LIBER QUARTERLY 21 (3/4), April 2012 — ISSN: 1435-5205. P387–405
http://liber.library.uu.nl/
Igitur publishing

Knotworking in Academic Libraries: Two Case Studies from the University of Helsinki

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Abstract

Librarians in academic libraries are facing major changes in their work due to, e.g., the internet, digitization, and increasing use of new channels for information retrieval by their most important clients, namely researchers. This creates challenges for librarians: both to deepen their own expertise and to develop innovative service models for their clients.

In this paper we present a development project entitled 'Knotworking in the Library' from the Helsinki University Library. The project made use of the Change Laboratory method, which is an intensive developmental effort which facilitates improvements in the activities of organizations and changes in the organizational culture. The process started in Viikki Campus Library in 2009–2010 and continued in the City Centre Campus Library in 2010–2011. The aim was to create new kinds of partnership between libraries and research groups in the form of knotworking. By knotworking we mean a boundary-crossing, collective problem-solving way of organizing work.

The knotworking model presented in this paper generated practical tools to assist selected research groups in dealing with data management related-issues.

Key Words: Knotworking; Change Laboratory; service innovation; research data management

Introduction

Librarians in academic libraries are currently facing major changes in their work due to, e.g., the internet and digitization of material. Also, research funders increasingly demand a detailed description of the research data created and a plan for their lifecycle management. Researchers' resources may not be sufficient to meet these new requirements. The need for new kinds of support services has motivated academic libraries to search for models whereby librarians and research groups develop new ways of collaborating to meet the challenges (Brophy, 2007; Earnshaw and Vince, 2007; Rader, 2002). The Helsinki University Library has taken a proactive approach to developing services for research groups. The new tasks include organizing, archiving and storing huge amounts of research data as well as viewing the publishing processes in a new way. In this paper, we present a two-phase change effort aimed at addressing these challenges. In both change efforts — one in Viikki Campus Library in 2009 and the other in the City Centre Campus Library

in 2010 — innovative services were developed through close collaboration between the librarians and the selected research group members.

Knotworking and the Change Laboratory

The Helsinki University Library has started addressing the challenges in a concrete way through knotworking (Engeström *et al*., 1999). Knotworking is a boundary-crossing, collective way of organizing work. Knotworking is a means for participants to create continuity in the production of the shared object (e.g., research data archiving). According to Engeström the knot symbolizes a rapidly pulsating, distributed and partially improvised collaboration between loosely connected actors and activity systems (Engeström, 2000, p. 972). Knotworking is "a longitudinal process in which knots are formed, dissolved, and re-formed as the object is co-configured time and time again, typically with no clear deadline or fixed end point" (Engeström, 2000, p. 973). In other words, knotworking differs from team work in the sense that continuity is connected to the object, not the practitioners; the practitioners and the initiators of knots can change.

Applying the knotworking model requires a long-term effort. This can be achieved by using the Change Laboratory method based on the methodology of Developmental Work Research (Engeström, 2007). The Change Laboratory method can be used to effect changes in organizational culture as well as to continuously improve the activity of organizations. This requires the active participation of the practitioners in an intensive process: normally 5–10 sessions are arranged weekly or fortnightly. All the sessions are video and audio recorded, and the recordings are used for reflection in later sessions and in research.

The Change Laboratory process begins by collecting ethnographic data such as video recordings and interviews (so-called mirror material) representing the present state of the work practices. In the sessions the participants analyze the challenges in their work practices with the help of the mirror with the aim of revealing historically developed, work-related tensions and disturbances and of planning a new model of activity to solve them. Various analytical models and tools such as the cyclical model of expansive learning (Engeström, 1987, p. 323) and the triangular representation of an activity

system (Engeström, 1987, p. 78) can be used to help practitioners perceive their work activity as a whole. In the Change Laboratory sessions practitioners move between the past, present, and future states of their activity, which brings a historical element into the creation of something new. The Change Laboratory produces the rich data about collective problem solving and collective learning that change management requires. The method has been used for over ten years to help organizations such as hospitals, schools, newspapers, theatres, factories etc.

