Information Literacy Practices of Researchers in Workplace Information Ecologies

Jela Steinerová(✉)

Comenius University, Bratislava, Slovakia
jela.steinerova@uniba.sk

Abstract. The paper explores information literacy practices of researchers in the context of information ecologies. Selected examples of information behavior studies of researchers and workplace information literacy are reviewed. Information ecologies in workplaces are explained. Findings of a qualitative study of 19 researchers in Slovakia are presented based on methodology of semi-structured interviews and concept mapping. Two concept maps representing issues of barriers and values in information practices are outlined. Findings suggest that multidimensional factors influence workplace information ecologies, mainly disciplinary cultures, values and tasks. Barriers include administrative overload, disintegration of sources and lack of funding. Main values include deep motivation and development of knowledge. Workplace information ecologies can improve research infrastructures and models of information literacy practices.

Keywords: Information literacy practices · Researchers
Workplace information ecologies · Concept mapping

1 Introduction

The purpose of this paper is to explore information literacy practices of researchers in scholarly workplaces in the context of information ecologies. The changing nature of work in digital environment has influenced information behavior of researchers. Digital technologies and social collaborative tools require new, flexible workplace information literacy practices and changing information culture. For example, success factors for distributed work [1] can include an environment of trust and shared ideas and clarity of expectations. Scholarly workplaces include both physical and digital spaces in which workplace information practices change. That is why workplace information literacy [2] in scholarly work needs more attention. In the following sections we will briefly review selected information behavior studies of researchers and concepts of workplace information literacy and information ecologies. We will report on a qualitative study of information behavior of researchers in Slovakia with examples of concept maps of values and barriers. We ask the following research question: Which values and barriers determine workplace information practices of researchers?

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2 Information Behavior Studies and Workplace Information

2.1 Related Studies of Information Behavior of Researchers

Human information behavior studies encompass a variety of models and empirical studies. Many studies pay special attention to professional environment and workplace information behavior [3]. Case [4] has summarized that information behavior models have spread from scientific information to everyday information behavior. First studies were targeted on scientists and engineers, later on researchers in social sciences and humanities. Paisley developed a framework of information use (1968) describing a scientist in an interconnected set of systems, including his personality, work team, formal organization, formal information systems, reference group, membership group, invisible college, political and legal/economic systems [5]. Further studies emphasized the role of scholars as gatekeepers who share information informally. Ellis's studies of scholars lead to his widely recognized model of information behavior [6]. Further highly cited models include especially those by Kuhlthau (ISP), Wilson, and Dervin (sense-making). Fosters' [7] non-linear model of information behavior of scholars identified non-linear processes of opening, orientation, consolidation and cognitive and external factors. Further models considered digital environments and collaboratories. As an example we can mention the theory of remote scientific collaboration by Olson and Olson [8]. Recent trends point to tacit knowledge in information use environments of researchers [9]. The domain analytic approach and disciplinary approaches [10, 11] found differences in information use patterns in disciplines. Research of communication in the sciences identified patterns of online publishing, citation and semantic linking and scientific discovery which are different in disciplines based on weak problem solving (humanities, social sciences) and disciplines with strong problem solving (high level of domain knowledge, sciences) [12]. As opposed to information behavior which is cognitively oriented [13], information practices refer to information use, contexts and social situations. A significant contribution is the use of activity theory by Wilson [14], emphasizing different tools (such as artefacts, mental constructs and norms) used in practices. The model by Byström and Järvelin [3] confirmed relationships between task complexity and information behavior. New models of human information behavior have broadened understanding of the information process towards manifold contextual factors [15, 16], web space searching [17], evolution and social frameworks [18, 19], and holistic ecological approach [20], including workplaces, digital tools and barriers.

