages 25 – 30. The graphs are presented in order of the observed process. Each number represents an activity undertaken by the participant. Numbers [1] to [7] are the seven steps of the Ellis (1989) model. Numbers [8], [9] and [10] represent the outcomes when the participants tried to access a certain article. Number [8] represents having successfully accessed an article, [9] when an access problem was encountered; the article of interest cannot directly be opened and [10] marks the point where the participant is not successful with overcoming an access problem and abandons the article of interest.

To explain the graphs in a more detailed matter, the individual graph of participant one has been put apart and explained in table 3. The process of information seeking, selecting and accessing is continuous as can be seen from the individual graphs. Participants use extracting [3] (search for articles of interest in the databases), browsing [4] (use the table of contents, reference lists, etc.) or chaining [5] (the citation in the text of previously accessed articles) to locate and find articles of interest. In between, participants might shift to other sources by differentiation [2]. However, if the entire process is analysed it because clear that it can be divided into sub-processes: an information seeker starts by selecting a source [2], searches interesting articles in that source [3] and tries to access it. The outcome of accessing an article can be divided into two results: successfully accessing an article [8], or abandoning an article [10]. Hence, the information seeker ends the search for that particular article because accessing the article was successful [8] or not [10], and moves on to find other articles of interest. The sub-processes show the search activities for one particular article, by starting to look for articles and ends with success [8] or failure [10]. It is then followed up by another sub-process which is targeted on finding a different article. Access problems [9] do, however, not show the end of a sub-process;

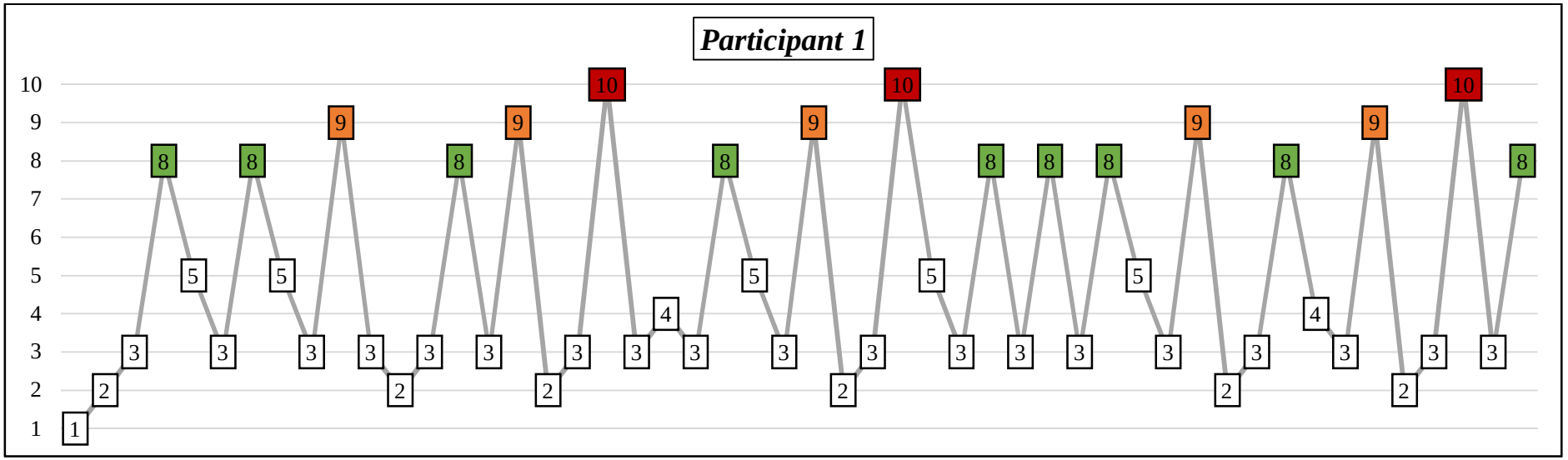
an access problem is an important milestone in the search for an article as it represents an obstacle of which yet has to be determined whether it will end in success [8] or failure [10].

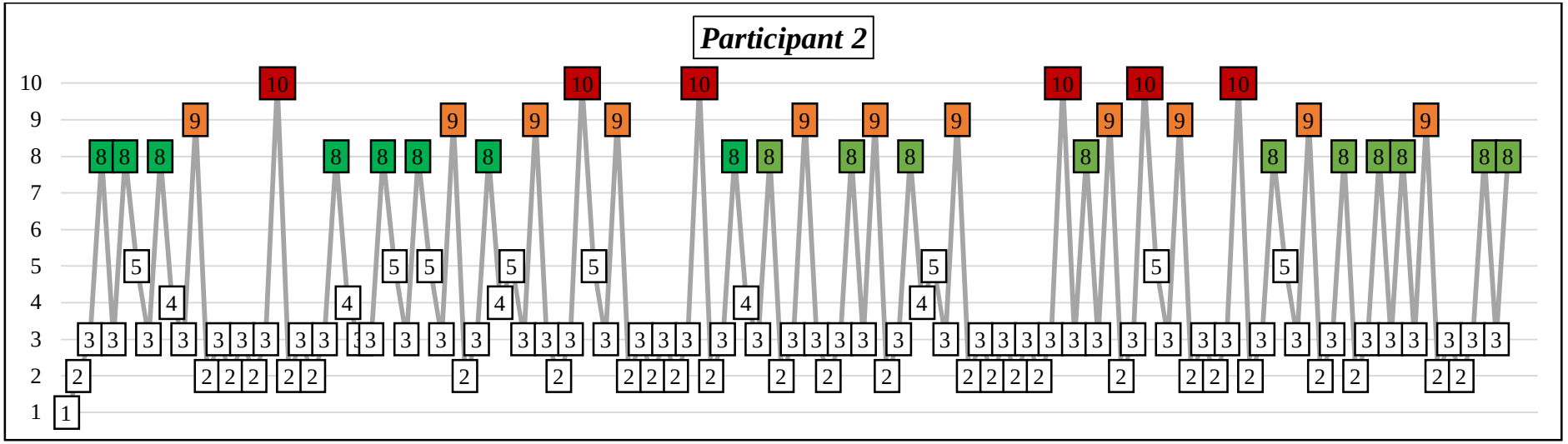
Step	Activity	Process
[1]	**Starting**	Participant one began with starting: identifying possible sources for information
[2]	**Differentiating**	Differentiation to select a source, Scopus in this case
[3]	**Extracting**	Keywords where used to start a search query and participant selects interesting articles
[8]	**Accessing successfully**	Participant tries to access an article of interest and succeeds: article is accessible and can be read
[5]	**Chaining**	Participant uses the successfully opened article to find, identify and select other interesting articles by reading the table of contents, reference list, etc.
[3]	**Extracting**	Participant has identified an article of interest while chaining and tries to locate it in the previously used database (Scopus)
[8]	**Accessing successfully**	Participant can successfully access the article of interest by searching the database
[5]	**Chaining**	Participant uses the previous, successfully opened, article to find, identify and select other interesting articles by reading the table of contents, reference list, etc.
[3]	**Extracting**	Participant has identified an article of interest while chaining and tries to locate it in the previously used database (Scopus)
[9]	**Access problem**	Participant tries to access the article of interest, but encounters an access problem; it cannot directly be accessed
[3]	**Extracting**	Participant tries to overcome the access problem by searching for the article in the same database she has found the article; still Scopus
[2]	**Differentiating**	Unsuccessfully in Scopus, participant identifies Google Scholar as another source to search for the same article.
[3]	**Extracting**	Google Scholar is used to extract the article.
[8]	**Accessing successfully**	The participant can overcome the access problem successfully, by using Google Scholar where the article was available.
[3]	**Extracting**	Participant goes back to Google Scholar to use keywords and starts to identify other interesting articles.
[9]	**Access problem**	Participant identified an article of interest and tries to access it, but encounters an access problem; it cannot directly be accessed.
[2]	**Differentiating**	Unsuccessfully in Google Scholar, participant identifies Scopus as another source to search for the same article.
[3]	**Extracting**	Participant searches in Scopus for the article.
[10]	**Unsolved access problem**	The article with the access problem cannot be accessed in Scopus, therefore participant one gives up and ends her search for this article: it is abandoned. After this point, the participant starts to search for other interesting articles.
Etc.	**Etc.**	Etc.