The Helsinki University Library

Helsinki University Library is Finland's largest multidisciplinary university library and it provides information and library services across a number of disciplines at four university campuses. The Helsinki University Library aspires to be one of the leading multidisciplinary research university libraries in the world by 2020.

Helsinki University Library in its present state was founded on the 1st of January 2010 after a long period of development lasting from 1993 to 2010. In 1993 there were 160 libraries. An international evaluation in 2000 and a follow-up evaluation in 2004 were crucial factors in creating the present model of a single university library. The new Helsinki University Library consists of the following centralized library services: 1) administration and development, 2) acquisition and metadata services, and 3) digital services.

In addition four subject-specific campus libraries (in Meilahti, Kumpula, Viikki and City Centre) serve teaching and research. These came into being out of the earlier faculty and department libraries during 1999–2009. Each of them had a long history of its own. The structural changes presently underway in the City Centre Campus Library will be completed in 2012 when the new Kaisa Building will open its doors, bringing together most of the smaller libraries which are currently scattered over eleven locations.

Since 1st August 2006 the former Helsinki University Library is the National Library of Finland. Like the former University Library, it is an independent institution, which is of national relevance within the university as a national "memory bank" and which provides services to the entire national library network. The university library duties are laid down in the Service Agreement 2010–2012.

Research Site

Two different campus libraries were selected for this research project. The Viikki Campus Library was selected as the first pilot. This library was the oldest campus library (1999–) and a tradition of collaboration with research groups had already been established. The faculties on the Viikki campus are Agriculture and Forestry, Biological and Environmental Sciences, Pharmacy and Veterinary Medicine. Viikki is a unified campus with many active research groups of international repute.

The City Centre Campus Library was the opposite of Viikki. As it was established only in 2010, merging five faculty libraries and the undergraduate library, it was much younger, and it is also a very different type of campus. The faculties at the City Centre Campus include Arts and Humanities, Behavioural Sciences, Law, Social Sciences and Theology. The humanities and social sciences do not seem have a tradition of working in research groups as the biosciences campuses do. The resources for research are very different too. Humanities and social sciences are book-based whereas the biosciences are heavy users of net-based material. In fact, the concept of a ''research group'' remained elusive to most of the researchers at the City Centre Campus. Another important reason for selecting the City Centre Campus Library was that the library was under construction both inside and out. The new building will not be ready until 2012, which means that there was some time to develop the services.

Features of the Viikki Campus Library

The Viikki Campus Library was founded in 1999 when four faculty libraries and smaller units were merged and moved from several addresses in the city to a new library building in Viikki. Therefore, the library has had time to adjust to the changes brought about by the merger. The disciplines based at the Viikki campus traditionally conduct their research in research groups. The Library had already taken an active role in serving the researchers and had been taking part in development groups for new requirements for research material. The librarians were subject experts and had according responsibilities. They were well connected both inside the university and outside. Several research institutes had also moved to the campus to further research-related cooperation with faculties and institutions.

At the time of the Change Laboratory in 2009, Viikki employed 39 permanent staff members; it boasted 12,500 shelf metres of books and monographs, 3,100 periodicals, 18,000 e-journals, 250 databases, approximately 2,000 electronic books, 200 study places and 100 workstations for the clients. The library floor space is 5,000 square metres on four floors.

Librarians and Research Groups in the Viikki Campus Change Laboratory

Fifteen professionals from the Viikki Campus Library, including the library director, participated in the Change Laboratory sessions. It was the intention of the project to involve professionals from different fields of expertise in order to reflect the multi-voicedness of the community.