2.2 Workplace Information Literacy: Conceptual Background

Workplace digital environments are challenges for development of information literacy practices. Workplaces can be understood as places where people engage in work activities and use information. Recent challenges are raised by electronic and mobile communications. Conceptual analyses of workplace information were presented in the framework of the ENWI project [21, 22]. One of the first frameworks of workplace information of professionals was Taylor's model of information use environments [5]. Although we can find many studies and models of information seeking in contexts,

workplace information needs more attention. Contexts of information work were emphasized by Bruce in the concept of informed learning in which she linked information literacy and workplace performance [23]. Both individual and collective factors of experience in communities and disciplines are taken into account, especially social practices of collaboration and information sharing [24]. That is why the concept of workplace information literacy refers to making sense, learning and understanding information environments and power relationships. Workplace information literacy connects workplace information resources with activities and learning. Lloyd [25] enriched the concept of workplace learning by collaborative and socio-cultural practices, environmental contexts, and information landscapes. Sommerville et al. [26] emphasized the cyclical process of cultivating workplace information literacy represented by evidence-based practices, including proficiencies in asking questions, selecting authoritative sources, application of findings and evaluation. Workplace information literacy can be regarded as specific transliteracy based on information resources, information use, learning, teamwork and use of digital tools. Different perspectives on workplace information literacy can be divided into behavioral, relational and socio-cultural approaches in the three contexts of education, workplaces and communities [27]. Abram [2] emphasized that advances in workplace information literacy are based on social networks, collaboration, management of communications, and transfer of skills. As a result information fluency is determined as the ability to find, evaluate and use digital information effectively and ethically in personal and work roles. Abram [2] also points to the fact that educational institutions are regarded as valid targets for workplace information literacy training by impact of professors on students. Another important perspective introduced the concept of professional information literacy based on studies of professions in digital (web) environments [27]. In academic workplaces the concepts of methodological and research information literacies were introduced [28, 29]. Other factors of workplace information literacy cover information use, decision-making, interactions among activities, tasks, tools, technologies, policies and personalities. The question is if the framework of information ecology can contribute to understanding of workplace information literacy practices of researchers.

2.3 Information Ecologies

Information ecologies are defined as dynamic systems of people, practices, values and technologies [30]. They can emerge in different workplaces and contexts (e.g. universities, hospitals, libraries). Holistic views on information environments in contexts are framed by information ecology. A complex model of information environment in organizations was presented by Choo [31], composed by cognitive, affective and situational factors in three dimensions of information use. Information ecology in organizations was determined by Davenport and Prusak [32] as making information meaningful in information management. Environmental sustainability of people, systems and information presented Chowdhury [33]. Sustainable professional information practices were outlined by Liquette [34]. Workplaces can be regarded as information ecologies where information can be shared, and collaboration, interactivity and participation shape communities. Information ecologies cover procedures, goals, values,

communities and places of information-related activities. Main characteristics are diversity of components, adaptations between men and networks and co-evolution. In digital workplaces information ecologies open spaces for participation and value-based design of services and products. Critical components are tools for eliminating information overload and risks of information use. For example, Huvila [35] presented social framework of ecology of information work based on studies of archaeologists. In information ecologies links between social and technological contexts and external and internal environments maintain balance in workplace information culture. Collaborative information behavior and information sharing are further concepts which help understand workplace information practices of researchers. In information ecologies cognitive, technological and socio-political dimensions were identified. Principles of knowledge construction include reliance, trust, and culture of critical participation [36]. Workplace information practices of researchers can form information ecologies at micro-level, i.e. individual cognitive, affective and sensorimotor skills, information seeking, relevance assessment and values of information. At macro-level it means management of information resources, systems and services which can inform design of knowledge-based services for individuals and communities of practice of researchers. Information ecologies in scholarly workplaces refer to dynamic places of multiple intertwined factors of digital sources use, social networking, digital publishing, data management, and remote collaborations, integrated by research creativity.

3 A Study of Information Behavior of Researchers

3.1 Research Design and Methodology

A qualitative study of 19 researchers in different disciplines in Slovakia was conducted in 2015–2016. The objectives of the study were to identify information needs and attitudes of researchers to information infrastructures. The design of the study and first results were presented in 2016 [29]. The disciplines included humanities (39%), sciences and medicine (28%), social sciences (22%) and technical sciences (11%). In this paper we report on part of this study with regard to selected information practices, namely barriers and common values. We asked the following questions: What is the influence of workplace information infrastructure on information practices of researchers? Which barriers are most significant in information ecologies? Which values emerge in information ecologies? The methodology of the study was designed using semi-structured interviews, content analyses and concept mapping. Data were coded, categorized and interpreted. Deeper semantic analyses have been applied, including concept mapping. A special concept map of a researcher in information environment was developed, including the components of the research process, the information process, the information infrastructure, and factors of influence [29]. Resulting concept maps represent the collective discourse of researchers.

