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Aliaksandra Shutsko, Wolfgang G. Stock

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Aliaksandra Shutsko and Wolfgang G. Stock*

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Abstract: What are the motivations and sought gratifications leading information science researchers to share and to reuse research data? Research data are both datasets and supplementary materials such as interview guides or questionnaires. The theoretical backgrounds of this study are the Lasswell Formula of Communication, the Uses and Gratifications Theory, and the Self-determination Theory, which formed the basis for the construction of an interview guide and the interpretation of the interview transcripts. We performed 11 in-depth interviews with German information scientists, all with experiences with data. The results demonstrate that research data sharing is not a rare practice among information scientists. Due to problems with different information horizons of the sharing and the reusing researchers, the reusing of data sets is much rarer than the reuse of supplementary materials.

Keywords: research data; information science; data sharing; data reuse; motivations; gratifications

1 Introduction

For centuries, large amounts of data have been generated by researchers. However, this data often remains underutilized because of the lack of research data sharing and reuse practices in the scientific community. In the context of Open Science (Zarghani et al. 2023), it is discussed that research data should be shared by universities and research institutes in a comprehensible and reusable manner; for realizing this, a new job profile called “data steward” became created (Seidlmayer et al. 2023). For data stewardship, the FAIR principles were formulated, for instance, by the European

Commission for its “Horizon 2020” programme (European Commission 2016), meaning that shared research data should be findable, accessible, interoperable, and reusable (Boeckhout, Zielhuis, and Bredenoord 2018; Wilkinson et al. 2016). However, as necessary preconditions, researchers have to have the willingness to FAIRly share their research data and other researchers must have the willingness to reuse such data. Both preconditions are by no means self-evident. Although in some disciplines such as astrophysics the culture of data sharing and reuse is already well established (Zuiderwijk and Spiers 2019), the data markets of most scientific communities are not yet perfectly filled with data. Our research concentrates on data in only one knowledge field, namely information science: what is the situation of research data sharing and reuse in information science research?

There are many articles on research data and their sharing and reusing, but not so many about the researchers' concrete motivations to share their own data or to reuse data from third parties. Extensive studies of the drivers and impediments of research data sharing and reuse can be found in the works by Gregory et al. (2023), Zuiderwijk, Shinde, and Jeng (2020), and Tenopir et al. (2020). Stieglitz et al. (2020, 11) report on perceived advances (benefits for switching, career, and networking), disadvantages (also for one's own career), and uncertainty factors (fears of losing one's unique value, of data misuse, and of competition) for the researchers' intention to share their research data. Key motivation factors for researchers to share their research data are contributing to scientific progress as well as increasing citations and visibility (Elsayed and Saleh 2018). Heck et al. (2020) mention that shared open research data is beneficial not only for research, but also for science teaching. Some projects work with questionnaires with many participants (as, e.g., Gregory et al. 2023), but cannot give detailed information on all motivations of the researchers and also not for specific disciplines.

In this work, we aim to investigate current research data sharing and reuse motivations of information science researchers. For information science, you can find articles on research data management in this knowledge field (Ashiq, Saleem, and Asim 2021; Kim et al. 2022; Nezhad, Droudi, and Javaran 2021), on information science research data on Figshare (Cho 2019), on data curation in this discipline

*Corresponding author: Wolfgang G. Stock, Heinrich Heine University Düsseldorf, Universitätsstraße 1, D-40225 Düsseldorf, Germany, E-mail: wolfgang.stock@hhu.de. <https://orcid.org/0000-0003-2697-3225>

Aliaksandra Shutsko, Heinrich Heine University Düsseldorf, Universitätsstraße 1, D-40225 Düsseldorf, Germany, E-mail: aliaksandra.shutsko@hhu.de

(Maurya and Subaveerapandiyam 2022), and the correlations between an information science journal and the availability of the articles' research data (Aleixandre-Benavent et al. 2016). But we failed to identify studies on the motivations and sought gratifications of information scientists to share or reuse research data. It is the aim of this article to fill this research gap.

For this, an exploratory study employing semi-structured interviews was conducted. To identify motives and gratifications of researchers, we probe three theoretical frameworks, i.e., the Lasswell formula of communication, the Uses and Gratifications Theory (U>), and the Self-Determination Theory (SDT). So far, there have been no studies employing the named theoretical approaches to study the use of media platforms for research data sharing and reuse in academia. Research data repositories include services such as *Zenodo*, *OSF* or data search portals like *Google Dataset Search* or *Web of Science – Data Citation Index*.

In this article “research data” is defined as any information in relation to research. Thus, research data includes not only files of raw data and calculations, but also other types of information underlying a research study such as spreadsheets, questionnaires, interview guides, transcripts, codebooks, models, algorithms, and scripts.

2 Theoretical Background

2.1 Academics' Information Behaviour Concerning Research Data Sharing and Reuse

Wilson (2000, 49) defines information behaviour as “the totality of human behavior in relation to sources and channels of information, including both active and passive information seeking, and information use.” Since “research data” can be subsumed under information, research data sharing and research data reuse can be viewed as types of information behaviour. Furthermore, to use, or reuse, the research data, researchers need to engage in information seeking behaviour. Similarly to the social media users, researchers may act as “prosumers,” i.e., both as producers and as consumers of the content, in this case, the research data.

Research data sharing is defined as making data available to other (external) researchers who are not involved in the data collection in any form. The form of data sharing can vary from granting access to data upon request to a publication, as supplementary material to a research article, a

publication in a data journal, or in a research data repository. Data reuse is “the use of any research resource regardless of when it is used, the purpose, the characteristics of the data and its user” (van de Sandt et al. 2019, 14).