A set of mirror data was collected prior to the sessions. Mirror data are video clips from interviews with librarians and the members of the participating research groups. The video clips depict in a concrete way possible disturbances and challenges in the work activity of librarians. The mirror data from Viikki consisted of interviews with two librarians and one representative of each research group. The interviews aimed at unearthing changes in library work and its object, and the possible role libraries could play in supporting research groups in the future. One of the two librarians interviewed had worked for the library for over ten years; the other had a particular interest in the potential of ICT in further developing library services. All of the interviews were videotaped and the researchers selected key clips to be shown as mirror data in the Change Laboratory sessions.

The library staff participating in the Change Laboratory sessions chose two different research groups in terms of research interest and group structure for the pilot project. These were Peatland Ecology (Department of Forest Sciences) and the Cyanobacteria Group (Food and Environmental Sciences).

In the course of the Change Laboratory sessions it became clear that both groups had a lot in common with regard to their scientific scope. Both research groups were represented in the sessions by five to ten researchers who were in different stages of their academic careers. The leaders of both research groups were present in the sessions. In the interest of obtaining mirror data, two senior researchers from the Peatland Ecology Group and the leader of the Cyanobacteria Group were interviewed. The Change Laboratory consisted of six two-hour sessions in September–November 2009.

Features of the City Centre Campus Library

After the pilot in the Viikki Campus Library with two research groups, the second phase of the 'Knotworking in the Library' project was conducted in the City Centre Campus Library with four research groups. The City Centre Campus Library became operational at the beginning of 2010 and was in the middle of its transformation from a number of smaller libraries to one central facility.

The City Centre Campus Library serves five faculties in the city centre: the Faculty of Arts and Humanities, the Faculty of Behavioural Sciences, the Faculty of Law, the Faculty of Social Sciences, and the Faculty of Theology. At the time of the project, the library was still scattered over 11 locations. Because of the disciplines involved and, perhaps, the geographic dispersion, it seems that the researchers at City Centre Campus do not identify themselves as members of research groups but see themselves as individual researchers or, at most, identify with the department involved. The new Kaisa library building will cover an area of 13,000 square metres and have about 1.5 million books. The library expects to receive about 1.1 million visitors annually.

Librarians and Research Groups in the Centre Campus Change Laboratory

Eighteen librarians from the City Centre Campus Library representing different occupations participated in the Change Laboratory sessions and four of them were interviewed beforehand. Four research groups from the City Centre Campus Library participated in the project. Five groups were interviewed, because one group from the Finnish Language Department withdrew from the project after the interviews.

The research groups were: Cognitive Science from the Faculty of Behavioural Sciences; The Construing Reader in the Framework of Media Concept Project (Finnish Language) from the Faculty of Arts, New Media Environment; Challenges for Copyright from the Communication Law in the Faculty of Law; and Politics of Philosophy and Gender (Gender Studies) from the Faculty of Arts. One to four researchers from each research group participated in every session and from three to five of them were interviewed beforehand. The Change Laboratory consisted of eight weekly sessions in October and November 2010.