4 Concept Mapping

Concept mapping was used as a methodology for representation of content analyses of data acquired by interviews. Information landscapes as dynamic representations of information environments cover information literacy practices in disciplines based on discussions [25, 37]. Collective mapping of information practices in workplaces was applied by Whitworth et al. [38]. These maps were used as learning experience. In our approach we used concept mapping to extract key concepts and semantic relations in order to visualize contexts of discourse. In line with similar research [39, 40], we visualized discourse in 25 concept maps. In perceptions of information infrastructures, we found common patterns of expertise, experience and critical analytical information practices manifested in the use of authoritative sources and personal expert networks. Differences stem from problem statements, methodologies, types of data, publishing patterns, participation in social networks and collaboration. As examples, concept maps representing barriers and values are outlined.

4.1 Barriers in Research Information Infrastructures

The concept map Barriers in research information infrastructures identified main barriers as perceived by researchers in their workplaces, namely individual, social, technological, administrative and environmental aspects (Fig. 1).

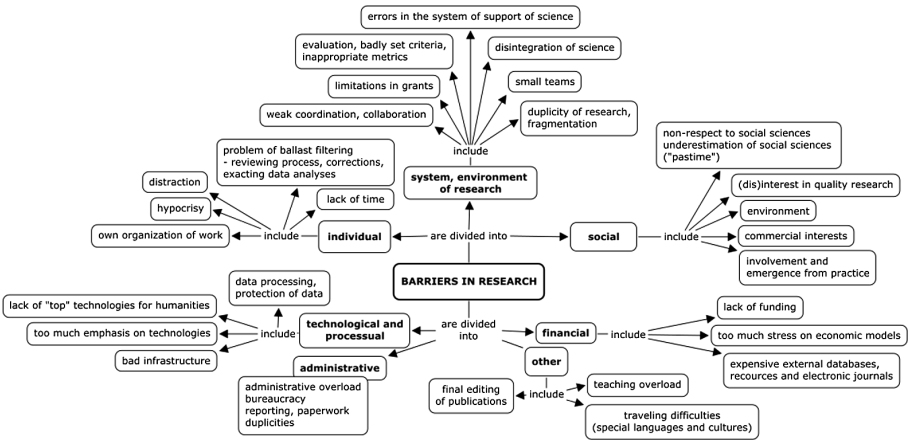

Fig. 1. Concept map barriers in research information infrastructure

Most frequently perceived barriers were administrative overload and lack of funding. Other categories identified technological, personal and social barriers. One researcher put it explicitly*: "We would need financing of that infrastructure. I do not ask for salaries, but for this…" (R19).* These findings point to gaps between information needs of researchers and existing information infrastructures, as found by other studies [41]. Findings confirmed problems of societal interest in the quality research.

Proposals for improvement of information infrastructure were articulated, namely integrated information services, digital systems and repositories, organization of research process, information sharing, interdisciplinary networking and support of young researchers.

4.2 Values of Research Work

Regarding values of research work common attitudes were noted represented by deep motivation of researchers, interest in topics and intellectual pleasure/thrill. (Fig. 2). Researchers identified values involved in social and individual contexts of scholarly activities – from help to people in everyday activities to social significance of basic questions of life. Individual values include freedom of inquiry and characteristics of creative personality based on curiosity and professionality. Values were perceived as dynamic, connected with discovery of new perspectives and creative experience. They are also socially constructed and validated by international community. Values emerge from understanding of a learned scholar and his fascination by knowing. At social level values reflect the social status of science, collaboration and service to society. New discoveries, new practical solutions, new methods and new applications of knowledge were identified as examples of values of research. Generally, values reflect curiosity, knowledge growth and help bridge gaps in knowing. We noted disciplinary differences between sciences (practical solutions, discoveries and quest for understanding life) and social sciences and humanities (broader contexts, interpretations, understanding of people and society in time and space). Values are embodied in personalities of researchers who are main actors of dynamic workplace information ecologies. Similar approach determined value factors of information literacy and information practices of employees (e.g. efficiency, credibility, trust, sustainability) [42].