2.2 Lasswell Formula of Communication: How Do Researchers Share or Reuse Research Data?

One of the classical sender-centred communication models is the theory of Lasswell (1948) introducing the following questions:

- Who
- Says What
- In Which Channel
- To Whom
- With What Effect?

These five questions lead to five sub-disciplines of communication science, which however can definitely cooperate. “Scholars who study the ‘who,’ the communicator, look into the factors that initiate and guide the act of communication. ... Specialists who focus upon the ‘says what’ engage in content analysis. Those who look primarily at the radio, press, film and other channels of communication are doing media analysis. When the principal concern is with the persons reached by the media, we speak of audience analysis. If the question is the impact upon audience, the problem is effect analysis” (Lasswell 1948, 37). Braddock (1958) adds two further questions:

- What Circumstances?
- What Purpose?

What Circumstances? analyses the environment of the actions in terms of time and setting. This question is similar to Sonnenwald's (2005) conception of an “information horizon,” which includes the context (e.g., a scientific discipline), the concrete situation in the context (e.g., constructing a questionnaire for a special research project), the researchers' social networks, and the researchers' information sources. Two communication partners, in our case two researchers, one of them sharing their data and the other reusing them, should have the same information horizon to really understand the data's provenience. What Purpose? means the communicator's motives to communicate. For further insights on gratifications and motivations of the sharing and reusing researchers, we bank on the Uses and Gratification Theory from communication science and on Self-determination Theory from psychology.

2.3 Uses and Gratifications Theory: Which Gratifications Do Researchers Seek for Their Data Sharing and Reuse?

Originally uses and gratifications research (Katz, Blumler, and Gurevich 1974, 510) was concerned with: “(1) the social and psychological origins of (2) needs, which generate (3) expectations of (4) the mass media or other sources, which lead to (5) differential patterns of media exposure (or engagement in other activities), resulting in (6) need gratifications and (7) other consequences, perhaps mostly unintended ones.” In the very broad sense, this means that individuals utilize media with the intention of fulfilling some particular needs, which may or may not be gratified by using the specific media. Recent research makes use of gratification categories as information, self-presentation, social interaction (or socialization), and entertainment (see, e.g., Ilhan 2018, or Zimmer, Scheibe, and Stock 2018). In U> literature (Palmgreen and Rayburn 1985; Quan-Haase and Young 2010), there is a differentiation made between the gratifications sought and the gratifications obtained, whereas gratifications sought refer to the needs and motivations triggering the adoption of media, the gratifications obtained measure the degree to which specific services or content fulfil the audience’s needs. To note, the gratifications sought and the gratifications obtained are not always the same (Palmgreen and Rayburn 1985). So, for example, by searching for information on a social media platform, a person may unintentionally engage in social interaction and thus additionally obtain socialization (Ilhan 2018). In this study we are going to identify (new) motives for the specific use of research data sharing and reuse. The newly generated categories will be integrated at a broader level into already established typologies to expand the U> for its adoption for the study of data sharing and reuse (Sundar and Limperos 2013).

2.4 Self-determination Theory: What are the Researchers’ Motivations for Data Sharing and Reuse?

Self-determination theory is a macro-theory of human motivation that treats motivation not as a unitary concept but distinguishes between different types of motivation (Deci and Ryan 2008a, 2008b). One distinction in SDT is between intrinsic and extrinsic motivation. When people are intrinsically motivated, they do an activity because it is inherently interesting or enjoyable (Deci and Ryan 2000). Extrinsic motivation, on the contrary, requires external

awards for an action to be initiated. Depending on the level of internalization of an activity or the regulatory style, extrinsic motivation is divided into four subtypes: integrated regulation (human’s actions are regulated by congruence, awareness, and synthesis with self), identified regulation (regulated by personal importance and conscious valuing); introjected regulation (regulated by self-control, ego-involvement, or internal rewards); and external regulation (regulated by compliance, external rewards, or punishments) (Deci and Ryan 2000). Gagné and Deci (2005) additionally differentiate between external material and external social regulation and exclude integrated regulation from the self-determination continuum. Along with intrinsic and extrinsic motivation, there is also amotivation which is associated with the lack of activity.

Another approach to classify motivations is to distinguish between autonomous and controlled motivation. Autonomous regulation includes intrinsic motivation, but also two subtypes of extrinsic motivation, i.e., integration and identification. Accordingly, introjection and external regulation build up the controlled motivation (Deci and Ryan 2000). SDT proposes that autonomous motivation depends on the satisfaction of three psychological needs for competence, autonomy, and relatedness (Gagné and Deci 2005). Meeting these needs leads to personal growth, vitality, and well-being (Deci and Ryan 2000). Since SDT focuses on the phenomenon of “needs,” it is often used in combination with U> which also concentrates on the needs or gratifications sought (Cozma and Dimitrova 2021).

