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Published in:
Library Hi Tech

DOI:
[10.1108/07378830910968155](https://doi.org/10.1108/07378830910968155)

2009

[Link to publication](#)

Citation for published version (APA):

Sonnenwald, D. H., Lassi, M., Olson, N., Ponti, M., & Axelsson, A.-S. (2009). Exploring new ways of working using virtual research environments in library and information science. *Library Hi Tech*, 27(2), 191-204.
<https://doi.org/10.1108/07378830910968155>

Total number of authors:
5

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Exploring new ways of working using virtual research environments in library and information science

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Abstract

Purpose

The purpose of this paper is to present current and ongoing research investigating new ways of working across geographic distances and time within library and information science (LIS).

Design/methodology/approach

A total of four studies were conducted focusing on: the design of a virtual research environment (VRE) to facilitate the sharing of data collection instruments among students, researchers and professionals; new ways professionals and researchers can collaborate; collaborative decision making in the context of purchasing a library management system; and collaboration among LIS professionals.

Findings

Early results show that VREs within LIS can build on previous VRE research which focused on other domains. However, there are several unique characteristics of LIS that place requirements on VREs and which are not yet implemented within VREs and that offer unique opportunities for VREs to enhance LIS research, education and practice.

Originality/value

This paper reports on ongoing research and preliminary findings of unique studies investigating how VREs could enhance LIS research and professional practice, and how LIS research and practice can inspire the next generation of VREs.

1. Introduction

Increasingly collaboration across disciplines, organizations, geographical distances and political boundaries is needed in order to create new knowledge, solve complex problems, enhance work practices, design new services and products, and educate students and lifelong learners. Virtual research environments, or collaboratories, have emerged to support such collaboration. To date, most virtual research environment (VRE) development and evaluation has focused on supporting natural science and engineering research as well as business (Atkins et al., 2003; Arzberger and Finholt, 2002; Finholt, 2002). These VREs provide remote access to scientific instruments and software; support interaction among researchers, among teachers and learners, and to a lesser degree between researchers and learners; include digital libraries and data archives that provide storage and retrieval of scientific documents and data. Any one VRE will typically support one or two of these goals. In a

recent survey of VREs Bos et al. (2007) identified seven types of VREs based on their technical features and organizational structure: shared instrument, community data systems, open community contribution system, virtual community of practice, virtual learning communities, distributed research centers and community infrastructure projects.

The experiences from VREs in the natural sciences and engineering show that a number of socio-technical issues are critical to the success of a VRE (Sonnenwald, 2007; Olson et al., 2008; Cummings and Kiesler, 2005). These issues include: a vision-based organizational structure within the VRE (Sonnenwald, 2003); meaningful recognition for contributions (Arzberger and Finholt, 2002); trust among participants (Finholt, 2002; Sonnenwald and Sonnewald, 2003); a good match between the technology and users' values (Orlikowski, 1993); need for new information organization and human-information interaction methods (Arzberger and Finholt, 2002); support for situational awareness (Sonnenwald et al., 2004); and, improvement over the current way of working (Sonnenwald et al., 2003).

Research on, and development of, VREs to support collaboration in the social sciences, including library and information science research and professional practice, has lagged behind VRE research and development in the natural sciences, engineering and business. For example, papers at the most recent largest international conferences in this area, the ACM Computer-Supported Cooperative Work Conference '08 and ACM Group Conference '07, which together had a total of 163 papers, had no papers on VREs in the social sciences. There were only two papers on VREs and collaboration in social science professions; one concerning collaboration in non-profit homeless outreach centers and one concerning the use of technology for non-profit fundraising. There were also no papers focusing on collaboration between social science researchers and professionals. Given the predominant focus on VREs in natural science, engineering and business, we do not know if existing VREs and theories are applicable to the social sciences, in particular to library and information science (LIS) research and professional practice. We believe there is a need to conduct research on VREs and collaboration in LIS, including collaboration between LIS professionals and researchers. To support LIS research and practice, enabling LIS research and practice to continue to address important complex problems, discover new ways of working, and avoid being left behind in the digital divide research on VREs and collaboration in LIS is required.