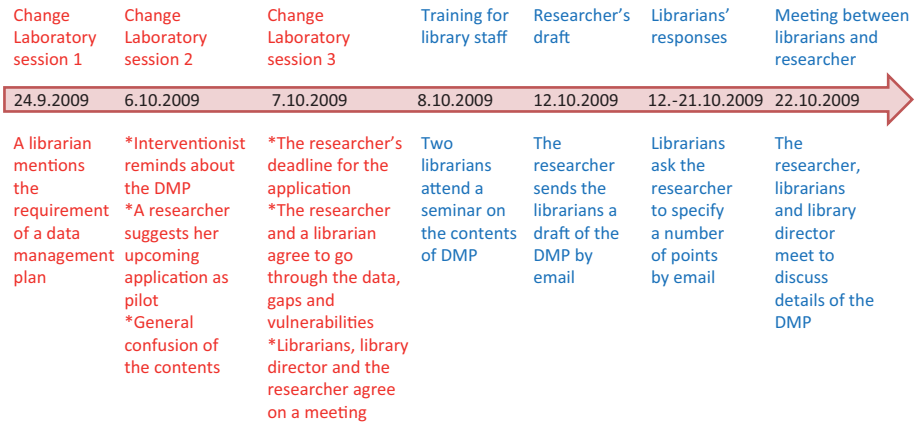
Knotworking in the Library

Knotworking can be understood in terms of an innovative model of organizing work in which professionals and their clients form 'knots' in order to work on a shared object. These knots are less fixed than teams and can adapt to changes more rapidly. New knots can be formed when circumstances so require. In the context of the present project knotworking was initiated in the Change Laboratory sessions. In both cases the knotworking model led to continuation of the work independent of the Change Laboratory sessions, and led to the creation of a service tray as the central outcome of both of the phases of the project. The two case studies in this paper represent different types of knotworking.

Viikki Campus

In this article we take a closer look at the creation of a data management plan (DMP) in a joint effort by a researcher of the Cyanobacteria Group and the library staff. This service innovation was prompted by the researcher's imminent need to submit such a plan in the context of a grant application to the Academy of Finland, which had recently introduced a DMP requirement. Figure 1 depicts the timeline of the creation of the data management plan.

Fig. 1: Timeline of the co-configuration of a pilot data management plan by the Viikki Campus Library staff and a researcher of the Cyanobacteria Group.



The Change Laboratory process in Viikki consisted of six sessions. The first session was only attended by the library staff. When discussing possible new areas of collaboration between the library and the selected research groups, one librarian mentioned the new requirement set by the Academy of Finland which stipulates that research groups and projects must draw up a data management plan. The librarian suggested that the library use its expertise to act as an intermediary between the research groups, the Academy of Finland and different administrative parties involved to meet this requirement, even though it was as yet unclear what this would entail.

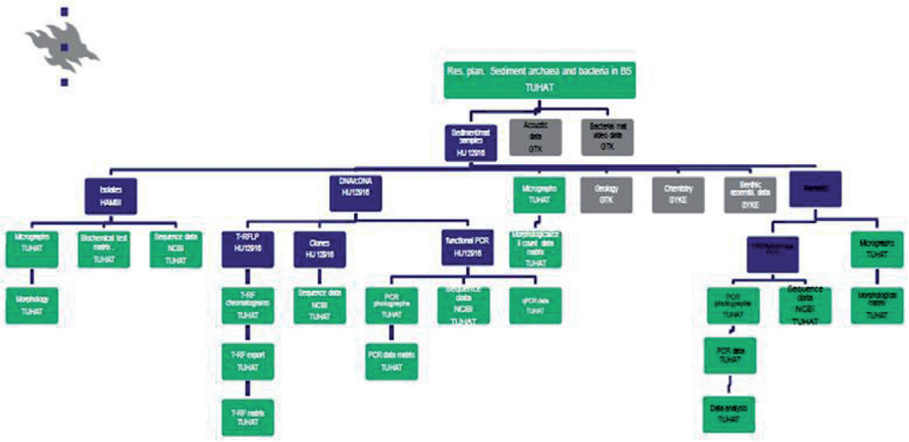
The library staff and representatives from both pilot research groups participated in the second Change Laboratory session. When the interventionist reminded the group of the data management plan requirement, a researcher from the Cyanobacteria Group commented that the present procedure was unclear: 'I have done something like this [in the past], but I'm not entirely sure what it actually means. I've usually just written a paragraph…' The researcher then mentioned that she was, in fact, about to apply for a grant from the Academy of Finland: 'This reminds me: the deadline for the next applications is at the end of the month, so is it OK for me to let them know now that I'm working with the library to produce such plan?' The researcher had an actual need for a new tool to meet the application requirements and she seized the opportunity to collaborate with the library. The procedure was new for the library staff too: 'As I've understood it, the Academy has not given any specific instructions as of yet. We're off to a seminar actually [with a colleague] the day after tomorrow. The purpose is to hear about the data management plan.'