2.5 Research Model and Research Questions

A model for information behaviour research on social live streaming services (SLSSs) developed by Zimmer, Scheibe, and Stock (2018) was adapted and used as a basis for this study. The original model aims at better understanding of the communication patterns on SLSS and is built on the classical Lasswell formula of communication, the Uses and Gratifications theory of media usage, and the theory of Self-Determination. It can be used to study information behaviour on any (social) media. Our research model is presented in Figure 1. We see two researchers, one (researcher X) sharing research data and the other (researcher Y) seeking, finding, and reusing the data. Both users have their specific information horizons and their needs leading to certain gratifications and motives to share or to reuse research data (thin lines). Research data are sets of numerical data and other material, for instance, a questionnaire or an interview guide. Researcher X publishes their research data on an information service (such as Zenodo), and researcher Y looks

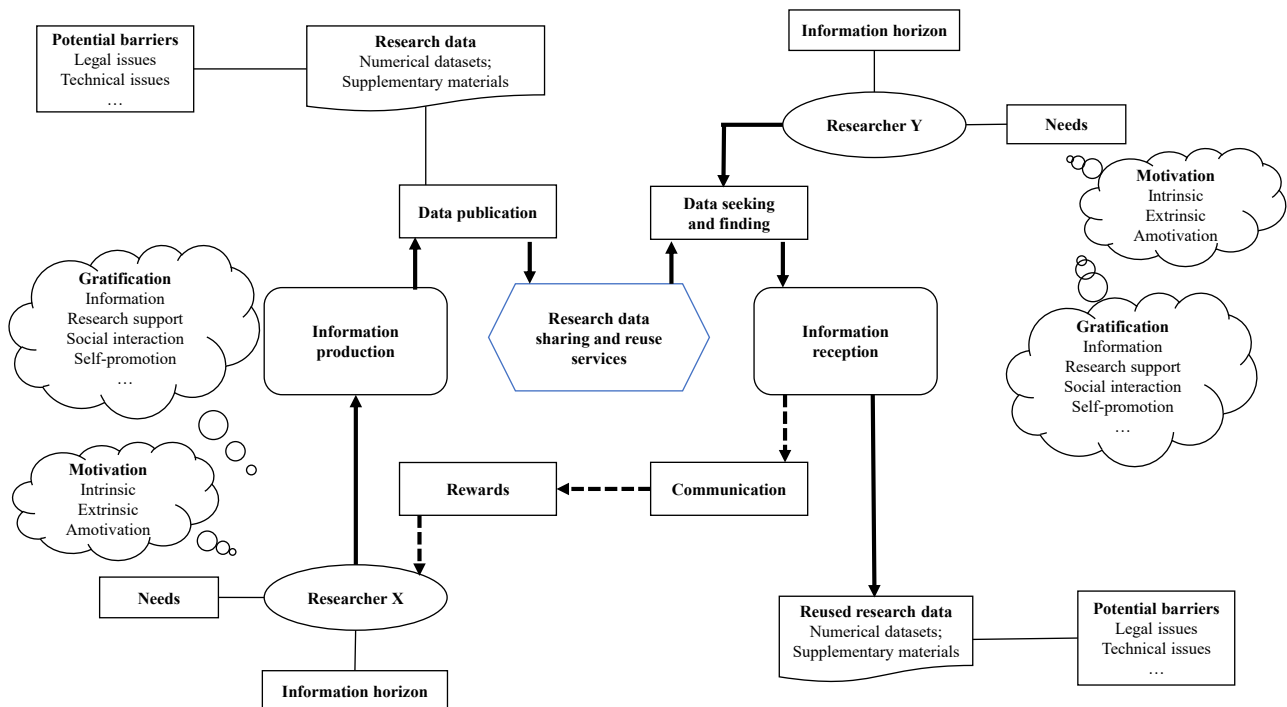


Figure 1: Model for information behaviour research on research data sharing and reuse.

for data for reuse and receives the data from the service (bold lines with directions of actions). Both users have to face potential barriers such as, for instance, legal or technical issues. If researcher Y acts fairly, they will communicate that they have reused the data from X, and X is rewarded by this communication, e.g., by a citation of the data publication (dotted lines).

In this study we identify actual and potential motives and gratifications for data sharing and reuse. Research based on the combination of the U> and the SDT can be used to study how and why individuals engage in some activities (Cozma and Dimitrova 2021) which suits the explorative nature of this study. The overarching goal of this study is to explore the motives and gratifications of information science researchers to share, or not to share, their research data and to reuse, or not to reuse, third-party research data. For that, the following four research questions have been formulated:

RQ1: Who are the information science researchers sharing or reusing research data?

RQ2: What are the gratifications sought and gratifications obtained of research data sharing and reuse in information science?

RQ3: How are the information science researchers motivated to share and to reuse research data?

RQ4: What are barriers for research data sharing and reuse and possible solutions for how to overcome existing difficulties in information science?

3 Methods

This study utilizes a qualitative research design complemented by a quantitative one. Accordingly, the data collection process in this study can be divided in two parts: semi-structured interviews and a small poll at the end of an interview. The selected methods from qualitative and quantitative research allow one to explore common practices and experiences of researchers with sharing and reusing research data and to get a more nuanced understanding of the processes.

3.1 Data Collection Design

To collect the data, one author of this article conducted semi-structured interviews. A semi-structured interview is an interview type containing pre-formulated mostly open-ended questions, some of which may be skipped or reformulated ad hoc by the interviewer. Also, the order of the questions may be changed during the interview. By using this approach, a basic framework is established that ensures a certain minimum amount of information is covered and

that limits deviation from the interview topic. Yet, it also allows for enough flexibility to discuss related subject matters that may not be specifically outlined in the interview guide but still fall within the interview's overarching theme (Wittkowski 1994). A semi-structured interview is considered to be an appropriate method for data collection if a study focuses on the participants' concrete perspectives rather than a generalized view of a phenomenon (Adeoye-Olatunde and Olenik 2021). To conduct the interviews, an interview guide was developed.

Additionally, a small poll of four close-ended questions was started at the end of the interview to collect data about the motivation of the interviewees to share and reuse research data in a more structured way. The poll was included in the study to enable comparison of the results from the interviews in a quantitative way. A combination of qualitative and quantitative methods is often used in interviews to enhance the depth of the data (Adeoye-Olatunde and Olenik 2021).