To address this we have several ongoing research projects. We are conducting a study that uses a socio-technical design approach to develop a VRE prototype to support sharing data collection instruments among LIS researchers, students and professionals. Another project is investigating collaboration among LIS professionals and researchers in order to increase our understanding of what may facilitate and/or hinder collaboration across academic and professional boundaries, and the role of technology in these collaborations. We are also studying collaborative decision-making and the selection of library management systems, identifying socio-technical practices that emerge during the selection process. We recently completed an exploratory study investigating needs and challenges with respect to remote collaboration among LIS professionals. Requirements for a VRE to support remote collaboration were identified. We describe these projects and discuss their implications in this paper.

2. A VRE for data collection instruments to support LIS research: a socio-technical design

The aim of this project is to design and evaluate a VRE that would facilitate sharing data collection instruments used in LIS research, including research conducted by academic researchers, professionals and students. Sharing data collection instruments can enable transparency in research, reduction of

effort needed to design and validate instruments, and encourage purposeful replication of studies. This is especially important in LIS because our journals do not require publication of data collection instruments, and resources to conduct research in both academic and professional settings are limited. To design the VRE we are employing a socio-technical approach, investigating: how students, researchers and professionals evaluate and choose data collection instruments; the motivation for individuals and organizations to share data collection instruments with others who they may or may not know; and, how a controlled vocabulary can effectively support submission, retrieval and evaluation of data collection instruments. The results are being used to create a VRE prototype.

Previous research in scientific collaboration, scholarly communication, scientific collaboratories, scientific disciplines, invisible colleges, and virtual communities suggests that six categories of factors may impact the design, adoption and use of a VRE to facilitate sharing data collection instruments within LIS. The categories are: career, disciplinary and scientific advancement, personal, community, cost of use and cost of development and sustainment. Career factors concern the reward system of science and disciplines, e.g. citation and acknowledgment, which can impact a researcher's career advancements. Disciplinary and scientific advancement factors concern science and disciplines in general, such as the effects that collaboration across national boundaries can have on promoting new perspectives and methodologies of a discipline and new ideas. Personal factors concern aspects of doing science which affect researchers on a personal level, other than their career. Community factors concern aspects that affect the community of researchers, apart from the factors related specifically to disciplines and reward systems. Cost of use factors concern whether the benefits of submitting to and using a VRE is worth the cost for the individual, e.g. download time, search features, and ease of use. Cost of development and sustainment factors concern the costs of developing and sustaining a VRE for a community or discipline, such as time, effort and money.

However, as mentioned earlier we do not know if these factors apply to LIS because no previous research investigated sharing within LIS context. Therefore, as a first step towards building a VRE, we conducted interviews with LIS students, research and professionals who had used and/or were planning to use quantitative and/or qualitative research methods. During the interviews we inquired about their perspectives regarding sharing and reusing data collection instruments in order to confirm previously identified factors and discover new factors. Analysis of the interview data indicates that the study participants are receptive to the idea of sharing data collection instrument with others. LIS is not seen as a discipline with a collaborative culture, however study participants believe that a shift to a collaborative culture will develop over time. Perceived benefits of sharing instruments include: an increased potential for creating and using higher quality instruments; enabling additional advancements in LIS research, e.g. by comparison of results; saving time and effort; and increased learning through studying other people's instruments. The most often reported incentive for sharing is receiving citations and acknowledgements in publications in which their instruments have been used. Disincentives for sharing include concerns about instruments being used erroneously; the possibility of not getting credit for instruments used by someone else; and the fear that competitors could more quickly advance by using existing instruments.

From the interview analysis a proposed design of a VRE prototype is emerging. The prototype consists of two components: a repository for data collection instruments and a social organization, or network, that supports communication and collaboration to manage and sustain the VRE. The prototype includes a variety of features ranging from features to support and sustain the VRE overall, such as digital learning objects illustrating how different types of data collection can be used, to detailed systems features, such as a controlled vocabulary for describing instruments.

An evaluation of the prototype is being planned. Using a think-aloud method study participants' perceptions of the proposed design features will be captured and analyzed. We hope the overall results of this project will contribute to the science of VREs in LIS.

3. Collaboration between LIS researchers and professionals

There has long been a concern about the research-practice gap within LIS. Multiple authors have highlighted the disconnection between the world of professional practice, interested in service and information system development, and the world of the academy, focused on the development of theory and the progress of the discipline (Joint, 2005; Haddow and Klobas, 2004; Booth, 2003; Bates, 1999). Haddow and Klobas (2004) suggest two ways to address this gap: one is to involve more professionals in research, and the other is to improve the transfer of research into practice. However, these two approaches do not reconnect the two worlds straightforwardly, unless the views and interests of both professionals and academics are solicited and represented in a balanced and even-handed way and both groups engage in an iterative process of exchange and synthesis of knowledge.