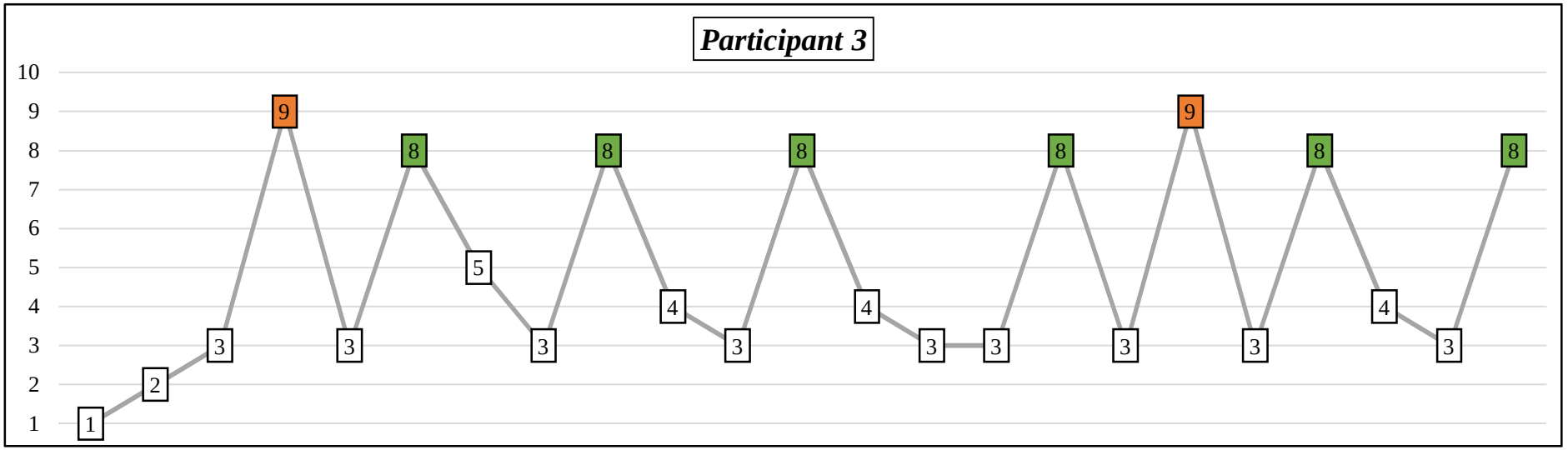
Table 3. Reviewing the individual information seeking behaviour of participant one

Information seeking behaviour per participant

Legend	
10.	Unsolved access problem
9.	Access problem
8.	Accessing article successfully
7.	Networking
6.	Monitoring
5.	Chaining
4.	Browsing
3.	Extracting
2.	Differentiating
1.	Starting




Participant 2
10
9
8
7
6
5
4
3
2
1


Participant 3
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5
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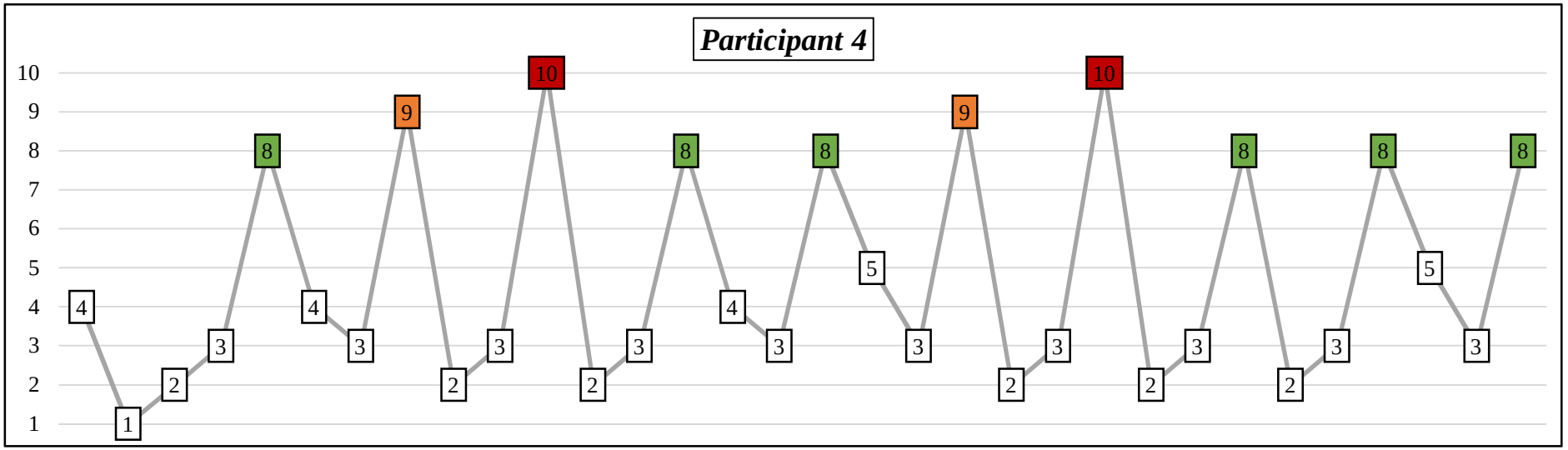
3
2
1


