medical school. A librarian was asked to present ''Utilizing the Medical Literature to Prepare a Research Protocol,'' another grand rounds session that covered how to do a comprehensive literature search. A librarian trained the HRPO analysts to search PubMed, Science Citation Index, and Embase and established literature searching guidelines that investigators must follow when submitting a new research protocol. Librarians were asked to participate in the evaluation of the HRPO by the Association for the Accreditation of Human Research Protection Programs, the accreditation board for human research protection programs. A librarian also demonstrated to the members of all four IRB panels how to read a consent document from the research subject's perspective. Since the training, librarians have observed that many more IRB members, who are primarily medical school faculty, have paid closer attention to the readability of the consent forms.

CONCLUSION

The work that HS/HSL librarians have done on behalf of clear health communication has been very satisfying. It has increased the library's visibility on campus, facilitated new relationships with faculty and administration, and given reference staff some challenging projects to work on. The authors hope that research subjects have benefited from these efforts as well.

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Innovative information service development: meeting the information needs of an interdisciplinary, cross-sector research complex

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Question: How can a team of health sciences librarians effectively meet the diverse needs of a new research complex?

Setting: A satellite location of an academic health sciences library that spearheads information services for an interdisciplinary, cross-sector research complex provides a case study.

Methods: The health sciences library established a library space at a new research complex that combines the services and expertise of a bioinformationist, translational research librarian, and public/private partnership librarian. The focus is on integrated information services, and the librarians serve as a boundary-spanning unit within the research complex.

Results: The colocation of the library with research cores and other units at the research complex has led to the creation of new partnerships and deepened existing ones.

Conclusion: Meeting the information needs of a diverse population requires a multifaceted approach to providing information services, and librarians must proactively seek out opportunities to establish meaningful collaborations.

INTRODUCTION

The Taubman Health Sciences Library (THL), a division of the University Library (MLibrary) at the University of Michigan (UM), has adapted quickly to changing information needs in the ever-evolving information landscape of the health sciences. The university demonstrated its commitment to bridging academic research and entrepreneurial opportunity through its 2009 acquisition and subsequent development of the North Campus Research Complex (NCRC). To enhance the synergistic relationship between the university, library system, and diverse population at the NCRC, THL established MLibrary@ NCRC, an innovative library focused on access to information and integrated services. This article describes how MLibrary@NCRC integrated multiple

librarians' roles and established a service paradigm to meet the information needs of an interdisciplinary, cross-sector research complex.

BACKGROUND

In 2009, UM acquired a 28-building research complex and developed it to focus on interdisciplinary research and entrepreneurial activity. The vision for the NCRC is to ''expand the University's capabilities as one of the nation's top translational research institutions and be a driver in the resurgence of the Michigan economy'' and to be ''a world of fast-paced scientific discovery that ignites improvements to humanity's health and well-being'' [1]. NCRC is home to 7 major research programs, including translational oncology, computational medicine and bioinformatics, and the Institute for Health Care Policy and Innovation. Also colocated in the research complex are 2 private companies (Lycera and Boropharm) and the Venture Accelerator, a business incubator for start-ups based on UM technology. Finally, the NCRC houses units supporting public/private partnerships (Business Development and Business Engagement Center), Veterans Administration researchers, and personnel from 10 UM schools and additional units [2]. As of May 2013, 2,135 people work at the NCRC.

Information in the literature about academic library services for interdisciplinary and cross-sector research complexes is limited. While academic library services do exist for businesses at campus-related research parks, including the collaboration between the University of Toronto and the MaRS discovery district [3], the authors did not find evidence in the literature documenting cases where health sciences libraries developed targeted services for all residents of a research complex. Services and resources described on websites, such as those offered by the University of Wisconsin and the University of Illinois, vary according to user affiliation with the sponsoring institution [4, 5].