A VRE might support such collaboration between professionals and academics in research, potentially transforming the way research between academics and professionals is undertaken. As discussed previously the potential for a VRE within LIS, specifically to support collaboration between professionals and academics, has not been fully investigated yet. Therefore, we are conducting a qualitative study of three collaborative projects involving LIS professionals and researchers.

The study aims to investigate the influence of socio-technical aspects of work that facilitate and/or hinder collaboration between professionals and researchers in academia. In particular, it aims to understand the contextual and disciplinary circumstances in which collaborations form and develop in order to design a VRE that addresses problems and gaps arising from the ways in which LIS researchers and professionals work together. The study is comparative as it concerns how collaborative projects develop from their start to completion in two national contexts. The projects include two retrospective cases and one real-time case in both a southern and a northern European country.

To study the interplay between socio-technical aspects of work organization and the activities of the actors to build and sustain collaboration, we are employing actor-network theory (ANT), in particular Callon's (1986) model of translation of interests, to inform the analysis of 30 semi-structured interviews and 44 texts (project documents, web pages and e-mail messages). Although the analysis is still ongoing, the preliminary results highlight some key socio-technical aspects influencing the uptake of a VRE.

In the two Southern European cases, the project groups were temporal assemblages of people and things enrolled to accomplish a task. They remained emergent groups and never gained characters of stability. The lack of external funding and lack of intellectual property regulations did not hinder the projects, and did not appear to be the most critical issue for future sustainability. On the contrary, these issues explicitly enabled the participation of qualified professionals. For example, the lack of institutional intellectual property ownership and lack of funding provided flexibility that allowed project members to easily make decisions regarding intellectual property (Ponti and Sonnenwald, 2008).

In the Northern European case the project team shared many characteristics with conventional project teams. The project was institutionalized to some extent and the changes in the funding organization

affected collaboration by disrupting the long-established social bonds among project participants and bringing about loss of human and social capital.

In all the three cases, there were no formal rules to govern the projects and no scientific or administrative leader, but rather a coordinator whose role did not entail a “hierarchy of authority” within the project, which was egalitarian and consensual (Chompalov et al., 2002).

The three projects did not need high performance computing or very innovative scientific tools, but used inexpensive and simple technology for collaboration and data distribution. However, in one project an artifact, the primary data collection instrument used in project, had consequences for collocated and remote collaboration. Its complexity and ambiguity during the early stages of the project were not easily resolved using off-the-shelf videoconferencing and shared application tools. Team members resorted to face-to-face interaction, which excluded remote team members.

Another important finding was that the “gift culture” (Raymond, 1999) played a major role in all the three projects, as all the participants were volunteers in the southern European cases. The professionals in the Northern European case also participated without compensation. Intrinsic rewards motivated participants to contribute to the project whose goal was to produce an outcome that would be shared and beneficial to the larger community of LIS professionals.

A VRE could leverage this “gift culture”, and encourage the participation of professionals and researchers in collaborative and decentralized peer-to-peer production networks in which the right to give away over the right of ownership is a key element (Benkler, 2006). In these networks, volunteer participants can share resources and outputs, pursue professional interests and learn new things without relying much on the participation of their institutions. A LIS VRE might constitute a flexible and interactive “place for professional development”, suitable for professionals at all levels of experience, which provides them a variety of opportunities supported by technologies. Furthermore, it may encourage the development of a new generation of research projects involving students, professionals, researchers. New features that can support the synchronous, interactive collaborative design and application of complex data collection instruments across distances is an example of how VREs need to be enhanced to support collaboration among LIS researchers and professionals. We anticipate additional features will emerge through our data analysis, which is expected to be completed by the end of 2008.

4. Collaborative decision making and the selection of library management systems

This study looks at the collaborative decision-making process related to the selection of library management systems (LMS) that are the primary type of information system used within libraries today. LMSs can cost up to \$2 million or more for larger academic libraries, and can require two or three times that amount for the “cost of ownership” over a five-year period (Muirhead, 1997). These systems are very complex and perform an enormous number of functions ranging from simple routine operations, e.g. processing loans and returns, to management of all aspects of administrative library work and even providing user portals and acting as sophisticated gateways to various internal and external resources (e.g. Leeves, 1994). The LMS marketplace has expanded considerably (e.g. see Breeding, 2007), and each library is faced with a large number of products to choose from.