Participant 4
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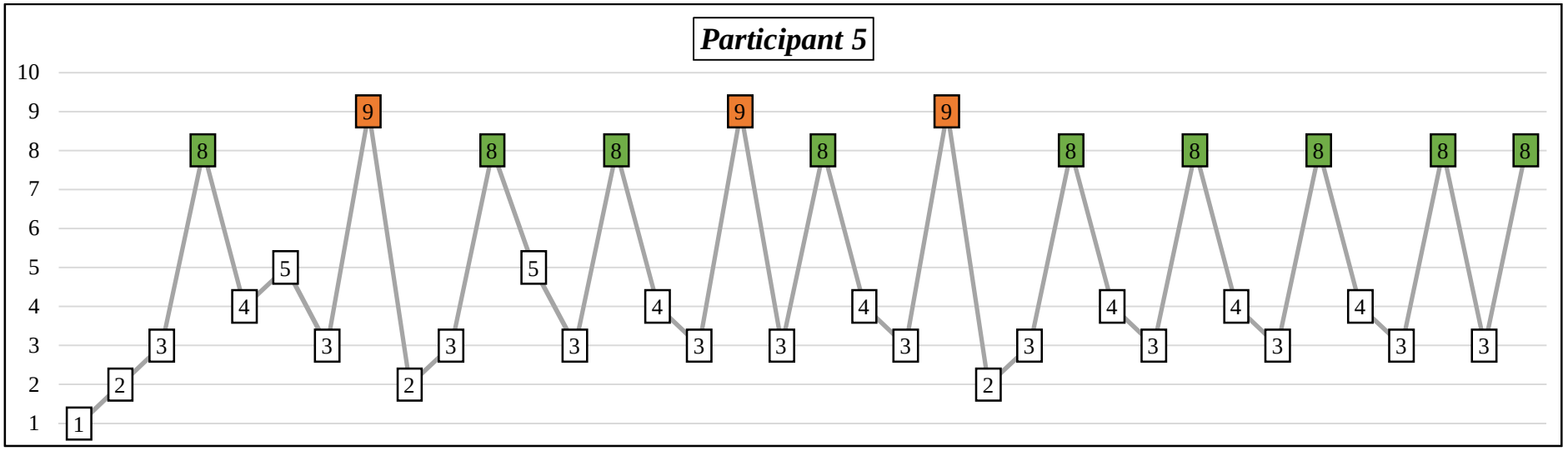
4 1 2 3 8 4 3 9 2 3 10 2 3 8 4 3 8 5 3 9 2 3 10 2 3 8 2 3 8 5 3 8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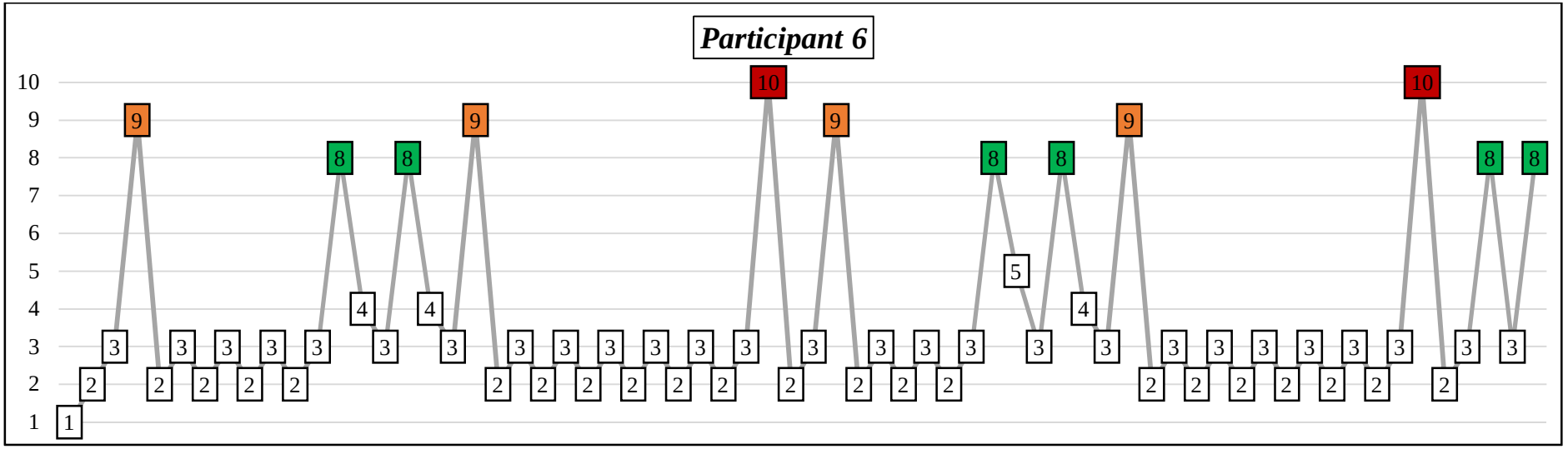
1 2 3 8 4 5 3 9 2 3 8 5 3 8 4 3 9 3 8 4 3 9 2 3 8 4 3 8 4 3 8 4 3 8 3 8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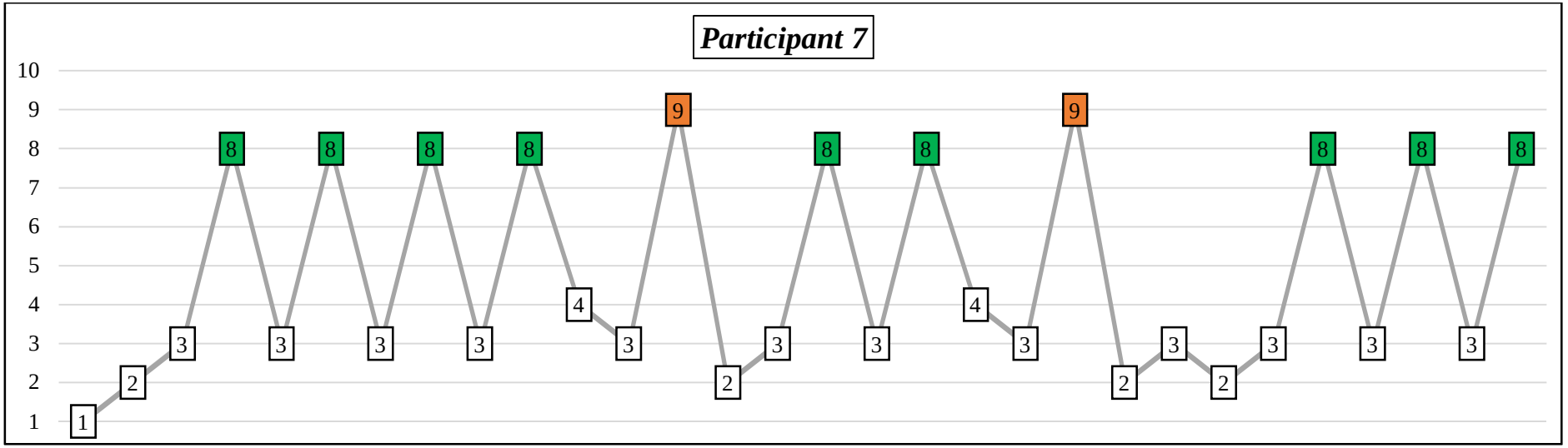
8
7
6
5
4
3
2
1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9
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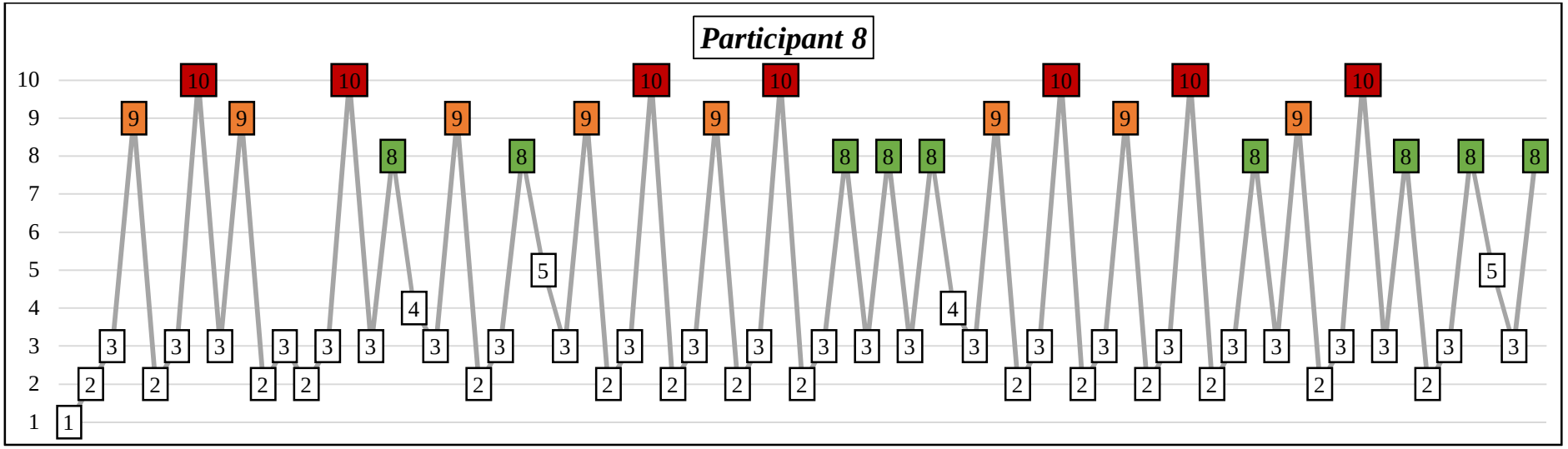
6
5
4
3
2
1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10
9
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6
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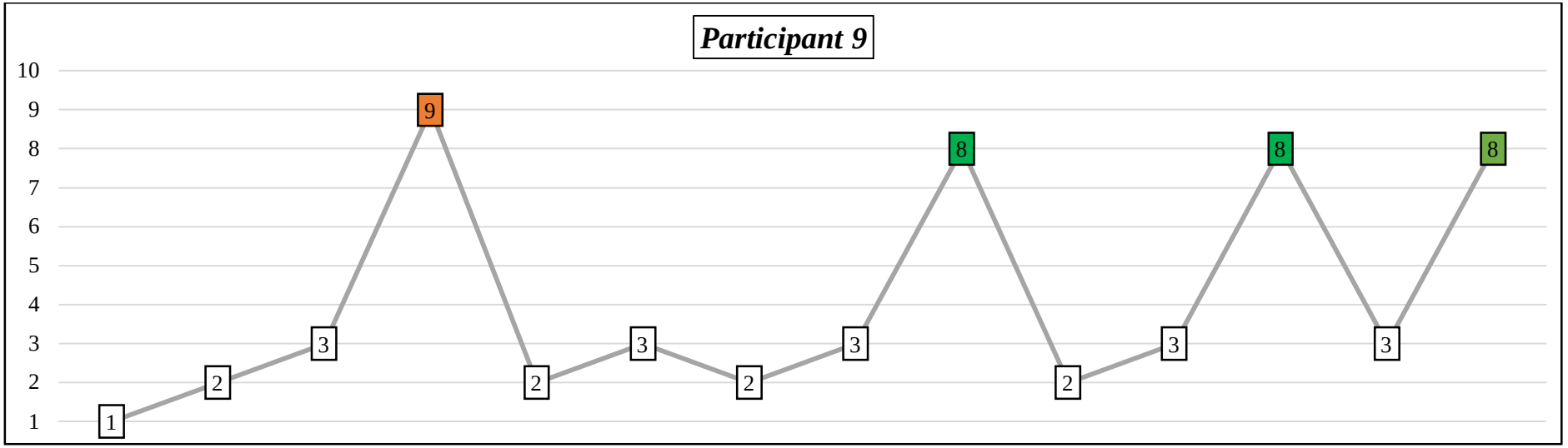
4
3
2
1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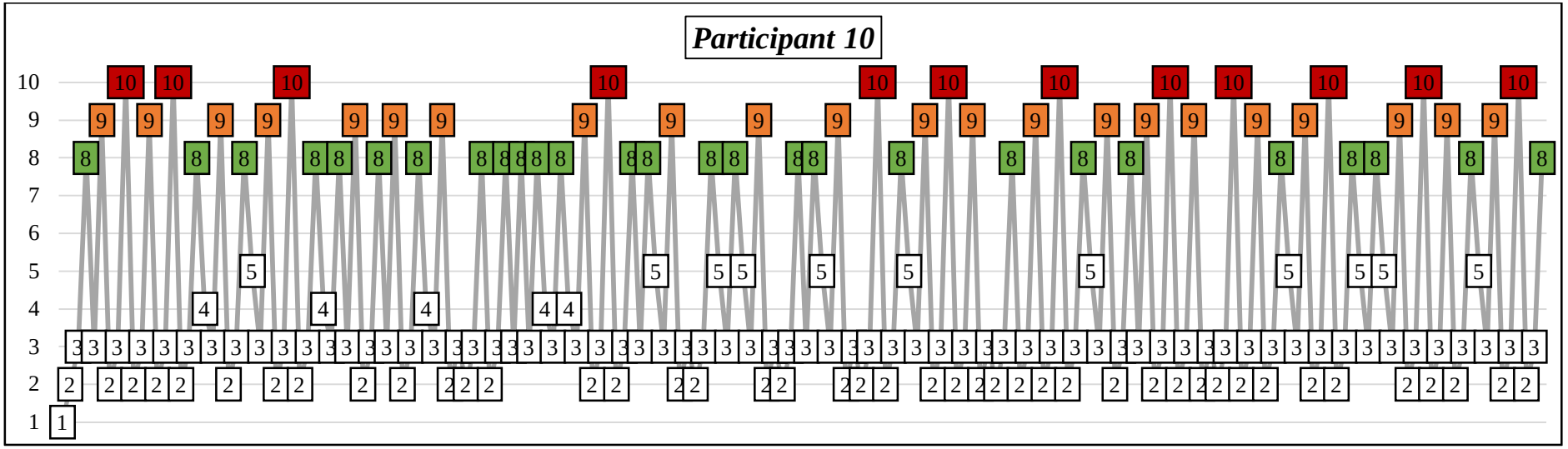
Participant 10
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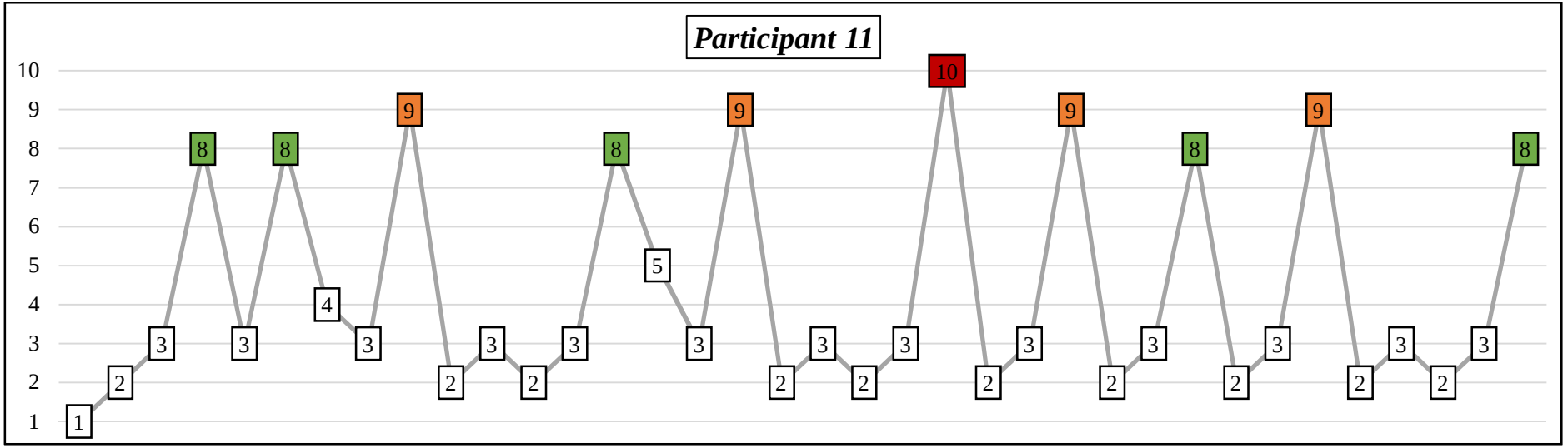
1