The idea was further elaborated in the third Change Laboratory session which was devoted to the particular needs of the Cyanobacteria Group. In response to the interventionist's reminder about the data management plan, the Cyanobacteria researcher who had in the previous session briefly mentioned her imminent application to the Academy of Finland now emphasised the urgency of her situation: 'This is a very important issue. Personally, I need to have a plan as early as the 31st of October, so my share of the pilot case have to be completed before the end of the month.' The researcher also acknowledged the need to design the data management plan in such a way that it could later be expanded to serve the whole research community. The library director responded positively: 'Great! Why don't we set a date for our best experts and your best experts to work on this?' The researcher and three librarians then took concrete steps towards the co-configuration the data management plan by setting a date for a meeting to go through the details.

The data management plan was a learning experience for all parties involved: the library staff attended a seminar after this initial step in the budding collaboration. The researcher sent a draft of the data management plan to the librarians and an exhaustive exchange of emails followed: the librarians were negotiating amongst themselves the best way to proceed. To get an overall picture they sent the researcher a list of questions in an attempt to clarify the specific nature of the data, the storage space and software needed, usage rights and data protection issues.

After the researcher's responses had been received, a meeting was organized between the researcher and a colleague from the same group, eight librarians and the library director. For the researcher one of the benefits of collaborating with the library staff was that it helped her organize her own data, detect possible overlaps and improve the description of the data. To illustrate this, Figure 2 contains a flow chart created by the researcher. This flow chart shows what types of data are involved and where the data, statistical and metadata files are deposited.

Fig. 2: Flow chart extracted from a data management plan required by the Academy of Finland and created by a researcher from the Cyanobacteria group.



Flow chart of data. The data, statistical and metadata files are deposited in the TUHAT data archive.
Blue=actual samples, green=digital data, gray=data deposited in another institution than University of Helsinki.
HAMBI=culture collection of University of Helsinki, NCBI= National Center for Biotechnology Information,
HU12916=freeser of Univeristy of Helsinki, GTK=geological Survey of FInland, SYKE=SYKE Marine research Centre,
TUHAT=data archive of University of Helsinki.

It was our intention to describe a second test case, a data management plan for a Peatland researcher, but due to the researcher's timetable this could not be done. Instead, the library professionals built a website for the Viikki campus faculties with information about available data storage options, the data management requirements of the Academy of Finland, and other important issues. This data management website has been updated and expanded ever since by the library staff and now also includes information for the City Centre campus.

City Centre Campus Library

The second knotworking case we present in this paper produced a quick reference guidebook for the Cognitive Science research group. This phase of the project was markedly different from the Viikki phase: knotworking was sparked by and initiated in the Change Laboratory sessions, but it mainly took place outside the Laboratory.

At the beginning of the Change Laboratory process it became evident that the library was unable to meet the data management needs of the Cognitive Science research group. Thus, innovative solutions were needed.

Some of the research group's concerns involved general threats to stored data. A research expressed it as follows: 'Yes, today we had a fire drill. This is an example of a possible threat, because our data would have burned. I mean, everybody grabbed their own laptops but did anyone think of taking the external hard drive along?'

Other concerns focused on data management issues at a local level. The following excerpt highlights some of the problems associated with a lack of shared data storage practices.

'Researcher 1:	Yes, we store them [data] on several different computers.
Librarian 1:	On a number of different computers, and each researcher has his own index system and there is no common format (…)
Researcher 2:	We store everything on external hard drives.
Librarian 1:	Yes.
Researcher 2:	So if you want one particular file, then you ask a colleague on which drive it is.
Librarian 1:	Yes.
Researcher 2:	And the answer is that it's probably on that drive.