Previous research has shown that such systems can have significant implications for multiple aspects of organizational life (e.g. Bichteler, 1986; Craghill et al., 1989; Crawford and Rice, 1997; Howard,

1981; Johnson, 1991; Morris and Dyer, 1998; Pungitore, 1986; Pfeffer and Leblebici, 1977; Robey, 1977, 1981; Robey and Azevedo, 1994) including organizational structure, human resources, power divisions and job contents. Consequently, the task of selecting a LMS, a complex enterprise system, from among a number of other similarly complex systems, poses a major challenge for libraries. The selection has many financial, organizational and social implications. To assist libraries in the selection process, a number of models and suggestions have been made over the years, however these seem inadequate in reflecting the complexity of organizational decision-making and the social, cultural, and political influences, diversity of potential goals and pressures, breadth and diversity of the systems, changing LMS market place and the shifting practices in collaborative LMS selections and decision making practices.

Owing to the increasing complexity of organizational structures and practices as well as economical constraints libraries today increasingly collaborate in their efforts to select and purchase shared library management systems. Thus, there is an increase in collaborative decision-making among multiple organizations and this is aided by the use of VREs. In many organizations individuals selecting an LMS will have had no prior experience in collaborative decision-making across geographic distances or organizations. Further insights into the social and technical aspects of the collaborative decision-making process are needed to assist organizations and individuals in their efforts to select an LMS, a complex enterprise system that will impact many aspects of their work for years to come. Therefore, we are investigating the collaborative decision-making process related to the selection of an LMS from a social constructivist perspective using a case study approach.

The theoretical framework used in this study is a synthesis of several theories including methodological symmetry and decision making as rule-following. Methodological symmetry (Collins, 1981) posits that the credibility of all beliefs are treated on a par regardless of their truth or falsity and thus the researcher studies the effects of actions and beliefs rather than being concerned with judging the rationality, truth or success of the beliefs and actions. Decision making is seen as influenced by rules (Brunsson, 2000) which are often established by shared beliefs and norms, and which may produce a similar pattern of actions among those who share these beliefs and norm. This is an alternative to the more traditional perspective that views decision-making as predictions of future states and careful selection of the best outcomes among the available options.

Four case studies, based in three European countries, are underway. Two cases involve multiple libraries collaboratively selecting a shared LMS. Case study data includes approximately 150 hours of audio and/or video recordings of interviews (both formal and informal), with a wide range of people at various organizational levels, and observations of group meetings. In addition to these a large number of relevant documents, e.g. system specification documents, system tender documents, responses to tenders, staff evaluations of systems, formal and informal communications, have also been collected for each case. Data analysis includes iterative coding of interview transcripts, observations and relevant documents. Data collection activities concluded in 2008 and data analysis is underway.

Preliminary results of data analysis confirm that social contacts, lobbying, and informal communications play an important role in the process and outcome of decision-making. Specific practices used include: the use of committee structures, use of pre-meeting meetings and application of chairmanship techniques; inclusion or exclusion of people and timing of events to suit; promotion of ideas through concept building and use; and symbolic actions. For example, promotion of ideas through concept building and use is done through repeatedly associating an action or an idea with carefully chosen words or concepts that have positive or negative connotations. This serves to promote or demote that action or idea. Symbolic actions, including facial expressions (positive or negative),

jokes, derogatory comments, may be consistently used in association with a particular LMS to influence the selection of that particular LMS positively or negatively.

Preliminary findings further indicate that when it comes to videoconference meetings, small talk and informal conversations do not receive as much time and space as they do in face-to-face meetings. However, such informal conversations and even gossip are not totally eliminated and do occur mainly before, and to a lesser extent throughout, the meetings. Such informal exchanges seem more common among those members who already have an established relationship. Other more sensitive informal discussions however are conducted via the phone or e-mail. During formal videoconference meetings some of the less vocal participants usually keep quiet until prompted to speak. However, in one particular case study it was observed that the chairs of the meetings were quite diligent in inviting each group member to vocally participate.

There are several implications of these results. Specialized training on how to chair video conference meetings and how remote participants can effectively get involved in discussions may benefit the collaborative decision-making process. In addition, training regarding practices commonly used to influence decision-making can help individuals navigate the decision-making process more effectively. Such training may be especially important for geographically distributed collaborative decision-making processes because videoconferencing technology inherently constrains the participatory process, enabling more dominant members controlling the technology to influence the dynamics and outcomes of meetings more drastically than possible in traditional face-to-face meetings.