Participant 11
10
9
8
7
6
5
4
3
2
1

4.3.1 Individual information seeking strategies

The individual graphs, page 25 – 30, provide the opportunity to review each participant's searching strategy and behaviour.

Participant one. Only uses two out of four known databases in the entire search process and uses chaining more than browsing. Furthermore, when faced with access problems, differentiation is only used once after which the article is abandoned if it has not been successful. The amount of searched articles and observations show a reading strategy alternated with a scanning strategy.

Participant two. Uses five out seven known databases in the search process and also uses chaining more than browsing. When faced with access problems, the participant does not always use all of her known sources to search for the article of interest before abandoning it. Better results can, therefore, be possible. The amount of searched articles shows a scanning strategy.

Participant three. Uses the only databases known to this participants, never differentiates and uses browsing more than chaining. The participants search process does take time, in the one hour, only six articles where searched for and shows a reading strategy.

Participant four. Makes use of all known, two, databases and uses chaining and browsing an equal amount of times. When faced with access problems, all known databases are used and the amount of searched articles show a reading strategy.

Participant five. Makes use of two out of three known databases and prefers browsing instead of chaining. The participant was able to overcome all access problems and used a reading strategy.

Participant six. Used all of all seven databases and used browsing more than chaining. The amount of searched articles and process shows a reading strategy.

Participant seven. Made use of all three known databases and never used chaining, but did use browsing several times. The participant was able to overcome all encountered access problems and made use of a reading strategy.

Participant eight. Used three out of five known databases and did not prefer browsing over chaining or vice versa. The participant showed a very alternated search strategy; moving from scanning to reading and back in an unstructured way.