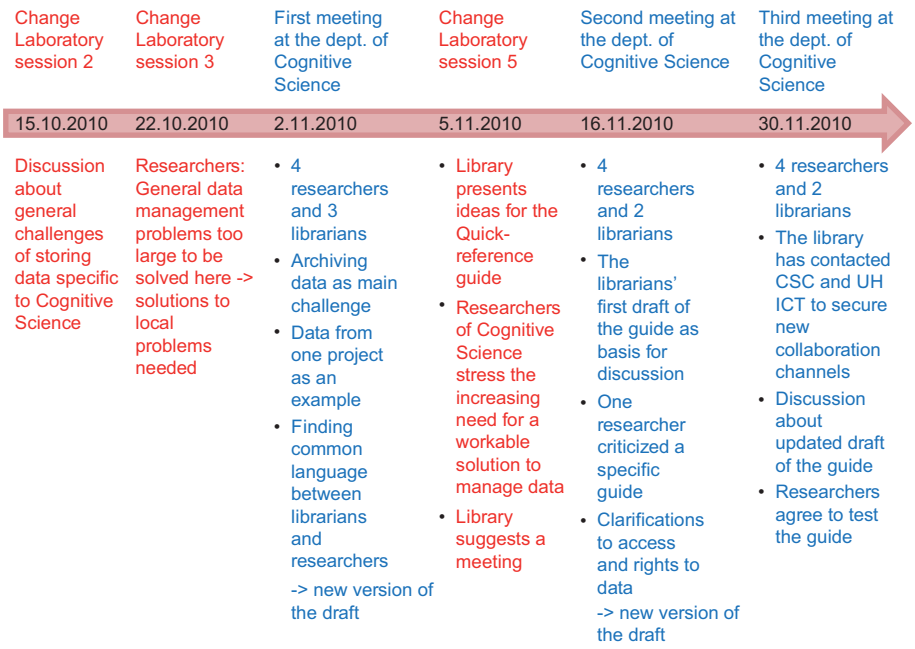
Librarian 1: Yes.

Researcher 2: And then you look, it could be here, it could be there. Before I left for my holidays I made back-ups of everything I'm involved in and it took the whole day to track the files down, I mean, finding out which computer was used and how the data are registered.'

This excerpt reveals that storage, encoding and description practices were rather random, varied from one researcher to another, and, as the head of the department stated 'may lead to not being able to use perfectly valid data due to serious shortcomings in storage practices'.

The library professionals and Cognitive Science researchers began knotworking to develop solutions for the data management problems; the timeline of the creation of a quick reference guide is shown in Figure 3.

Fig. 3: Timeline of the creation of a quick reference guide by the City Centre Campus Library staff and the researchers of the Cognitive Science research group.



The issues of the Cognitive Science researchers were discussed in more detail in the second Change Laboratory session: it became apparent that they were having serious problems managing, storing and archiving their data. The research group handles mostly large video files, such as EEG files and eye movement recordings, and these are difficult to store, that is, the available options were deemed insufficient. During the second Change Laboratory session the library suggested that the research group make use of the Finnish Social Science Data Archive (FSD). The researchers were not convinced right away, as was demonstrated by the third Change Laboratory session, when the discussion centred on the researchers' need to sort out their own, local practices first before zooming in on large-scale data management issues. The librarians and researchers decided to organize a special meeting to enable the librarians to familiarize themselves with the work methods of the researchers.

The first of such meetings in a series of three was held in the department of Cognitive Science and was attended by three library professionals and four researchers. First, the participants had to find a common language: the researchers had brought some of their data to illustrate the particular issues involved in archiving, tagging and describing the content — preferably in such a way that the data would be understandable independently of the researcher.

The fourth session was devoted to the needs of another research group. Then, in the fifth Change Laboratory session, the library staff presented their ideas about what they now called a quick reference guide. This term was used to denote a collection of guidelines to be used at different stages of the research to store data systematically and to do away with random data descriptions used by tens of individual researchers. The library explained that the purpose of the guide was to enable data to be stored safely in a structured way. The researchers welcomed this type of assistance and a meeting was organized outside of the Change Laboratory to discuss the details of the quick reference guide.