PILOT STUDY

A pilot information needs study was conducted in 2011 to better understand the information needs of NCRC residents. Librarians attempted to contact a representative sample from units housed at the NCRC at the end of 2011, a population of approximately 700 people at that time, and used semi-structured interviews to explore information use behavior and needs (Appendix, online only). Interview coding was done individually by 2 librarians, who compared, discussed, and agreed on overall themes and identified comments supporting each theme. For each coded theme, librarians identified at least 3 unique comments by different respondents that exemplified the subject at large.

Librarians conducted nine interviews. The respondents were staff and faculty from a variety of research and administrative units, including the Comprehensive Cancer Center, the Medical School's Office of Research, and the Business Engagement Center. Five primary themes emerged from the interview coding: (1) lack of awareness of existing THL services and resources, (2) patron preference for interacting with a person, (3) barriers to sharing information, (4) general challenges related to the complex university environment, and (5) interest in and need for THL-provided workshops or training sessions (Table 1). While the pilot study was limited in scope given the relatively small population housed at the NCRC, the core themes emphasized the importance of sharing information across units and disciplines, and helped to create the foundation of providing information service and to establish the philosophy of sharing information across NCRC units to span disciplinary boundaries.

THL and NCRC administrators agreed that a library presence would be both a valuable addition to the campus and a necessary base from which to collaborate with the population, provide access to resources and customized information services, and address the themes that emerged from the pilot study. Because of the interdisciplinary nature of the research being conducted at the campus, it was decided that customized services that could be tailored to specific information needs and a small-footprint library that could be moved to different locations as the campus grew were the best solutions to providing information services. While a larger-footprint library at the NCRC was a potential option, THL and NCRC administrators thought that launching services from a small space would allow the library to evolve as needed.

MLIBRARY@NCRC: SERVICES AND ROLES

Mlibrary@NCRC opened in July 2012. Its goal is to embed tailored information resources and services into the NCRC to support its collaborative mission. Services are available to all individuals and groups housed at the NCRC, including research cores and clusters, companies, and other units. Occupying approximately 500 square feet in a central location, the library houses 3 computers with a standard university software load and access to MLibrary's electronic resources (in accordance with license agreements), offers printing and scanning services, and contains a conference table to facilitate consultations, training, or group work. The physical space is designed to reflect a focus on resources, services, and collaboration and to emphasize the librarians' role in partnering with users to identify, use, manage, and organize all types of information. Colocation with NCRC researchers allows serendipitous meetings that lead to projects, responsive in-person communications compared to email, immediate in-depth discussions, and a deeper understanding of information needs.

MLibrary@NCRC librarians recognize that domain knowledge and specialized information organization and retrieval skills are not enough to satisfy the needs of this diverse population. To fully meet this research complex's information needs, the librarians serve as a boundary-spanning unit within the research complex. Long, Cunningham, and Braithwaite define a boundary-spanning unit as ''one that ''facilitate[s]

Table 1
Themes of information needs determined from interviews of North Campus Research Complex (NCRC) residents with sample evidence

Theme	Evidence from interviewees
Lack of awareness of Taubman Health Sciences Library (THL) services and resources	• Interviewee does not think to use THL. Says his/her department underutilizes the library. • Interviewee has been at the university for 10 years, but never uses the library much because he/she assumed it was for faculty, researchers, etc. • Interviewee was not familiar with interlibrary loan.
Patron preference for interacting with a person	• Interviewee likes knowing that he/she can talk to a human and have an issue resolved. Therefore, he/she usually starts by calling a phone number (prefers phone over email). • Interviewee wants a point of contact to call for specific information.
Barriers to sharing information	• Groups do not know what other groups have or want. • Have not found a solution that is easy for everyone—something always gets in the way. You can make something available but then to make it reciprocal is beyond others' skill set. • Barriers to sharing information with tools are that everyone has to have access, everyone has to use it, and everyone has to keep it up-to-date. Everyone does not do this. The time for upkeep is a barrier.
General challenges related to the complex university environment	• Knowing what is available, where to go to see what is available are the biggest problems. • Mapping resources at the university—this is a big challenge
Interest in and need for THL-provided workshops or training sessions	• Interested in any classes that the library gives on how to use resources. • Interviewee interested in ways to use resources more effectively to filter out less relevant stuff. • When asked if he/she would be interested in Google training, the interviewee said yes.