3.2 Interview and Questionnaire

Before starting the interview, an informed consent form was sent to the participants, which they had to read and, if they agreed with conditions, sign and send back to the interviewer. The interview guide was structured following the research model of the study. First, participants were informed about the aims of the study and the structure of the interview. The interview consisted of three main thematic sections. In the first section, the questions about researcher's background, including research and work context, were asked. This information should help to better classify the answers and will be reported only in anonymized form. The second part of the interview was dedicated to data sharing. The interviewees were asked about their experiences and expectations regarding data sharing. This section also included questions about the motivations for sharing, or not sharing, research data with third parties. The next section consisted of similar questions but focused on data reuse. In both cases, the interviewer pointed out that she will distinguish between two types of research data: first, the questions related to the collected or generated datasets; after that, almost the same questions referred to other types of research data such as questionnaires, etc. At the end of the interview, participants were invited to fill out the short survey.

Scales measuring uses and gratifications of research data sharing and reuse were adapted from previous research. Along with the categories most widely used in the U> research such as information, social interaction,

self-promotion, and entertainment, Cozma and Dimitrova (2021) identified the category of research support. Further on, the categories of teaching support, society support, and politics support were added to the list of items based on the findings from Zuiderwijk, Shinde, and Jeng (2020), Gregory et al. (2020), and Fecher et al. (2015). It was indicated that the data collected orally will be transcribed and then pseudonymized and anonymized to the extent possible.

Primary study population included German researchers in the field of information science who work with data and share (or not) their research data or reuse (or not) the data from third parties. The study subjects were recruited through purposive sampling. We invited to an interview researchers from many German universities and other research performing institutions (e.g., *Leibniz Institutes*) listed at the website of the *Hochschulverband Informationswissenschaft*, a scientific association of information scientists in German-speaking countries. In total, 24 information scientists from 16 institutions were invited to participate in the interview. The invitations were sent via e-mail. We received 17 replies. Eleven people accepted the invitation; six people could not find time. As a result, 11 interviews with researchers from nine institutions were conducted. In light of 11 interviews from one country it should be noted that this is a case study of limited scope and that the results cannot be generalized.

Data collection took place between October 13 and November 24, 2022. The interviews were conducted in German, online, and video-recorded using the *WebEx* desktop application. The shortest conversation took 43 min and the longest 63 min. With participants' consent, all interviews were transcribed using *f4x Automatic Speech Recognition*. The automatically created transcripts were then manually checked and corrected if needed.

3.3 Data Analysis

To analyse the data from the interview transcripts, content and thematic analyses were applied. Thematic analysis is a method for identifying, analysing, and reporting topics within data (Braun and Clarke 2006). Thematic analysis is often used interchangeably with content analysis (Krippendorff 2018), but content analysis sometimes provides quantitative figures and thematic analysis does not (Vaismoradi, Turunen, and Bondas 2013).

As the number of codes can grow rapidly, making the data not manageable, it was necessary to create a codebook. Minimum components of a codebook are usually code labels, their content description or definition and an example for reference (Saldaña 2013). There are three main approaches

to develop a codebook: theory-driven, when codes are developed on the basis of an existing theory or concepts in advance before starting the coding; data-driven, when codes are developed from the raw data; and structural, when codes are developed based on a specific project's research goals and questions (DeCuir-Gunby, Marshall, and McCulloch 2011). In this study, the code book was first created based on the structural and theory-driven approach and then extended applying the data-driven method. As a unit of coding, meaningful text passages including enough contextual information were selected. The coding was completed manually by one of the authors of this article. Although it can be advantageous to involve a team of coders, many qualitative studies remain "a solitary act," meaning that also solo-coding is an acceptable approach (Saldaña 2013). Following the analysis of the interview transcripts, quantitative data from the poll were analysed using descriptive statistics.

4 Results

4.1 RQ1: Who are the Information Science Researchers Sharing or Reusing Research Data?

Our study sample will be described following the first part of the extended version of the Lasswell formula of communication: Who shared (reused) What to Whom under What Circumstances through What Medium? Eleven information scientists, who took part in the study, are cited here through ISR001 to ISR011. These are six women and five men working either at a university or research performing organisation with working experience as researchers from six to over 40 years. Nine people have a PhD degree and two people are PhD candidates. One researcher belongs to the Baby Boomers Generation (i.e., born approximately between 1946 and 1960), three researchers to Generation X (i.e., born approximately between 1960 and 1980), and seven researchers to Generation Y (i.e., born approximately between 1980 and 1996). The reference to birth years for generations were taken from Fietkiewicz et al. (2016). Eight researchers have already shared a dataset at least once. All the interviewees shared other types of research data such as questionnaires, etc. To share their research data, interviewees used the following options: publication in a research data repository and related services such as *Zenodo*, *OSF*, *QualiService*, *Github*, an institutional repository, or a data centre, publication in a data journal, or as supplementary material to a journal article or conference paper. In doing so, researchers shared their datasets mostly with the general public without imposing any

restrictions on use in open access. Talking about sharing of documents, a licencing option with a Creative Commons license to protect intellectual property rights of the author was mentioned. In addition to that, ten out of 11 interview partners expressed their readiness to share the research data (again) in the future.

Only three interviewees had experience with reusing numerical datasets while all but one of the researchers had reused other types of research data. Six people would be potentially interested in reusing a dataset while two persons would prefer to work only with their own data. With regard to the search for research data, interviewees admitted that mostly they found research data accidentally while searching for literature.

