Management 2.0

The Librarian-Designer: Working with Science Teams

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Introduction

In 2001, a healthy volunteer participant in a drug trial at Johns Hopkins died after investigators failed to review all of the information on hexamethonium, a drug used in the trial. A review of the resources available at Johns Hopkins indicated that if researchers had widened their online search, they would have found citations to older articles reporting the drug's dangers.[1] Thankfully, the Johns Hopkins tragedy is a rare occurrence in clinical trials, however, it points out how having a knowledgeable librarian as part of the research team might have made a difference to the outcome. Most likely, a librarian would have continued her search beyond the first, easily obtained resources. In today's world of online databases, anyone with a computer might think he will find all the information available. Of course, librarians realize this isn't the case, but that knowledge does not do much good if the people who need your assistance don't come to you.

In this article, I will discuss the role of librarians in research science, particularly in what is known as *team science.* I suggest that these librarians see themselves as librarian-designers, adding value to the team by their full participation in this unique context.

The science of team science

If you work in an academic or medical library, the people who 'don't come to you' might well be participants in *team science.* In 2006, the National Cancer Institute presented the *Science of Team Science* as a new area of study, one promoting "team-based research through empirical examination of the processes by which scientific teams organize, communicate, and conduct research. The field is concerned with understanding and managing circumstances that facilitate or hinder the effectiveness of large-scale collaborative research, training, and translational initiatives."[2] These initiatives bring information developed by researchers to practitioners.[3] Translational medical teams, for example, communicate research to doctors who can then apply that research in clinical trials. Team research has increased due to modern science's need for expensive laboratories, equipment, and multiple research perspectives. The movement to team-based research is also evidenced by the increasing number of patents obtained by teams, team-authored peer-reviewed articles,[4] and by the preference of the United States government to fund team-based work. The result is that researchers are strongly encouraged to form teams in order to obtain funding.[5] This new way of working may be beneficial to scientific research, but it does not automatically follow that team scientists know the resources or best methods for handling information in this environment.

The librarian-designer

The person with these crucial information skills is the librarian-designer. I introduce this term to indicate a librarian who uses systems thinking to envision the workplace as the environment in which she designs systems and services. [6] These systems and services may be technologically based, focused on human (social) elements, or some blend of the two. In addition to having well-developed core library skills, the librarian-designer has an understanding of human information behavior, research methods, and has a knowledge of information management tools and processes, gained through schooling, continuing education, or on-the-job experience.

In the systems perspective, the organization in which work is performed is characterized as a system of inter-related parts in which the organization's goals are not simply met or unmet, but can be measured to show how close the system is to reaching its goal. Measuring the changes to the system helps the librarian-designer know where the effort to meet the goal has broken down and where to intervene in the system. A systems thinker considers the elements of resources, components, management, people, objectives, measurement, and environment. In the context of team science, these elements might be manifested as: *resources* – tools for getting things done; *components* – the team's activities, its goals, and how it measures performance; *management* (control) – the ability to determine when the system needs to be changed; *people* – the individuals in the system; *objectives* – performing experiments; *measures* – accepted papers, obtaining grants, successful studies; and the *environment* – the university or research center, the economy, available technology.

The librarian-designer approaches information problems with the understanding that the parts are inter-related and inter-dependent, and that a change to one part affects the whole, so that the design (those systems and services provided to the team) affects the performance of the whole system. A typical librarian approach to information needs is to provide the precise information which she believes will satisfy the need. Too often the librarian does not ask about the context in which the information will be used, who will use it, or what problem brought the user to the librarian in the first place, despite almost thirty years of a shift in the discipline to focusing on the user.[7]

While the systems approach is useful for determining how elements are inter-related and where to intervene for change, it does not make problem solving any easier. This can be attributed to the presence of *wicked* and *tame* problems.[8] In a tame problem, the problem is one thing, and the solution is another. For example, the various team members may need to edit a paper before submitting it to a journal. This 'problem' of editing is solved by the purchase of software that allows multiple persons to work on one document. Tame problems have an end and the proposed solution can be tested and determined to be true or false, correct or incorrect. So, if the purchased software enables team members to work collaboratively, the solution is correct and the problem is solved.

Wicked problems do not have 'correct or false' solutions, but rather, they have solutions that are more or less appropriate. Every attempt to solve a wicked problem is a one shot deal because every change changes the wicked problem – you can never go back to the initial situation. The

librarian-designer will not be able to transfer solutions from one wicked problem to another. Each problem is different; each requires its own solution.