For an individual theme, each statement came from a different interviewee.

transactions and the flow of information between people or groups separated or hindered by some gap or barrier'' [6]. Both the pilot study and anecdotal evidence indicate that a large and complex university system can create barriers to finding and sharing needed information and resources. Effective boundary spanning requires the ability to ''create partnerships; form relationships with individuals and organizations; have a broad perspective of the institution'' [7]. MLibrary@NCRC librarians leverage information expertise to form relationships and make connections across the NCRC, the library system, and the university.

Mlibrary@NCRC is staffed by three librarians—a bioinformationist, an NCRC and public/private partnership librarian, and a translational research liaison—all under the oversight of the THL research and informatics coordinator. While subject-specific graduate degrees are not necessary for these roles, domain knowledge and background have been useful, especially for the bioinformationist. Each of the librarians staff MLibrary@NCRC at least 1 day per week. The permanent librarian effort to physically staff the MLibrary@NCRC is a 0.7 full-time equivalent (FTE); the remaining time is staffed by students. Librarians maintain liaison relationships with NCRC-based researchers and administrators, and often meet with them outside of their scheduled NCRC shifts.

MLibrary@NCRC librarians pursue outreach opportunities to raise the visibility of information resources and services and to embed them directly into users' environments. These efforts include committee work, on-site departmental office hours, and leverage of NCRC-specific opportunities, including the community newsletter and complex-wide collaborative lunches. Librarians also partner with the director of ''Collaborate!'' initiatives at the NCRC on a variety of projects, including development of an annual team science workshop.

KEY LIBRARIAN ROLES AT MLIBRARY@NCRC

This section outlines key librarian roles at MLibrary@ NCRC and discusses how each role contributes to the library's approach to customized provision of information services.

Bioinformationist

The bioinformationist is a crucial component of MLibrary@NCRC services. While THL's bioinformationist supports all bioinformatics research on campus, she works most closely with the Department of Computational Medicine and Bioinformatics (DCM&B) and the Bioinformatics Core, both located at the NCRC. The bioinformationist is truly embedded within both units, which each pay a portion of her salary, and conducts weekly office hours in the Bioinformatics Core. The bioinformationist's role is varied and often nontraditional, with a heavy emphasis on training, outreach, and programming.

Outreach is particularly important to the Bioinformatics Core, a centralized fee-for-service unit that provides bioinformatics support and data analysis for researchers. The Bioinformatics Core must be highly

visible to continually attract new clients. The bioinformationist represents the Bioinformatics Core at monthly ''NCRC Collaborate Lunches,'' where she promotes the Bioinformatics Core and answers questions about its resources and services. The bioinformationist also coordinates programming for a weekly ''Tools and Technology'' seminar series, hosted by the DCM&B. She identifies and schedules speakers and promotes the series via emails, newsletter articles, and websites. Additionally, she attends DCM&B's weekly Bioinformatics and Proteomics Journal Club, a for-credit course featuring student presentations and discussion of relevant scholarly articles. Each semester, she participates in and presents on library services and citation databases, including PubMed or Web of Science.

Training is another key role for the bioinformationist. She partners with researchers to plan, coordinate, and deliver training on pertinent topics and resources to support Bioinformatics Core services and conducts training sessions on a variety of bioinformatics tools, including web-based sessions for remote users.

Finally, the bioinformationist provides information services that are often out of scope for health sciences librarians, including web content management support for nonlibrary units. When the DCM&B became an official UM Medical School department in January 2012, the bioinformationist played a crucial role in developing content and preparing the website for the department's launch. Her role in website development led to a project to update and improve the website of a data-analysis and data-sharing knowledge management platform, tranSMART. Colocation has been essential for the bioinformationist from the inception of the website project because her major collaborators, the project manager and programmers, are based at the NCRC.