Participant nine. Also used three out of five known databases, never used chaining or browsing during the observation and searched for the lowest amount of articles of all participants. Only four articles where searched for and the only access problem was bypassed successfully. The participant made use of a reading strategy.

Participant ten. Used all known sources and preferred chaining over browsing. The participant was also the one that searched for most articles in all observations: 39 in one hour. A scanning strategy was, therefore, used.

Participant eleven. Used all known sources and did not have a preference between browsing or chaining. The participant made use of a reading strategy.

4.3.2 Starting [1]

All participants used starting to head directly to differentiating, as identifying was not as such a long process. Identifying a source of interest usually meant choosing between their top two or three most used sources. Even though participants did select a particular source, all but one admitted *'I usually start at the same source, because it is easy and I know how to search with this one'*. In 14 out of the 15 participants, their first used source was Google Scholar or Scopus. Participant six was the only exception to this and made use of seven different databases, starting with the source which would have the highest rate of success.

4.3.3 Differentiating [2]

When confronted with the particular choice of their first information source, the participant's answered in the same manner: *'The university taught me to use this source, so then it would be good enough'* and *'I always get so much results when searching* (writer: in their primary source) *that I always have enough information, so why go or use another source?'*. This is a matter of ease of use: students are learned, by their university, to use a certain source and therefore they are comfortable when using it and it saves time compared to using another, unknown source (Meho & Tibbo, 2003).

4.3.4 Extracting [3]

After the choice of database, participants directly started with the extracting phase. All participants used online databases during the observations. When extracting, the participants used a number of keywords, one or two, and started selecting articles by reviewing the titles and abstracts. In case there were too many hits, they looked at the results of the first, and sometimes second, page after which the search was changed with an extra keyword to narrow the amount of articles down, or other used other keywords. Vice versa, if participants found too

few articles, a broader term/keyword, or less terms/keywords, were used to broaden the search scope. Besides one participant, number six, no one wrote down the used search terms/keywords, what the results was (amount of articles found) or which focus and filters were used, see attachment 3.

Except for participant six, no participant made use of 'AND' or 'DE' options in a database, or searched for full text articles, peer reviewed or would even set a particular time frame in their search filters. Another feature that was not used by all, was the Thesaurus. Of all 15 participants, only seven knew of the existence of the Thesaurus, but only three reported using it on a regular base. Why was it not used by the others? The participants answered in a familiar way (see paragraph 4.3.2 differentiating): *'I always get enough information'* and *'I was not taught by the university so it would not be that useful/important'*, showing that students do not seem to care which sources they use, as longs as it is successful.

4.3.5 Browsing [4] and chaining [5]

In the observations, and joining interviews, it became clear that the participants use browsing and chaining unstructured, at their own discretion or willingness. When references or citations seemed interesting or useful, participants would use these in their own work, searched for the concerning source (article, book, etc.) and this would give them an opportunity to get their hands on new, useable information. At other moments, the table of contents, reference list, abstracts and authors were used as a starting point to gain new information. All participants did not use it as a standard step of finding new articles: they suddenly and willingly decided that the browsing or chaining would be their next step.

4.3.6 Monitoring [6]

In the case of monitoring, as can be seen from table 2 and the individual line graphs, all participants were in unity; no one kept track in a particular area by keeping up-to-date with a particular journal, magazine, book, newspapers etc. When asked why not, the answer lies in the extension of the ease of use: *'it takes too much time', 'whenever I search I always find enough sources'* etc. Some participants clarified not using monitoring, because subject of their assignments, and their thesis subject, differed and therefore it was not interesting to keep track of certain sources.

4.3.7 Networking [7]

Networking was not observed, but the lack of use was revealed in the adjacent interviews: participants only used it when they came across an access problem they really wanted to solve.

Teachers, fellow students from other universities, supervisors or partners could be asked to search and access a certain article. *'Whenever I really want a paper and cannot access or find it at the databases I have access to, I use the databases my girlfriend has access to. She is studying on the University of Utrecht, which has more/other databases.*' This citation shows the most common use of networking: partners who had access to other databases where asked to search for an article, and in some cases login codes where exchanged. However, teachers and supervisors were named as possible sources to overcome an access problem, but the participants never contacted them for this situation. This will be further discussed in the next chapter.

4.3.8 Successfully accessing [8], access problems [9] and unsolved access problems [10]

Table 4 shows the results of observations. The 11 participants tried to access a total of 140 articles in the one hour of their observation with an average of 12.7 per participants. In total, 65 access problems [9] were encountered, with an average of 5.8 per participant, and was not able to solve 33 of these 65 encountered access problems [10], an average of 3 per participant. In summary this means that the participants were able to directly access 53.6 percent on average [8], but encountered access problems [9] with 46.3 of all scientific literature. Indirectly, 76.4 was eventually accessed [8] with extra effort of the participants and 23.6 percent of all articles was inaccessible [10] in the observations. These results show the direct impact of access problems in the information seeking process and can be addressed as large as almost one out of each two articles represented an access problem.

Participant	Amount of articles	Directly accessed [8]		Access problem [9]		Unsolved access problems [10]		Total success		Satisfactory level
1	12	7	58,33%	5	41,67%	3	**25,00%**	**9**	**75%**	**4**
2	24	13	54,17%	11	45,83%	6	**25,00%**	**18**	**75%**	**4**
3	6	4	66,67%	2	33,33%	0	0,00%	**6**	**100%**	**2**
4	8	6	75,00%	2	25,00%	2	**25,00%**	**6**	**75%**	**4**
5	9	6	66,67%	3	33,33%	0	0,00%	**9**	**100%**	**3**
6	8	4	50,00%	4	50,00%	2	**25,00%**	**6**	**75%**	**5**
7	9	7	77,78%	2	22,22%	0	0,00%	**9**	**100%**	**4**
8	16	8	50,00%	8	50,00%	7	**43.75%**	**9**	**56%**	**4**
9	3	1	33,33%	2	66,67%	0	0,00%	**3**	**100%**	**4**
10	39	17	43,59%	22	56,41%	12	**30,77%**	**27**	**69%**	**2**
11	6	2	33,33%	4	66,67%	1	**16,67%**	**5**	**83%**	**4**
Total	**140**	**75**	**53,57%**	**65**	**46,43%**	**33**	**23,57%**	**107**	**76%**	**3.6**

Table 4. Amount of access problems per participants

4.3.9 Satisfactory level

After the observations, the participants were asked how satisfied they were with the results from their literature search, one a one-to-five scale, see table 4. This resulted in an average of 3.6, or 72 percent, compared to the total solved access problems of 82.6 percent. From this it can be concluded that the participants are somewhat critical on their results but still find it adequate enough. However, if the results are considered on an individual base, it appears that the participants are very subjective on their results as can be seen in table 4. Participants 1, 2, 4, 6, and 8 have a high unsolved access problem rate, are satisfied or even very satisfied with their findings. Very critical participants however, 3 and 5, solved all access problems but were not satisfied with their success. The other critical participant, 10, has the second highest unsolved rating, therefor making his satisfactory level of 2 a normal critical insight. These results show the high subjectivity level of the participants on their results and findings.

4.3.10 The effects of extracting [3], browsing [4] and chaining [5]

In the process of information seeking, the participants had three possible ways of selecting an article which they would want to access: extracting, browsing and chaining. Extracting is the basis of information seeking behaviour as the participants first have to find and access articles before browsing or chaining can be used. Table 5 also show that extracting is the most used way of selecting articles with 58.6 percent, browsing and chaining are responsible for just over 40 percent of all selected articles. The individual participant's information seeking behaviour makes it possible to measure the success rate of each selecting and accessing path.