Further, the librarian-designer cannot trust that any given solution can stay in place for long without being reexamined. She must be aware of changes to the system as they occur and which may necessitate revisiting the prior solution and reworking it to fit current conditions. For example, institutional budget reductions may have a ripple effect on the team with the result that some technology may not be purchased, there may not be funding for doctoral students or postdocs, or the project may be unable to expand as expected.

Finally, the wicked problem solver is responsible for her actions. As she manages the team's information environment, she cannot hide from the decisions she makes and the effect they have on the team. She must be willing to step back and change or retract choices that don't work as expected.

More than embedded

To work effectively, to really see the system in which she operates, the librarian-designer should be an embedded librarian, one "who physically relocate[s] from a library to serve on teams and work more closely within their patron groups."[9] Embedded librarians are not only associated with the researchers or faculty with which they work, but are integrated into the group "to the extent that the group seeking to integrate [embedded librarians] is experiencing and observing, as nearly as possible, the daily life of the primary group. Embedding requires more direct and purposeful interaction than acting in parallel with another person, group, or activity." [10]

Embedded with the team, the librarian-designer is available throughout the research process. She is readily available for consultation, reducing the chance that team members will leave information search and retrieval for 'later' because they are too occupied with their day-to-day tasks. The embedded librarian comes to know the issues facing the team and is less dependent upon a team member's 'imposed query.'[11] For example, a doctoral student may bring a query from her advisor, and although the doctoral student is knowledgeable, she does not have her advisor's knowledge and may be unable to provide all of the input necessary for the librarian to do the best job. Like the children's game of 'telephone,' queries are subject to change as they go from one person to another to the librarian. Or, the agent (in this case, the doctoral student) presenting the query does not have enough domain knowledge to assist the librarian in refining the search or in determining whether retrieved information is relevant. A librarian embedded with the team member is likely to acquire some domain knowledge and have more understanding of the doctoral student's needs so that when imposed queries do occur, they are not problematic.

Carlson and Kneale[12] suggest that the embedded librarians have the ability to accept risks, build trusted relationships, have an entrepreneurial mindset, and move outside of their comfort zones. Of these, I consider the most important is having an entrepreneurial mindset – the ability to recognize opportunities and to take action on them."[13] In order to see these opportunities, the embedded librarian should attend team meetings and be copied on memos to team members as appropriate. Embedded librarians should have an office in the department. [14] Even if the

librarian isn't there full time, an office indicates that the librarian is an insider and part of the team, not an outsider with only a tenuous connection to the team and its work.

In addition to being embedded within the team, the librarian-designer working in a team science environment should be a boundary spanner,[15] a person with knowledge of multiple domains and who can be a trusted source of information or connection linking the domains. Boundary spanners have contacts in external organizations, have access to or knowledge about resources that is not held by others, and are sufficiently expert in their knowledge that they can share and guide others, enabling them to act more efficiently and effectively, and able to place more attention to their work, and less attention to tasks that are secondary to it.[16] While boundary spanners are able to communicate information from within and outside of the organization, the size and degree of specialization that has developed inside the modern organization has created a need for boundary spanners who are also expert at communicating at the subunit level. The embedded librarian-designer should easily span boundaries between the institution and resource vendors; between departments within the institution, such as between the office of external funding and the research team; and between external organizations and team members, such as between the team and professional organizations.

Understanding Collaborative Information Work

In the team environment, members are likely to engage in collaborative information seeking and retrieval, which involves "creating a solution that is more than merely the sum of each party's contribution."[17] That is, the best result, the most useful retrieved information, is not simply the addition of all retrieved information, but one that builds on that information so that it represents a 'total view' of the collaborators' reactions to and understanding of the retrieved information. Collaborators are often engaged in search and retrieval over long periods of time or for several sessions, as opposed to the typical one-off reference interview. Collaboration may need to be made visible, so that collaborators can see the history of the discussions surrounding search and retrieval. They may need taxonomy of agreed upon terms to counter the tendency of collaborators to speak past each other as they use different terms from their own disciplines. The librarian-designer will have the skills and insight to recognize the differences inherent in collaborative information behavior and to determine which tools or reference techniques will best assist the team in these endeavors.