4.2 RQ2: Uses and Gratifications for Information Scientists' Data Sharing and Reuse

In this subsection, an answer to the remaining two components of the Lasswell formula of communication is provided: Who shared or reused What for What Purpose (i.e., gratifications sought) with What Effect (i.e., gratifications obtained)? We identified eight major themes for data sharing and six major themes for data reuse. Some major themes were additionally divided into new created subcategories. We start with the gratifications which information scientists seek when they share or reuse research data (Table 1).

Information seeking. One of the most frequently reported motives in studies based on the U> is information, or information seeking. In this study, the category is used to capture uses related to the possibility of exploring research data in order to be informed about something (ISR008).

Research support turned out to be the most extensive category. In general, interviewees often admitted that they shared their data for any purposes to support reusability of their research data and in the hope that the data can be reused by others. Among more specific motives, quality control and verification took one of the central positions. On the one hand, researchers share their own research data so that others can check the quality of their research and verify the findings. On the other hand, researchers reuse others' data to control the results (ISR007). Very close to this topic stands replicability which can basically be classified as a subtype of quality control (ISR007). Other motives closely related to quality control are transparency and traceability (ISR003). And although one can be negatively criticized if data have been made accessible, the research in general becomes more trustworthy and reliable (ISR005). The importance of sharing the documentation and supplementary materials for interpreting and

Table 1: Gratifications sought for research data sharing and reuse.

Category	Subcategory	Mentioned in interviews			
		Research data sharing		Research data reuse	
		Datasets	Other research data types	Datasets	Other research data types
Information (seeking)	–	+	+	+	–
Research support	Reusability	+	–	–	–
	New research	+	+	+	+
	Inspiration	–	–	+	+
	Making comparisons	+	–	+	+
	Combining with other data	+	–	+	–
	Quality control and verification	+	+	+	–
	Efficiency in research	+	+	+	–
	Accelerating scientific progress	+	–	–	–
	Transparency and traceability ^a	+	+	–	–
	Replicability ^a	+	+	+	–
	Interpreting and understanding data ^a	–	+	–	+
	Research topic ^a	–	–	+	–
	Using standards ^a	–	–	–	+
	Interoperability ^a	–	–	–	+
	Enhancing own research ^a	–	–	–	+
Society support	–	+	–	–	–
Politics support	–	–	–	–	–
Teaching support	–	+	–	+	+
Social interaction	Cooperation	+	+	+	–
	Recognition	–	–	–	–
	Reputation	+	–	–	–
	Visibility and citability	+	+	–	–
Self-esteem/Self-promotion	Co-authorship	–	–	–	–
	–	–	–	–	–
Entertainment	–	–	–	–	–
Other	–	–	–	–	–

+: Category and subcategory was mentioned by at least one interviewee; –: subcategory was not mentioned by interviewees; ^a: new subcategory identified during thematic analysis.

understanding datasets was also often mentioned by the interviewees (ISR005). All but one of the researchers admitted that it is possible to conduct new research reusing already existing data. The research data can be used to answer new research questions and confirm new hypotheses and assumptions applying other methods of analysis practised not only within one's own community but also in other disciplines (ISR003). New findings can be obtained by making comparisons or combining own data with others' data (ISR004). With regard to the reuse of data collection instruments, the importance of using already verified standard questionnaires was stressed because it can provide a sense of security as well as save one's time (ISR005). Thus, using established instruments leads to interoperability, meaning that comparisons and combinations with other data can be made more easily (ISR007). Furthermore, reusing of standardized data collection instruments can enhance one's own research (ISR009). Also, reusing research data in order to get inspiration and new ideas for own projects found a response among

researchers (ISR007). Some of the interview partners additionally specified that they consider research data reuse as a research topic and either already do their own research in this area or follow someone's research. Reusing research data was also associated with increased efficiency in science because the data collection process is usually time consuming (ISR008). Taking into account the variety of applications of the shared research data, it was not surprising that researchers also link research data sharing and reuse as general accelerators of scientific progress (ISR011).

Society support was introduced to check whether researchers see the benefits from data sharing for the broader public and also whether they put data sharing into relation with the topic of citizen science (ISR001). However, the interview partner admitted that it would be rather difficult for citizens to be able to interpret the data and to conduct data analysis by themselves. Sharing data to *support political decisions and problem-solving* was an additional subcategory defined after literature review.

Although it was not spontaneously mentioned by any interview partner, it was selected in the poll by seven out of 11 participants. Based on this we can conclude that the topic is nevertheless relevant when discussing possible ways of using shared data. *Teaching support* is given when information scientists share or use data in academic training.

Social interaction. One common benefit of data sharing and reuse discussed in the literature is the promotion of cooperation between researchers which might lead to new projects, new fundraisings, and new findings. Although this category was named by some interview partners as an interesting option which can motivate researchers to engage into data sharing, no one mentioned that it had already happened in praxis. Another predefined aspect of social interaction included increased recognition among colleagues. The subcategory did not find resonance during the interviews but was selected by most of the researchers while answering the poll regarding the data sharing. At the same, recognition as a motive to reuse others' research data was only selected by two interview partners.

Self-promotion. Some of the benefits which data sharing and reuse can bring and which can be highly interesting for researchers are related to the promotion of their research profiles, their research topics, and their research teams, which might then lead to increased reputation of a person. Since research data should be cited if reused, it can increase citation levels and, therefore, visibility of one's research activities (ISR005). Another option is to set co-authorship as a requirement for reuse of shared data.

Entertainment. Another motive frequently reported in literature on the U> is related to the entertainment function of media. However, this aspect was not mentioned during the interviews. One possible reason for that might be that both research data sharing and reuse are associated with high efforts, some of which are related to the services for data sharing and reuse which are not yet always user-friendly.