Table 5 shows a high direct result from direct extracting [3] from an information source, 65.8 percent, against the much lower results of browsing [4] and chaining [5], respectively 32.3 and 40.7 percent. Eventually, after dealing with the occurred accessed problems, extracting yielded an 85.4 percent rate against 71 and 55.6 percent of browsing and chaining. Extracting is not only a more successful, and preferable, way of selecting scientific literature on the short term, but also on the long term. These differences do raise the question why one way is more successful than the others. As seen before, not all articles in the search results from the database are necessary accessible, but the bulk is. So when information seekers search in a database, extracting, the search query provides the information seeker with articles that are available or are named in the databases itself. However, when information seekers use browsing or chaining to find new, interesting, scientific literature, they do not know if this particular literature is available or named in the database(s) they use. Hence, the direct success rates of browsing and

chaining show a lower direct rate of success, and the information seeker will have to deal with more access problems to be, eventually, successful in accessing scientific literature.

Activity	Amount of articles	Directly accessed [8]		Access problem [9]		Unsolved [10]		Total success	
Direct Extracting [3]	82	54	65,85%	28	34,15%	12	14,63%	70	85,37%
Browsing [4]	31	10	32,26%	21	67,74%	9	29,03%	22	70,97%
Chaining [5]	27	11	40,74%	16	59,26%	12	44,44%	15	55,56%
Total	**140**	**75**	**53,57%**	**65**	**46,43%**	**33**	**23,57%**	**107**	**76,43%**

Table 5. Success of the approach steps

4.4 Steps undertaken when faced with access problems

This chapter shows the reaction of the participants when they were faced with access problems: not being able to access a particular information source, article or book.

4.4.1 Differentiating [2] and extracting [3]

The individual information seeking behaviour provides data on how the participants dealt with the encountered access problems. When faced with an access problem [9], all participants reacted in the same way: differentiate [2] and extract [3] if possible. In practice this meant selecting another database to search for the troubled article and all participants used Google Scholar as their first go-to databases, if they were not already using it. Using Google Scholar as a backup is very logical to the participants as they explained: *'If I have trouble finding an article, Google Scholar is the place to be where you don't have to log in or use a VPN connection. You just go to the website, copy paste the title of the article and you are ready to go'*. This example, also, shows that the participants do not seem to care where the information comes from, as long as they can access it quickly.

When Google Scholar was not successful, four participants abandoned [10] their search for this particular article and moved on to search for other relevant scientific articles or books. Of the remaining seven participants, six used, besides Google Scholar, one other database to search for the troubled article and abandoned their search if it was not found. Only one participant, number six, used all of her known databases to search for this article. The students do not go to great lengths to find articles that are not directly accessible, as they do not use all of their known databases. Again, the amount and easiness to find articles and time are factors named by the participants as an excuse not to extent their search after being encountered with access problems.

4.4.2 Networking [7]

If all else failed, participants turned to their network for accessing scientific literature. Four participants, of all 15, made use of the databases their partner had access to, in all cases attending other universities as the participants. Many knew other possibilities, such as contacting their thesis supervisor, teacher or author but this was rarely used. When faced with not using these channels, the participants reacted unforeseen: *'My supervisor or teacher is very busy and I do not think I could bother him with this. I do not think it is even important enough to ask him/her this'*. In the case of contacting an author of the scientific literature needed, students were even more hesitant as they deemed authors even more busy or uninterested in the work of a student. Another participant used Research Gate with success, as authors, when asked, will provide the Research Gate community with their research.

One participant made use of another networking source, which did not come forth in doing research for this subject; a study Facebook page. In this case, the participant studied Technical Medicine, a study which just started in recent years and which is not, yet, studied by many. The Facebook page is used by students of this particular study to ask for scientific literature which cannot be accessed by one, but might be by other students from different universities. The participant recorded using it regularly and that the success rate, up till now, was 100 percent.

4.4.3 IBL service

Of all 11 participant no one was aware of the possibility to ask the library of their university to search and access a certain piece of scientific literature. The four participants of the in-depth interviews, reported to have only been acquainted with it by accident. Two by a teacher, the other from going to the library and being offered the option, and the last one by an online forum, which had nothing to do with the university. All four reported to have only used it once or twice, that it worked just fine and that it, on overage, took three to five days before receiving the scientific literature. However, it seemed that the, financial, terms to use the IBL service differs per study. Two students recalled paying for everything, while another one told that his study had a small fund that would pay for two or three requests per student, per year. The remaining participants did not recall how this went down, besides not having to pay for it.

4.4.4 Lifting the paywall

The last possibilities, not used by any participants, is of course paying the paywall fee. Only one participants' company payed for scientific literature.

4.4.5 The process

The results present a number of options how students can deal with access problems: using Google Scholar, move to other databases, use your network or the IBL service. Another option is, of course, to pay for the literature. Many participants did not make use of all options and these options, besides paying, are in no way or from a guarantee that an information seeker can bypass or overcome all access problems.

5. Key findings, practical implications, limitations, future research & conclusion

In this chapter the key findings from the data and results from this thesis' research will be discussed, alongside with the practical implications. Furthermore, the limitations and suggestions for future research will be presented as well as the conclusion.

5.1 Key findings

This paragraph highlights the main and most important results from this thesis in their context.

5.1.1 Information seeking behaviour of graduate students

All observed participants use and know only a very limited amount of sources for accessing scientific literature. Participants only new, on average, 3.7 online databases per participant, while the amount of used sources is even lower. The joining interviews implicate a connection with the teachings of the university itself. When students start their Master study, they are taught to use certain sources, but only a very limited amount and in a very limited way, resulting in a situation where graduate students have to start searching for scientific literature with a basic level of knowledge and information searching capabilities.

The individual information seeking behaviour data show a basic structured way as the participant's use starting, differentiating and extracting as the basis. However, in practice students use only a very limited amount of their known sources to search with, and start by using their 'favourite' source instead of the source that would fit best for their information needs. Furthermore, the usage of browsing and chaining is totally unstructured and the use of monitoring has not been observed at all. The information seeking strategy most participants used can be described as a reading strategy, where students first read, parts, of the accessed articles instead of directly moving on. The use of online databases also shows a very basic level of knowledge of information seeking behaviour: typing in some relevant keywords are the bases for all searches, any use of advanced capabilities of databases are rarely observed and the joining interviews show a limited knowledge on the existence of these features. The findings on this subject support the work of Griffiths & Brophy (2005), who argue that, for many students, online searching is difficult and students do not use advanced features.

The participants show a very indifferent and unmotivated attitude towards achieving a better result when searching for scientific literature, as many do not actively search for possible improvements. These participants argue that the university has taught them these sources and capabilities and therefore, it should be suited to fulfil their needs. However, self-learning and

improvement to achieve better results when searching for information might be something we can expect from academic students of this generation. Instead, many participants settle on information and insights provided by the university.

5.1.2 Types of access problems

The results show two restrictions, the paywall and the availability within the databases. This will probably be nothing new for any academic researcher or academic student, however, the limited amount of knowledge and capabilities of the participants raise the questions whether this restricts the student's information seeking behaviour and quality of the results. It might restrict the information seeker to find the exact information, or even find the quality of information needed. In the observations and interviews it became clear that the participants, 14 out of 15, often receive too much results from their searches. In these searches the participants had to distinguish between information that regards their subject and information on completely unrelated topics. This situation takes up more time and it does not provide the information seeker with a clear picture of how many sources there actually are the given subject. Furthermore, it limits the searchers' sight as all participants do not view all available articles of their search query; most of the time they only view the articles on the first page. The obstacles that occur from having too much results, can be linked to the basic knowledge and capabilities graduate students have of the information seeking process. Having too much information to go through can provide restrictions on the information seekers and therefore could cause an access problem on its own.

5.1.3 Amount of access problems

Only just over 50 percent was directly accessible; 46.43 percent of all searched for articles encountered an access problem. After extra effort from the participants, 76.4 percent success was achieved, 23.6 percent was inaccessible. Stating this shows a relevant picture of the current situation as many participants did not use all sources and possibilities at their disposal, and therefor this figure could be (much?) higher. The figures also imply that extracting is a preferable way of selecting articles, over browsing and chaining as their success rate is much lower as the first-mentioned. Extracting shows results that are accessible or at least present in that database in some sort, with browsing and chaining, in combination with using a very limited amount of information sources, information seekers could be wasting his or her time by going after this information.