The second meeting outside the Change Laboratory context took place at the department of Cognitive Science. This time two professionals from the library and four researchers from the department participated, one of which (Researcher 2 in the excerpt below) had not been present at the Change Laboratory session or the previous meeting with the librarians. On the table

was the latest draft which had been emailed to the researchers before the meeting. One researcher had reservations about the need for the guide and expressed his fear that the guidelines might turn out to be too rigid:

> 'The bad thing about instructions is that they are hardly ever updated and soon lose touch with actual practices. Methods are developed and changed all the time, new things are invented and new stuff is being tried out so if it [the guide] is too detailed it will be outdated very soon.' (Researcher 2)

After hearing the librarians' comments, Researcher 2 offered some advice for improving the guide:

> 'The most important thing about such a guide is that the issues [a researcher] easily overlooks are dealt with. These are obvious things, such as who has collected the data and when; who has the right to use the data, who has the right to publish them in the future and so on.'

The ensuing discussion between the researchers and the librarians showed that many of the current data practices were not documented and were implicit. The information provided by the researchers enabled the librarians to prepare a new draft which emailed to the researchers and then discussed at the third meeting a fortnight after the second one. The meeting was attended by the same two librarians and four researchers as the second meeting. They went through the guide in detail and one of the researchers agreed to test the usability of the guide and report back to the library.

In order to sort out issues of large-scale storage of data, the library had been in touch with the IT Center for Science (CSC). CSC is a Finnish non-profit organization which provides ICT support to research institutes, e.g., network, application and data management services. The librarians introduced the option of storing the data at CSC at the meeting with the researchers, but this could not be decided upon, partly because some junior researchers required approval from the head of their research group. In the end, it was decided that the librarians would stay in touch with the researchers and help them fill in the appropriate application form.

As a result of knotworking between the library professionals and the researchers of Cognitive Science a quick reference guide was in fact produced. Upon

the recommendation of the librarians, the guide is structured in three sections, each covering a specific aspect of data management during different stages of a research project. The outline of the quick reference guide is as follows:

Section 1. Description of the study and the data
- Section 1.1. Meta documents for the study and the data
- Section 1.2. Possibilities for further development of metadata (documentation) of research process and research data

Section 2. Description of individual experiments
- Section 2.1. Meta documents of the experiment
- Section 2.2. Possibilities for further development of individual experiment data

Section 3. Description of recordings
- Section 3.1. Meta documents of the recordings
- Section 3.2. Possibilities for further development of recordings metadata

The final draft of the quick reference guide is a rather extensive set of guidelines which needed to be tested in practice by the researchers. This was done in early 2011. The guide was recommended by a cognitive sciences researcher also to be introduced to the neurosciences researchers' use.

The collaboration between the library staff and the researchers in creating the quick reference guide is an illustrative example of knotworking in solving data management problems. The problems were identified by the researchers and the librarians in the Change Laboratory sessions but the creation of the quick reference guide mainly took place in meetings organized by the practitioners. The participating librarians or the researchers were not always the same people in the Change Laboratory sessions or in the separate meetings: the collaboration was built on the shared object and the practitioners involved varied.

At a wider level the knotworking model created during the project included the innovation of new way of working. Instead of serving clients in the library, librarians went out of the library to meet researcher in their departments and offices. Furthermore, librarians cooperated actively with researchers in order to develop services researchers needed. This was a new way of working not only for librarians but also for researchers.

Conclusion

The two phases of the 'Knotworking in the Library' project differed in terms of their starting points. Viikki is a Biosciences campus with a long tradition of working in research groups and little need for printed resources. It is also worth noting that the leaders of the research groups were present at all the Change Laboratory sessions.