The most popular cases for sought gratifications for data sharing as well as data reuse relate to research support and information. Researchers share, or would share, their research data in general for any reusability purposes and especially for combinations of different datasets to produce new evidence. Also, the vast majority of study participants associate research data sharing with possibilities to accelerate scientific progress and to increase research efficiency. In case of research data reuse, all the researchers indicated that they use, or would use, others' data first of all for inspiration. Interestingly, study participants rated the category of recognition relatively high in case of sharing, but at the same time they do not associate increased recognition among colleagues and other researchers with research data reuse.

The situation around gratifications obtained from research data sharing and reuse is somewhat difficult. With regard to the research data sharing, one of the most frequently named by interviewees concerning gratifications sought is the transparency of one's research. Apparently, once the research data is published, transparency is given. However, researchers do not tend to check whether their published research data had been reused and, if so, for what purposes (ISR011). Concerning research data reuse, only three study participants had experience with dataset reuse and confirmed that their expectations were met and they could reuse the data. Reusing other types of research data also led to positive experiences (ISR009).

4.3 RQ3: Types of Motivation to Share and Reuse Research Data in Information Science

The coding of motivation to share and reuse research data was conducted in a deductive manner because the SDT entails a definite number of motivation types and does not imply creation of new categories. So, the text passages from interview transcripts were assigned to the list of predefined categories corresponding to the SDT motivation continuum.

As a result of the thematic coding, all types of motivation along the self-determination continuum could be identified within the study sample. It turned out that our sample is predominantly autonomously motivated. Most frequently, the interviewees demonstrated identified regulation, i.e., they share, or would share, or reuse, or would reuse, the data because they consider it important and identify this behaviour with personal values. Examples of intrinsic motivation can also be found in the sample. Some researchers engage, or would engage, in research data sharing and reuse because they find it interesting and exciting. However, researchers demonstrating external regulation, i.e., moved by external rewards or self-ego, are also present in the sample.

One distinctive feature of the study sample is the expression of mixed motivation. Some researchers have shared their data because of external rewards (i.e., funding conditions, enhancing reputation for further funding, under community pressure), but emphasized that they found those actions good and would do them also without external pressure (ISR004).

All but one of the interviewees indicated that they have shared or would share their research data because it can accelerate scientific progress which they consider important and would like to contribute to it (i.e., identified regulation).

The second most popular motivation turned out to be the obligation by an employer, project funder, or journals (i.e., external regulation). The third most popular option was social influence, because many other researchers participate in data sharing and they feel obligated to do the same (i.e., external regulation). In terms of the SDT, the participants demonstrate a mixture of identified motivation and external regulation, both material and social.

In the case of data reuse, the participants demonstrate more homogeneous results with identification and intrinsic motivation having most of the votes. The role of external regulation seems to be much less important as in the case with data sharing. So, researchers reuse, or would reuse, research data because it can accelerate scientific progress which is important for them. Additionally, researchers enjoy exploring and using third party research data. Thus, interviewees participate or would participate in data sharing because they consider it important, but also feel or are obliged to do so. At the same time, study participants do not feel pressure from outside when deciding whether to reuse data or not.

4.4 RQ4: Barriers and Obstacles to Information Scientists' Research Data Sharing and Reuse

Legal concerns are one of the major reasons why researchers do not share or reuse the data. Researchers' uncertainties regarding legal regulations seem to start already at a very general level as they can ask themselves, "What am I allowed to do?" (ISR005). More concretely, they are often concerned with the problems of data proprietorship, copyright, and privacy protection of study participants. Data proprietorship problems mostly refer to the bibliometric and altmetric data which are the property of a third party operating the source system like for example WoS, Scopus, or Twitter. These data are not allowed to be shared as downloaded. They can be shared only in aggregated form. Further on, copyright legislation should be taken into account, especially when it comes to sharing of the documents such as questionnaires or code books. However, the most complicated and nuanced issue remains protection of the privacy of study participants. To share the data from individuals, researchers require their allowance to do so which is usually regulated by signing a consent form. However, interview partners noticed that especially in their earlier research the options to share the data were not included in the consent form due to unawareness or an intentional unwillingness because of, for example, the fear

that participants might refuse to participate in a study if the anonymity is not guaranteed (ISR008).

Along with the legal side of the privacy protection, researchers are additionally confronted with research ethics. So, the interviewee ISR003 noticed that even having a participant's allowance to share the data, researchers might refrain from sharing because they find it more important, and feel obliged, to protect their participants (ISR003). So, the issue of data deidentification can also impede researchers from sharing because it can be a very challenging task.

Insufficient knowledge and general unawareness of the need to share the data or the possibility to reuse already existing research data is one of the central issues mentioned by seven out of 11 interview partners. Uncertainties start at a very general level, for example, "Where to share the data and how to share the data?" (ISR006) or what are the advantages of data sharing? (ISR002), and go deeper to the questions relating to, for example, data protection and informed consent (ISR003). Especially remarkable is that representatives of both younger and older generations underline that they did not learn anything about data sharing during their studies at the university and therefore do not have a sufficient command of knowledge in the topics of data sharing and reuse (ISR001, Silent Generation). At the same time, representatives of Generation Y pointed out to similar problems, "In the doctoral program something like this is not mentioned at all" (ISR009). The unawareness of the possibilities to reuse already existing data in one's own research is another obstacle mentioned in one interview (ISR002). Along with insufficient knowledge, one interviewee specified that early-career academics do not receive enough support to be able to properly start with data sharing (ISR008). Interviewees also mentioned some problems related to current immaturity of the infrastructure for data exchange (ISR008). This includes the absence of services such as research data repositories or data centres suitable for information science, problems with access to the data, and the publication of documents in non-user-friendly formats such as PDF. Besides that, researchers are often unaware of services (ISR005). Furthermore, the lack of services and the researchers' unawareness lead to the problems with the findability of data (ISR008).