5.1.4 Dealing with encountered access problems

The reaction of the participants on encountered access problems in the observations, can be, partially, attributed to the same lack of knowledge and capabilities earlier mentioned. Some of the, limited amount, of known databases are consulted for the needed literature, and when this fails, searches are abandoned. Some participants do use other possibilities, such as accessing databases their partners are able to access. However, this is also not observed. Luckily, some participants showed an interesting drive to find other ways of dealing with the access problems, such as student group Facebook pages, the IBL service and use of illegal, foreign, websites. Although the use of the first and latter is subject to ethical concerns, it does show possibilities if the information seeker is willing to use these sources.

A very interesting key findings is that the participants deviate from their normal information seeking process when they deal with access problems. Other sources are consulted as other databases than their 'favourite' are used, their network is asked to participate, and the IBL service sometimes provides results if students are aware of the possibilities. A last option, not observed but certainly a possibility, is paying for the information source. However, the participants do explain not to want to pay for any scientific literature; Open Access could, can, and therefor might be the solution.

5.2 Practical implications

In this chapter, some implications, descended from the results, are discussed.

This thesis' main focus is on finding out what impact access problems have on the information seeking behaviour. Access problems occur, simply because not all scientific literature is directly available due to subscription fees or other obstacles. As the gap in the literature shows a lack of understanding on this subject, finding out which processes are undertaken by graduate students and how many access problems are encountered is the basis of this thesis and its conclusions.

First of all, the activities students have to take when faced with access problems can be seen as all processes and steps that are undertaken, to access a particular piece of scientific literature, when it cannot directly be accessed. The data suggests a number of possibilities: networking, making use of other databases than usual, the IBL service and paying for literature. However, the observations make clear that the graduate student does not make full use of these possibilities and abandons literature quickly when faced with access problems. Rather than putting time and effort in finding quality information to use, the students are searching for easy

and quick accessible information. On the other side, there are students some investing time and effort by reaching out to others by posting their access problems on Facebook pages, Research Gate and using the IBL service. However, this does influence the information seeking process negatively as student are not sure of success and have to wait a while.

Secondly, the literature review showed that many students lack the capabilities and knowledge to be a good online researcher (Griffiths & Brophy, 2005). The results from this research support this claim: students are not aware of the differences between databases, do not use or know advanced features from databases and have a very limited knowledge regarding the amount and focus of databases their university provides them with. The data from this study does not, per se, identify the culprit, it does however, provide a possible solution to this problem. The students have been introduced to, acquired capabilities on, and were made aware of, the databases and possible sources by their university. The students copied and used this information, but did not proceeded to build on this knowledge by self-study or learning and worked their way through assignments and master thesis' with underdeveloped, basic skills and capabilities of the information sources. The outcome provides opportunities for the university and its information specialists to teach their students more advanced skills and provide them with extensive knowledge on how to be more successful when using online databases.

Thirdly, the amount of encountered access problems addresses, and shows, some of the impact it has on the information seeking behaviour. In this current situation it is inevitable for information seekers to deal with access problems as only 53.57 percent of all scientific literature which the participants tried to access was directly accessible. As though it might be inevitable, many participants do not even seem to have the knowledge to deal with access problems, have the motivation to acquire the knowledge or do even take the access problems serious. The consequences of this situation impacts the information seeking process and research time negatively, as access problems ask for different activities and the information seeker will have to invest effort and time to acquire all the articles. It also means that students cannot, or lack the motivation too, access all accessible articles, which eventually leaves its mark in the quality of their results as more information can provide better knowledge and insight on the subject of choice.

Fourthly, this thesis has used the information seeking behaviour model of Ellis (1989) with a revision of Meho & Tibbo (2003). However, the results from this thesis does not support all findings and conclusions of these articles when it comes to information seeking behaviour of graduate students. First of all, networking as a stage has only been used when faced with access

problems. As Meho and Tibbo view accessing scientific literature as a freestanding process, the original six stage model of Ellis (1989) should be maintained without the extension of the networking stage when talking about graduate students. Reason for this separation between populations, is the way networking is used. Graduate students use it to solve access problems but for social scientists, networking means communication and upholding close relations with friends, colleagues, intellectuals working in similar topics, government officials, booksellers and members of ethnic organizations (Ellis, 1989). It is focused on building collections, gathering and sharing information (Meho & Tibbo, 2003). Secondly in the current era of information seeking, it appears that monitoring is not used by graduate students in the process of information seeking. Students who are doing research on the university will have to deal with a number of different areas of information and topics, which in their career as students, are constantly moving from one to another. Therefor it does not seem to be necessary or even possible for students to use monitoring. And lastly, the results ask for deepening and enlargement of the information seeking behaviour.

Fifthly, the gathered data from this research adds and fills a small part of information and gap on accessing literature. As the process of accessing information is presented as a very black and white situation, the results beg to differ. When a certain scientific literature is chosen to be accessed, the process is divided into two possibilities: direct sources where the information seeker is able to access the literature immediately, and indirect sources, where access problems occur. It '*…is based on the success or failure of obtaining needed materials and/or gaining access to various sources and types of information'* (Meho & Tibbo, 2003, p. 585), which does not provide readers or users with any useful information on the process of accessing information. This thesis provides information on possible deepening and enlargement of the accessing process, by replacing networking into the accessing process, along with paying for literature, use of other databases with the sole purpose of accessing a particular piece of scientific literature and making use of the IBL service. This provides universities, teachers and their information specialists handles and basic possibilities to teach students how to deal with access problems. As argued before, guidance and support can make a difference in the information seeking behaviour of students and their results.

Last but not least, the introduction shows that universities are busy addressing the point of high subscription fees and are actively pursuing the open access movement, arguing that the lack of access deprives the student, researcher and faculty of valuable information. This implies that the university are actively supporting and helping students to become more efficient and

effective researchers, by teaching and providing them with the right skills, capabilities and knowledge. The results from the observations show the other side of the medallion, as students only have basic skills and knowledge. In hindsight, students are aware that the information they were provided with, by the university, could have been more in-depth and that having support or help during their Master's, would be helpful. However, pointing fingers will not solve this status quo on who's to blame for the level of research knowledge and capabilities of graduate students. One thing is for sure, the Universities are actively pursuing a better research situation and therefor they have the responsibility to live up to their credo at all levels of their institution.

5.3 Limitations

First, this thesis relies on qualitative research which has its strength, but also its weaknesses. In this type of research, the quality of the research heavily depends on the skills of the researcher and could easily be influenced by the researcher's idiosyncrasies and biases. To be as objective as possible, the data analysis has been checked by two other academic students, as well as the research design. Still, possible biases and idiosyncrasies could influence the integrity of this research.

Another limitation is that this study is focused on setting the first steps in discovering the impact of access problems in the information seeking behaviour of graduate students and to start a conversation on how these problems can be addressed. Therefor this study is not focused on generalizability of the results, but only to inform the readers, and the academic world, of the situation at hand. The data of this study comes from 11 observations of one hour, excluding the adjacent interview, and four in-depth interviews with other, former, graduate students. The, in total, 15 students, represent three different universities. This composition and small amount of participants limits the transferability and validity, and ensures that the findings are not to be treated as representative for all graduate students. However, it is focused on creating insight into the information seeking behaviour of this population. If this research would be reproduced, other outcomes are therefore possible.

Furthermore, the process of information seeking is subject to a fast and ever changing situation as the technology continues to provide more possibilities as universities, governments and other stakeholders are actively working towards an era of total open access. This restricts the durability of this research and might not be valid or representative in a short matter of time. However, even as total open access is to be achieved in the future, it does not directly make graduate students good researchers.