Data analysis is scheduled for completion fall 2009. Our ultimate goal is to develop a model of collaborative decision-making grounded in LMS selection within library settings in order to guide future practice and use of VRE technology.

5. Investigating needs and challenges with respect to remote collaboration among LIS professionals

We conducted an exploratory study that investigated LIS professionals' perspectives on the needs that might be addressed by a VRE, as well as norms and practices within their organizations that might facilitate and/or hinder the adoption of a VRE. Our goal is to provide insights regarding the potential and limitations for a VRE within this unique and important profession.

Interviews were conducted with ten LIS professionals working in a variety of settings, including a research university library, regional college library, large city public library, small town public library, government research agency, international corporation, small business, and non-government organization. All participants were managers responsible for library or information services in their organization. All participants, except one, lived and worked in Sweden; however, the professionals at the non-government and international organizations have professional responsibilities worldwide. The interviews were one to three hours in length, with an average length of one hour and 45 minutes. All interview questions were open-ended, and follow-up questions were asked to help ensure we captured the participants' meaning. The interviews were analyzed using both open coding and axial coding (Robson, 2002.) The data analysis shows that motivation for and obstacles to collaboration among LIS professionals include professional, socio-economic, resource accessibility and social networking issues. An overview of these issues is provided next.

The majority of study participants envisioned that a VRE could provide resources to facilitate their individual and organization's professional development and problem-solving. Some participants talked about this in terms of a need for expert advice while others talked about it as a need for new and innovative ideas or practices to be brought into their organization. It appears that participants find that their own organization occasionally lacks critical professional competences, which may very well also be the case since the demands on LIS professionals have increased in recent years, at the same time as resources for LIS organizations have often decreased. One way of addressing this increased demand without increasing costs could be to increase the knowledge-base among LIS professionals by connecting them in a VRE. This is particularly important for small and resource-scarce LIS organizations. Perhaps the most difficult challenge in this will be to bring about exchange of ideas between organizations and individuals with very different core activities, organizational size, experiences and knowledge, such as small town public libraries and large academic libraries.

Collaboration has been shown to provide economic benefits; however, all but two study participants did not believe that a VRE would provide economic benefits. Rather, it may impose a cost in terms of time, time needed to maintain a well-functioning VRE, and time needed to participate in a VRE. These issues would need to be addressed for a VRE to be successful.

In most knowledge organizations people's work is fragmented (Mark et al., 2005), and this increases as the number of electronic systems, emails, etc. increases. Hence, participants' reluctant attitude towards the idea of using a VRE if it is not well integrated into their current work practices and technology is fully understandable. Is it possible to design a VRE which will not be a burden to its users, especially when most potential users seem to be overloaded with information already? This has been discussed elsewhere in relation to the design of groupware (Grudin, 1994), and needs to be further considered in relation to a LIS VRE.

Access to data is a current focus of most scientific VRE efforts (Arzberger and Finholt, 2002.) However, study participants primarily expressed needs for resources of a different kind, namely for intangible resources such as people's knowledge and experience in different areas. Although some of the participants also expressed a wish for things such as tools, legal documents, and useful link collections, several participants explicitly expressed that they have more than enough resources of that kind already available. The majority of participants took the same perspective when they talked about sharing their own resources. Although a few mentioned other concrete things they would like to share, e.g. teaching materials, the majority were more enthusiastic about the idea of sharing their experiences, perspectives and tacit knowledge. A challenge is how to make such intangible resources visible and possible to share in a VRE, especially since failures of early VREs that attempted to support tacit knowledge sharing that were not compatible with existing reward structures have been reported (e.g. Orlikowski, 1993).

This last point relates clearly to what the participants expressed as most attractive about the idea of a VRE, which was, undoubtedly, the idea of having access to a network of people from a wide range of LIS related organizations. However, here lies also the largest challenge for a LIS VRE: to be able to make the VRE focused enough to be interesting to participate in, but still wide enough to be able to promote new knowledge sharing across organizational and disciplinary boundaries. This is especially challenging because LIS is a multi-disciplinary profession that does not have a recognized unifying core activity or grand challenge. The challenges to meet on a personal level lie in introducing the VRE into organizations in a way that complements but does not compete with existing routines and practices, and will be rewarded.