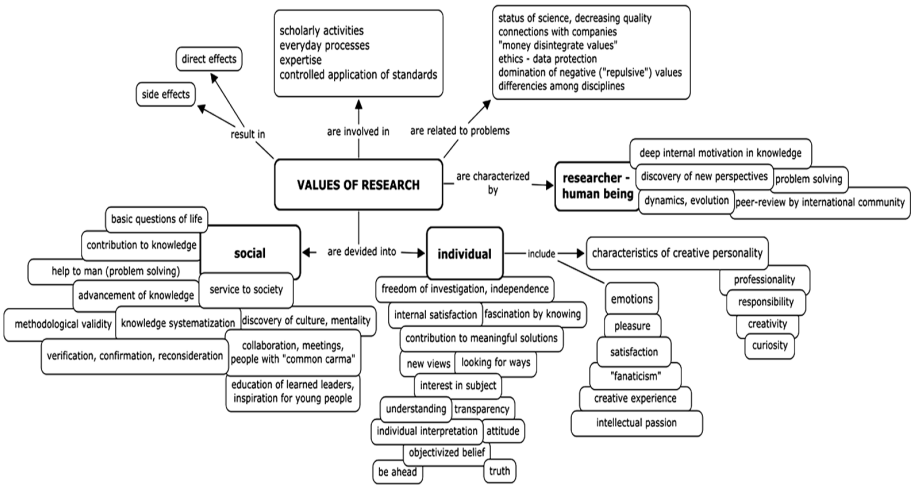

Fig. 2. Concept map values of research

5 Findings: Workplace Information Ecologies

In response to our questions we found that the three most frequently perceived barriers for scholars were lack of funding, administrative overload and understanding of science in society. Workplaces integrate both physical and digital environments. Main perceived problems were bureaucracy and limited access to project funding. Especially in humanities and social sciences researchers perceived insufficient workplace infrastructures, namely access to information sources and expensive technologies. Workplace information infrastructures were perceived as disintegrated. Another frequently mentioned barrier was an inappropriate system of research evaluation. Findings suggest that expertise and methodology are in correlation with workplace information literacy practices of researchers.

Perceived values of research point to deep professional motivation of researchers and the role of their personality. Such values as quest for new perspectives and bridging knowledge gaps are integrated with intellectual pleasure. Values and infrastructures are main components of sustainable workplace information practices of researchers. The position of science in society and promotion of open science were emphasized. Value-based design can support development of more efficient information infrastructures.

Based on the analysed data we can determine workplace information ecologies as dynamic interactions of researchers and hybrid information environments. Diversity of workplace information ecologies was confirmed depending on cultures of disciplines. Differences in disciplines have been manifested in manifold factors, such as problem statement (broad context; narrow context), methodologies, types of data, creativity, procedures, social networking, publishing patterns, collaboration (highly organized or less organized communities). Different information ecologies stem from problem-solving patterns of information use (in sciences, informatics), interpretations and knowledge construction (in humanities), surveys and social interactions (in social sciences). Workplace information ecologies often include digital tools which can add value, but also raise new problems, such as information ethics, security, privacy, copyright. Context-dependent, dialogic and practice-driven workplace information literacy practices have emerged. Digital environments broaden the range of information practices, especially participation in digital communities, networked collaboration, social media, electronic publishing, verification of information and digital literacy.

6 Conclusions

Information practices of researchers can be interpreted from the perspective of workplace information interactions and information infrastructures. Hybrid workplaces include high level of domain and practical expertise of researchers, and make use of methodological literacy, creativity and digital literacy. Findings of our study point to motivation of information practices of researchers embedded in values of research. We also identified main barriers of information practices of researchers, namely disintegrated information infrastructures. Information ecologies were determined as continually evolving dynamic interactions between researchers and information environments. Knowledge of workplace information practices of researchers and factors of workplace

information ecologies can help understand information needs of researchers and establish links between theory and value-based design of digital libraries and services. Information literacy practices of researchers differ in disciplines and domains. These differences can form contexts for community-based policies, digital systems, tools and services. Common factors of workplace information ecologies of researchers are research literacy and methodological creativity which should be supported by creative digital tools and practise-based services for researchers. We can also conclude that sustainability of workplace information literacy practices of researchers depends on such values as deep internal motivation and service to societal development. We recommend that information infrastructures should be adapted to information literacy practices of researchers, namely communication, collaboration, interdisciplinary partnerships, data management, academic social networks and new online genres. Workplace information ecologies can support participation in digital communities, cultivation of strategies of digital publishing and digital literacy and develop digital tools for complex worktasks and activities.

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