Seven researchers mentioned that they cannot reuse data because there are no datasets or it is very difficult to find datasets appropriate for their very special research topics (ISR011). This also refers to data collection instruments and other research documents which can be sometimes reused but only partially after some adaptations. Additionally, even though there have been attempts to standardise some data collection instruments which would facilitate data reuse and data comparability, every researcher is still

trying to modify instruments so that they “better” suit to their research questions (ISR010).

Almost every interview partner admitted that data sharing would mean “an additional step” in their work (ISR007) for which they do not have time, or do not want to find that time due to other priorities (ISR004). So, researchers often consider the preparation of the data for a separate publication and especially the preparation of a comprehensive documentation to make data understandable for third parties as a very resource-consuming task (ISR003). Providing translation of questionnaires and other documents was mentioned by ISR009 as an extra aspect associated with additional effort when preparing research data for sharing. When a study is conducted in German, but the publication is in English (as this article), one should think of translation (which we did not) which should preserve the quality and validity. Interestingly, researchers associate not only data sharing but also data reuse with additional effort which might prevent them from using external data. For instance, researchers perceived searching for third parties’ data as well as understanding and pre-processing it as time consuming.

Data reusability covers some obstacles related to data reuse. One impediment is the absence of a comprehensive documentation which often makes it impossible to reuse the data since the risks of misinterpretation or misunderstanding the data become very high (ISR004). Additionally, researchers have concerns about the data quality when the data are generated without their direct participation (ISR001). Also, data complexity may prevent researchers from sharing it.

An important factor facilitating or impeding both data sharing and reuse is the researcher’s social environment. The readiness to be involved in data sharing and reuse is influenced by the community climate. The more researchers share and reuse the data, the more aware and ready to participate are the beginners. In addition to that, a key role is played by the researcher’s supervisors and senior colleagues who set the tone of the research activities to be fulfilled by a young researcher.

Culture in the research community can have a big influence on researchers’ behaviour. Currently, the classical journal publications stay in the focus of the researchers (ISR006). When it comes to their own career, e.g., getting a professorship, it is not expected that candidates publish their data (ISR004). So, as noticed by ISR008, even though data sharing and reuse represent a good culture, it seems that it is not focused on by researchers yet. This, in turn, means that little happens in the field which can lead to frustrations (ISR008).

With regard to the PhD students, it is expected that they produce something new (ISR003). But even after having

received a doctoral title, researchers continue to concentrate on data generation by themselves as previously ignoring possibilities of research data reuse, “I want to become popular myself with my things” (ISR005).

Another cultural aspect hindering data sharing is that researchers want to use their data exclusively by themselves and for as many scientific publications as possible and are not interested in other profit from reuse of their data (ISR011). Further on, the fear that a simple mistake or even some data manipulations can become evident if the data is publicly available might become an obstacle on the way to research data sharing. Researchers do sometimes expect more requirements and guidance from publishers. As noticed by ISR009, data sharing is even prescribed in publication policies of some discipline-specific journals.

Along with barriers and obstacles for data sharing and reuse, interview partners also suggested some solutions on how to overcome existing difficulties and promote new practices. One of the most frequently mentioned suggestions was to put some pressure on researchers, e.g., from funding bodies, publishers, appointment committees, or employing institutions. Some interviewees admitted that it would be good if researchers internalize new practises. The more people participating in data sharing and reuse, the more obvious it would become for those people who have not yet started to share or reuse the research data. Furthermore, it was frequently mentioned that journals could play the role of agencies generating awareness among researchers via extending their publication policies and inserting relevant references in the templates for preparation of manuscripts. To make sharing of research data more attractive, a system of more strong incentives would be helpful, e.g., by praising data citations. More examples of research data sharing and reuse should be set by the research community and colleagues. Additionally, the role of researchers’ supervisors should not be underestimated.

5 Discussion and Conclusion

The goal of the study was to examine uses, gratifications, and motives of information science researchers to share, or not to share, their research data and to reuse, or not to reuse, third party research data. For that, a qualitative exploratory interview study with eleven German information scientists was conducted.

Although at a first glance it seems that “information science is a closed shop. Everyone is sitting on their data and not giving it out” (ISR001), this study demonstrates that research data sharing is not a rare practice among information scientists. More and more researchers are becoming

aware of it, taking part in it, or considering participation. Eight out of 11 study participants, regardless of position, working place, educational degree, years of research experience, gender, and age, have already shared their datasets at least once. All but one of the researchers would potentially share the datasets. Furthermore, every participant had already shared some other types of research data such as questionnaires, etc.

Only three researchers have reused third-party datasets thus far and there seems to be little interest in doing so in the future. However, upon examining the barriers to dataset reuse, these results are not particularly surprising. One of the most frequently named reasons for not reusing datasets was the fact that the research topics are so specific that there is no appropriate data or at least it was not possible to find it. In addition to that, legal concerns, absence of comprehensive documentation, and quality concerns were mentioned as further factors impeding reuse of third-party datasets. There is a special problem for scientometric research or for literature reviews. Here, the raw data are usually sets of bibliographic records found on commercial information services such as Web of Science, Scopus, or Dimensions. Especially in scientometrics, the amount of records can be rather high – up to hundreds of thousands of records or sometimes more. However, the data providers do not allow for sharing the hit lists produced by their services. In these research areas, data sharing and reuse is limited or even not possible.