5.4 Future research

First of all, future research should be focused, for one, on the relation between the teachings of the university, the information seeking behaviour, use of databases and results of graduate students. As the outcomes of the observations and interviews implies a direct relation between the teachings of the university on the use databases, the development of information seeking skills and the use and capabilities of graduate students. By knowing more on the successes and pitfalls of the student's information seeking behaviour, universities and their information specialists would be in a better situation to guide, teach and help students to become better researchers. Not only can it positively influence the results of the students, and therefore the university, it also gives students a better starting position when pursuing a career in research or the private sector.

Next to this, a longitudinal study could provide a better understanding of the information seeking behaviour of graduate students. This could potentially provide insight in the long term effects of access problems and use of databases if graduate students would be observed for a longer period of time. Furthermore, a larger sample size would make the findings more transferable, valid and generalizable, and could even provide a wider view of all possibilities a graduate student has to deal with access problems. As I propose possible revisions in the work of Ellis (1989) and Meho & Tibbo (2003), a larger sample size should be able to provide a clear understanding whether these assumptions are typical for the information seeking behaviour of graduate students.

5.5 Conclusion

This research investigated the information seeking behaviour of graduate students, which type and how much access problems they encounter, and which effect it has on the information seeking behaviour. These questions have been researched in order to provide an answer on the main research question: To what extent do access problems influence the information seeking behaviour of graduate students?

The results show that graduate students have to side track their usual and ideal information seeking process with actions they would normally not use, in order to deal with the encountered access problems. Furthermore, it shows that, of all literature the participants wanted to access, only 53 percent was directly available to them: in case of the other 47 percent, access problems were encountered. This statistic shows that the influence of access problems is rather large.

Furthermore, the results suggest that the knowledge and capabilities of the graduate students are limitations on the information seeking behaviour. The universities are however in the position to teach and guide graduate students in better, more effective, ways to seek for information. Universities can therefore make the students more aware of the possible sources of information that could be used, as well as provide the know-how and capabilities to work with them. This might help the graduate students to become more effective and efficient researchers and in time could increase the overall quality of graduate students' results.

The results, observations and adjoining interviews show that students are not very disciplined or motivated because they find enough information when searching for scientific literature. This however, conflicts with the idea of open access. While the Dutch universities are lobbying to provide a situation where all published scientific literature is freely and publicly available, students seem to struggle with the amount of data they can access at this very moment. Even though total open access can, and probably will, provide society with many benefits, universities should be focusing on teaching graduate students how to deal with the amount of information available at this moment, before providing them with even more.

Attachment 1 – Accessing literature 'yes or no'

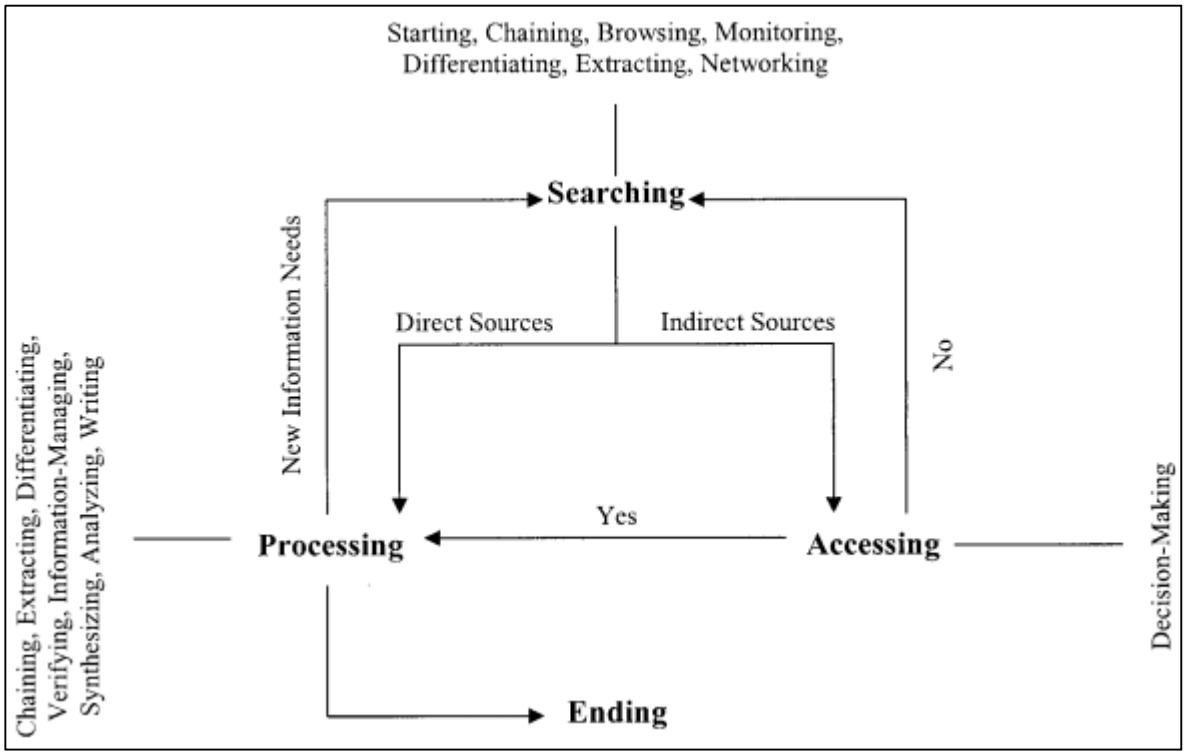


Figure 2. The information seeking behaviour process, modelled by (Meho & Tibbo, 2003)

Attachment 2 – Observation & joining interview form

Observation

Location:

Date:

Time:

Introduction

Assignment:

Searching for:

Progress:

Sources used:

Literature search process

Observed & interviewed:

Use of 7 searching steps of Ellis / Meho & Tebbo

Step	Use	Comments	Used at Access problem?	Only with Access Problem?
1. Starting				
2. Chaining				
3. Browsing				
4. Differentiating				
5. Monitoring				
6. Extracting				
7. Networking				

Dealing with access problems

Observed & interviewed:

Interview

Q: Why do you use these sources and how do you know of these sources?

A:

Q: Encountered access problems?

A:

Q: Do you know of OA and did you ever used OA articles or databases?

A:

Q: Are you satisfied with the information and articles you have found today?

A:

Q: Looking back, would you have wanted more guidance or help from the university with searching for articles and relevant information?

A:

Last remarks

Amount of access problems:

Attachment 3 – Search Plan Participant 6

Topic: Self-Determination Theory (SDT) within corporate organizations.

Research question: How can SDT support a cultural change towards autonomous and creative customer service agents, within an outsourced corporate environment?

- What aspects of SDT can support corporate cultural change?
- What interventions based on SDT can support the development of autonomous and creative customer service agents?

Key words: Self-Determination Theory, Autonomy, Creative Thinking, Corporate Culture, Corporate Climate

Search steps:

- 'Self-Determination' AND Autonomy AND Corporate
- 'Self-Determination' AND Creativity AND Corporate
- 'Self-Determination' AND Autonomy AND Work
- 'Self-Determination' AND Creativity AND Work
- 'Self-Determination' AND Autonomy
- 'Self-Determination' AND Autonomy AND Learning
- 'Self-Determination' AND Corporate
- Autonomy AND Corporate
- Autonomy AND Work
- Creativity AND Work
- Creativity AND Corporate
- 'Self-Determination' AND Corporate Culture
- 'Self-Determination' AND Culture
- 'Self-Determination' AND Corporate Climate
- 'Self-Determination' AND Climate
- 'Corporate Culture' AND Autonomy
- 'Corporate Culture' AND Creativity

Search sources:

- Scholar.google.nl
- Scopus
- Web of Science
- NARCIS
- ERIC

Relevant authors:

Richard Ryan, Edward Deci, Mihaly Csikszentmihalyi

Source type: Peer-reviewed articles, book chapters.

Time range: (1975-2012) 2012-2016

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