The results of the analysis indicate that a VRE could be, for most participants, a viable way of connecting to and exchanging resources with other professionals. Nevertheless, there are many challenges that must be addressed to help ensure success. Some of the challenges that emerged in the data analysis have been identified previously in the literature, but other challenges have not been previously identified. This implies that a LIS VRE could build on previous research but would also need to incorporate new ideas and research. Additional details can be found in Axelsson et al. (2009).

6. Discussion

Over the past 15 years an increasing number of systems and practices have emerged to support research, education and work across distances. These systems and practices have been described using a variety of names, including virtual research environments, collaboratories, problem-solving systems, groupware, shared workspaces, virtual communities of practice, virtual worlds, shared repositories, e-science, e-research, e-learning, remote collaboration, computer-supported cooperative work, distributed work and computer-supported cooperative learning. These names overlap in terms of concepts and technologies. Yet one thing is certain: research on how these concepts and technologies, and associated practices, impact or may impact LIS research, education and practice is lacking. There has been more research funding, and subsequently more research, focusing on new technologies and new ways of working in other domains. This is also true for our own research over the years. Funding from the National Institutes of Health, National Library of Medicine, and National Science Foundation has encouraged our research on collaboration and technologies to support collaboration in the natural sciences, engineering and medical domains.

Yet research on the impact of VREs in other disciplines suggests VREs could also have a positive impact on LIS research, education and practice. Collaboration allows participants to learn from one another, share resources including instruments, data and software tools, facilitate access to scarce resources, and build upon each other's results (e.g. Beaver, 2004; Berman and Brady, 2005; Birnholtz and Bietz, 2003; Sonnenwald, 2007). These benefits could also emerge in LIS. For example, master students around the world could investigate the same research question, e.g. exploring the collaborative information behavior process, re-using a survey or interview protocol already designed and tested by a more experienced researcher. The students could post links to their results, including links to their data, in the VRE discussed in Section 2. Then meta-data analyses could be done using the students' results. Any number of meta-data analyses could be done, e.g. analysis of similarities and differences across cultures, gender, domains, and job roles. VREs could also facilitate collaborative student-researcher-professional research projects, bringing new relevance to higher education for students, providing lifelong learning opportunities for professionals, enabling broader, more comprehensive research projects, and bringing additional resources to LIS researchers. The end result may be more comprehensive theories and innovations in information services, technology and practices.

VREs could help our discipline take better advantage of the large amounts of time and effort LIS master students spend working on theses and course projects. It's been our experience that many students have difficulty selecting required research and project topics. Conducting collaborative student-researcher-professional projects and encouraging the re-use of data collection instruments are ways to turn a task perceived as drudgery into a contribution to research and practice. We propose that this would motivate students, giving them a new sense of purpose with respect to their education.

Professionals may also benefit from VREs. Many libraries face similar challenges, but need to investigate these challenges within the context of their own organization. Rather than spending

resources to design and test a data collection instrument, such as a survey, to gather more information about a particular challenge or set of challenges, a library could reuse an existing survey instrument that has been shown to be effective in investigating the same challenges but in different contexts. Furthermore, results from the studies using the same data collection instrument could be recorded in a VRE. Then if multiple uses of the same data collection instrument yield similar results across multiple libraries, a library facing resource constraints may even decide not to conduct their own study but rather implement the results from the previous studies.

Our research further indicates that characteristics of and challenges facing library and information science research and practice may also inspire new advances in VREs. Examples of new features that could be included in VREs are: an expert-on-demand feature that allows organizations to request specialized expertise using a collective exchange approach; the inclusion of digital learning objects to assist learners in using resources and participating in the VRE; and, the inclusion of policies to sustain fair use of digital objects and automated mechanisms to verify adherence to those policies. Our research is ongoing and readers who are interested in additional information about our work should contact the authors.

Library and information science, as a discipline, does not receive the same levels of research funding as other disciplines, such as medicine, physics and chemistry, and this will most likely not change in the near future (although we should continue and expand our efforts to increase available funding). This is one reason why research on VREs within LIS is scarce. Paradoxically, because there is limited funding, we need to seriously consider the use of VREs to increase the effectiveness of our research and work, and contribute to the research on VREs to maintain, and ideally increase, the relevancy of our discipline.

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Acknowledgements:

The authors wish to thank all study participants who so graciously shared their experiences and insights, and Maria Spante who assisted in the project focusing on collaboration among LIS professionals. The work reported in this paper has been funded by Stiftelsen Förenings Sparbanken Sjuhärads, the Center for Collaborative Innovation, the Swedish National Graduate School of Language Technology and the Bengt Helmqvist Fund.