Although members engage in collaborative work and aim to function as a team, they are still affected by the context and constraints on the individual team members – each of whom is subject to pressures from sources as diverse as his or her discipline, home institution, financing sponsor, and supervisor can help the librarian-designer understand why some suggestions for managing information may fail. For example, a belief by the librarian-designer that all information should be available to everyone ignores the fact that in the United States, competition is an important element of research science – competition for students, funding, publication rights, and prestige – all of which can affect information behavior, even to withholding information from students training for science careers because of institutional and professional forces that reward such behavior.[18] Despite the best of intentions from the library science perspective, suggested information management systems may fail if prospective users

feel they give up too much privacy in order to use the system. A system designed to hold documents deposited by team members may fail because it does not address the need team members have to protect work in progress, obtain publisher clearances, protect future research streams, or consider commercial opportunities.[19] An understanding of the researchers' constraints makes it more likely that the newly designed system actually will be used because it reflects the team's contextual and organizational requirements. Where scientists are hesitant to share too much information about their activity, an expansive expertise list with detailed information about a scientist's research area may be more useful for collaboration than a system requiring the scientist to upload notes on current projects or recent grant applications.

When librarians ignore the pressures of organizational membership on those engaged in information seeking, when they ignore how people interact with each other or technology, they ignore the very real pressures that force people to act in ways that may not seem rational, efficient, or effective, but are the ways the person *must* act within a particular environment.[20] The librarian-designer would do well to become familiar with theories and concepts from organization science such as institutionalism,[21] organizational culture,[22] and power and roles,[23] as they are useful for understanding the pressures that force people in organizations to behave in certain ways and will influence the information behavior of the science team – and the information systems and services best suited for it.

A Suggestion for Design - Knowledge Management

The librarian-designer embedded in a science team should be able to create, purchase, or recommend tools for the team that mitigate the limits to individual knowledge. This includes knowledge management tools that help acquire, maintain, manipulate, and reuse and disseminate the knowledge needed by the team. The tools may be a blend of technical and human elements.

For knowledge management in collaborative teams, one tool I suggest is storytelling.[24] In storytelling,[25] people share stories in person or via video, placing their behavior and work processes in context - 'this is how I did *this task*, in *this organization*.' When done face to face, storytelling provides an opportunity for questions and answers. Because the librarian-designer wants to understand the 'why' of human information behavior, storytelling is a good method of letting people learn the whole story of how problems were solved, not just the solution. Videos with stories about the team's successes and challenges, procedures and information sources allow science teams to share information with newcomers to the team, such as graduate and post-doctoral students who may join the team at any point in its lifespan.

Librarian-designers should have enough knowledge of human information behavior to know which technical tools fit the job and when information sharing and knowledge creation need to be supported by tools and processes that emphasize connections to other humans.

The librarian-designer's added value

The librarian-designer is a problem solver, not only an information provider. She should be able to look at a problem and design a solution, whether that solution is purchasing a technology-

based system for information management, creating an expertise list for the team, or teaching new doctoral students how to use electronic resources. The librarian-designer perspective brings an added value to the team, due to the competencies and skills she commands. The librarian-designer has:

Leadership skills – She does not wait for team members to come to her, rather, she gets out in front of the team's information needs. The librarian-designer also seeks leadership positions in the library and in the professional associations to which she belongs.

Curiosity – A sense of curiosity, a willingness to learn about new fields, new information sources, and new technologies are useful characteristics of the librarian-designer.

Analytical ability – She can provide an analysis of the information retrieved, understanding not only what retrieved material will be useful to the team, but why.

Research ability – The librarian-designer is familiar with theories of human information behavior and has a basic competency in doing research from a library and information science perspective, including designing a research project, choosing a methodology, obtaining and analyzing data, and writing or presenting the findings.

Knowledge of information technology – In addition to knowing when technology should be used, the librarian-designer is aware of current information technologies to store, manage, and retrieve information and can select the appropriate tool for specific purposes.

Control over technology – She knows when technology is a helpful tool to manage information and when it may be a hindrance. The librarian-designer works with IT staff to determine the team's information technology needs, but does not let IT dictate the technologies used.

Presentation skills – She is well-practiced in bibliographic instruction and comfortable making presentations to anyone from team members to her institution's administration, to the outside organizations with which the team interacts.

Conclusion

Constrained by federal funding regulations, the need for expensive resources, and input from various disciplines, scientists are more likely to work in teams than ever before. These teams have members from many disciplines, members who are familiar with different information sources and use different terminologies. Doctoral students, post docs, research scientists, technicians, and perhaps medical doctors all have different levels of knowledge, so that individuals in the same team may require different types of assistance to meet their information

needs. The librarian-designer can add value to the team by offering more than reference, adding knowledge management tools, and thinking of the team and the organization in which it operates as a system. Their primary job is not information retrieval, but helping the team manage the information it creates and uses. The librarian-designer must be willing to work independently, to learn new skills, and to step out as a leader into a new role that promises to be intellectually fulfilling and professionally challenging.

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