In the case of datasets, the problem of different information horizons becomes particularly clear. At the same time, reusing other types of research data is rather a common practise among information scientists. Almost everyone on the sample has once reused such research data types as questionnaires, etc.

For what purposes do the information scientists share or reuse research data, or would do this? Looking through the prism of the U>, the study identified new main topics. Along with such U>-classical gratifications as information (seeking), social interaction, self-esteem, and self-promotion, these include research support, society support, politics support, and teaching support. To name a few more practical and most frequent examples, researchers (would) share research data to enable new research based on existing data, support research transparency, and guarantee data quality control and results verification.

Regarding the gratifications obtained, study participants turned out not to be especially interested in the tracking of their research data publications. On the one hand, this may be because research data publications are not used often and, therefore, are also cited rather rarely, and, thus, have less impact on researcher's reputation. On the

other hand, current data exchange systems do not allow for extensive feedback of the re-users. As to the dataset reuse, due to complexity of data and possible misinterpretations of it, reuse of third-party datasets may only be feasible to some extent. The reuse of other types of research data was on the contrary associated with positive experiences.

Exploration of motivation types (as defined within the SDT framework) present in the study sample lead to interesting results. Both extrinsic and intrinsic motivations are needed to motivate researchers to share their research data. While researchers consider research data sharing highly important and also interesting and exciting, it can be not enough to engage in it at a regular basis. This way, researchers see some external pressure, i.e., from funders, publishers, community, and employing institution, as a necessary but helpful action.

One more central point of this work was the exploration of challenges and barriers to research data sharing and reuse experienced by information scientists. We identified the following topics: legal concerns, protection of participants' privacy, insufficient knowledge and unawareness, insufficient support, technical issues, no appropriate research data, data reusability, social influence, culture, no formal requirements, and journal policies. Special attention deserves insufficient knowledge and unawareness among researchers as well as social influence.

Our research is subject to limitations. The most important limitation is the size of the number of interviews. Our research was a case study with a sample of only 11 respondents from only one country. So it is not feasible to draw far reaching conclusions for information scientists in general. So our study is only a first step into this emerging research area.

Although this study identifies gratifications for research data sharing and reuse, it does not take into account the importance of each separate item. Additionally, the scales developed on the basis of U> and SDT would profit if validations were conducted whether individual items do really measure always the same construct. The same refers to the findings on the types of motivation. The findings from this exploratory study can be used as a basis for future research, e.g., in a quantitative study applying survey as a data collection method. Moreover, since for the data collected in this study the authors managed to get consent from all the participants to make the research data available to other researchers for reuse, the interview and poll data can be reused in studies with new research questions and hypothesis and applying other data analysis methods. For example, correlation analysis and factor analysis could be conducted to get new knowledge from this dataset.

This study has practical implications. It identifies barriers impeding research data sharing and reuse among

information scientists, which should be considered when building up an infrastructure for and promoting research data sharing and reuse. Moreover, the study also offers solutions on how to overcome existing obstacles which can also be helpful for infrastructure providers and advocates of research data sharing and reuse. These solutions include the implementation of research data sharing and reuse lessons in the curricula of master's and especially PhD programs in information science (Lyon et al. 2015) and a practiced culture of sharing and reuse in information science institutions with the senior scientists as role models. As indexing is a topic in information science and practice, the indexing of research data should be optimal in this knowledge field, leading to an optimal findability of the data records through exactly fitting metadata. Awareness raising activities by national or international stakeholders are necessary (e.g., *Hochschulverband Informationswissenschaft* in Germany or ASIS&T in the international field), including open lectures, data sharing and reuse guidelines with a list of recommendations about what and how can be shared and found depending on specific types of data researchers work with, and lists of references to other helpful sources on the topic. Perhaps it is a good idea to establish data stewardship for information science research data at a relevant international organisation (e.g., IFLA or ASIST). For instance, the German *Hochschulverband Informationswissenschaft* manages a collection of "Research Resources in the Field of Information Science" on Zenodo (HI n.d.) and has published a guideline on open science including open access to research data (HI 2022).

Some pressure from publishing sources, i.e., journals and proceedings, would be helpful: if there are empirical studies to be published, the research data have to be published as well (as a digital appendix of the paper or in a specialised repository such as Zenodo). It must be ensured here that published research data also count as "publications" for the scientists and their institutions in scientometrics and research evaluations without restrictions (Stock et al. 2023, 41).

We are in need of clear international standards for the anonymization of personal data (e.g., from questionnaires or interviews) and for the publication of data originating from professional information services in accordance with the maybe modified terms and conditions of the suppliers. Reuse of research data can lead to increased co-authorship (if the re-user is fair and mentions the original author in the by-line) and to establishing or to fostering cooperation between the sharing and the reusing institutions. The more data sharing and reuse is applied in information science research, the more irresolute or reluctant information scientists will be willing to practice it as well, since data sharing

and reuse will have become a broadly accepted and obvious scientific practice – at least we hope so.

This paper has applied theoretical approaches from communication science and psychology in order to find an optimal starting point to study scientists' motivations and gratifications concerning research data sharing and reuse. Future research in information science can benefit from such theories as, for instance, the Uses and Gratifications Theory, the Self-determination Theory, or other theories or models for all topics in information behaviour research.

One limitation of our study is the data from only one country. Further studies are needed to expand the results to other countries and cultures including international comparisons. The deployment of infrastructure for research data sharing and reuse is already well advanced, but this is only a necessary condition for optimal data sharing and reuse. It will only be sufficient if the researchers are willing to cooperate and establish the needed motivations for both data sharing and data reuse.

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