The disciplines represented in the City Centre Change Laboratory, particularly humanities and social sciences, depend more on printed texts and monographs. These disciplines traditionally do not work in research groups but the researchers act as individuals. The participants in the four pilot groups were at different stages of their academic careers, but the most senior researchers and group leaders were typically not able to attend the Laboratory sessions due to practical circumstances. This led to a situation in which junior researchers did not have the authority to make decisions.

Regardless of these different starting points, both processes led to closer collaboration between researchers and the library staff.

One challenge to the library today is that researchers may either not recognize the relevance of library services or may not even know about them. In this particular project the library took on the challenge from both angles: in Viikki the library staff took up the challenge of creating a data management plan. Meeting the researchers' needs involved a lot of communication between the researchers and the library, amongst the library staff themselves and between the library and other partners. It was the researchers that took the initiative in a Change Laboratory session, but the meeting to sort out the details was initiated and hosted by the library. In the case of City Centre Campus Library the librarians went outside the confines of the library and reached out to the researchers with their knowhow. They met with the researchers at their place of work and closely worked with their colleagues in between the meetings.

In both cases the innovative services came about through knotworking. In Viikki the object of knotworking was a data management plan. Researchers and library professionals worked together to build a new tool which could be tested and then expanded and developed to serve a larger body of users. The individual library staff differed at the various stages of the process. Likewise, in City Centre Library, the knot was formed to work on the quick reference

guide. There were always 2–3 library professionals and 4 cognitive scientists involved in creating the quick reference guide.

The two phases of the 'Knotworking in the Library' project proved to be a demanding process. The two different research sites differed in terms of context and thus generated different innovations. In Viikki the process generated a comprehensive service tray which included the data management plan described here. The service tray also included 1) training and briefing related to the new information system, 2) tracking new releases and training the use of new tools for this purpose, 3) offering news flashes of new services and tools at the departments, and 4) assistance in issues related to visibility of the research group.

In the City Centre Campus Library the earlier experiences from Viikki could be put to good use: here too a tool for tracking new releases was implemented in addition to the quick reference guide. The City Centre Campus Library is currently changing its organizational structure to support the knotworking model: librarians must find their own way of collaborating with the research groups on the campus.

Envisioning the Future: Different Types of Agency within the Two Knotworking Cases

The new model of knotworking in academic libraries requires a new kind of agency from all parties involved. The two Change Laboratory processes presented here may not have led to large-scale breakthroughs, but they certainly illustrate how demanding it is to change one's own working method or organization. The two cases demonstrate that without the observations that led to the creation of these innovative solutions it might not have been possible for the librarians to critically evaluate their working method. Without these observations the pressure to change might not have been felt.

In the future it will be interesting to investigate more closely how initial ideas evolve into practical solutions and what kinds of agentive/initiative this requires. Engeström and Sannino (forthcoming) maintain that 'the formation of an expanded object and corresponding new pattern of activity requires and brings about collective and distributed agency, questioning and breaking away from the constraints of the existing activity'. This requires new forms

of agency so that it becomes possible to move 'from momentary individual initiative to sustained collective effort' (Engeström & Sannino, forthcoming).

This could be analysed through the six main types of participants' emerging agency that Engeström has traced within earlier Change Laboratory interventions (Engeström, 2011). These types can be briefly characterized as follows:

1. *Criticizing* the current activity and organization.
2. *Questioning or resisting* the interventionist or the management. Resistance towards the intervention process or the management may take the form of criticism, questioning, opposition and rejection.
3. *Explicating* new possibilities or potential in the activity. This refers to reflecting on previous positive experiences and seeing them as a potential left unacknowledged or characterizing the problematic object as a source of new possibilities.
4. *Envisioning* new patterns or models of the activity. Envisioning can occur in the form of preliminary suggestions or presentation of comprehensive models for the future.
5. *Committing* to concrete actions aimed at changing the activity and expressing this through commissive speech acts.
6. *Taking* consequential *actions* to change the activity. Participants of the interventions may actually change the situation through a sequence of actions. This may occur in, between and after the laboratory sessions.

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