North Campus Research Complex (NCRC) and public/private partnership librarian

The position of the NCRC and public/private partnership librarian was created in 2010 to foster relationships with units housed at the NCRC prior to the establishment of MLibrary@NCRC's physical footprint. The early development of the role allowed the librarian to establish the groundwork for future collaborations. Activities included developing an understanding of the research complex's information needs, establishing connections with NCRC residents, and linking researchers with MLibrary subject specialists or relevant campus units.

As more research groups have moved to the NCRC, this role has changed. The NCRC librarian now serves as a liaison to NCRC units with information needs at the intersection of health, engineering, and business, or with a key social science component, such as the Center for Bioethics and Social Sciences in Medicine and the Institute for Healthcare Policy and Innovation. Additionally, the librarian works with groups involved in creating and managing public/private

partnerships such as the Business Engagement Center and Business Development. She also serves as a liaison to Technology Transfer, external companies housed at the NCRC, the Venture Accelerator, and NCRC administration.

Working with this broad variety of units requires expertise in information resources and search skills that span the clinical and social sciences, as well as experience tailoring services for external partners. The NCRC librarian provides a variety of consultations and assists with expert searching on questions varying from company and market information to bioethics and medical decision making.* Because of the interdisciplinary nature of these information needs, the NCRC librarian implements techniques to facilitate research and serve as a connector between people and resources, including (1) explanations of how controlled vocabularies differ among databases, (2) orientations and trainings on a broad array of databases across disciplines, (3) referrals to foundational resources to give users a basic understanding of concepts in other disciplines, and (4) instruction on faculty expertise and grant-seeking tools such as SciVal Experts, COS Pivot, and Foundation Directory Online to help users connect with researchers and funding beyond their own discipline.

The NCRC librarian has successfully established many partnerships. She holds office hours in the Business Development unit, which allows a greater understanding of their unique needs and creates opportunities to increase partnerships. She also works with the Technology Transfer unit—including training TechStart interns on business, health, and engineering information resources—and she has created and maintains an online resource guide used by Technology Transfer staff.

Facilitating collaboration is one of the NCRC librarian's most important functions. She coordinates ''Tips and Tools'' workshops, which emphasize information resources and skills to help researchers establish cross-disciplinary partnerships. Workshop topics include interdisciplinary search techniques, network visualization tools, citation management resources, and use of faculty expertise resources such as SciVal Experts. Finally, the NCRC librarian works with NCRC communications to market MLibrary@NCRC services and resources, including writing promotional pieces for the NCRC community newsletter, and hosting tables at NCRC events, thereby increasing the library's visibility.

Translational research liaison

In 2008, THL designated a librarian as liaison to the Michigan Institute for Clinical and Health Research

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* Librarians at MLibrary@NCRC do not conduct searches for private companies but do provide consultations related to information discovery, use, and management. Any individual may access the Michigan University Library facilities and collections on site as licenses permit, and document delivery services are available through Michigan Information Transfer Source (MITS) <http://www.lib.umich.edu/mits/>.

(MICHR), which administers UM's Clinical and Translational Science Award (CTSA). The position was established to support MICHR and UM research administrators, as well as researchers and students funded through MICHR pilot grants. With the increased emphasis on translating knowledge in many domains, including basic and clinical sciences as well as public health and health policy research, the scope of this role has grown. Development of this position provided a model for nontraditional, flexible, and agile provision of information services. This model has been integral to establishing library services at the NCRC.

The translational research liaison's primary role is to partner with and support researchers, staff, and administrators engaged in preclinical, clinical, and translational research. Colocation at the NCRC has helped the translational research liaison establish and develop relationships with laboratories, clinical research groups, and policy scholars based at the research complex. While much of her work features in-depth consultations on citation databases and project management resources, she is also integrated with research laboratories, providing services varying from website design and maintenance to publication support. Data management is a pressing issue for many researchers, and requests for information regarding federal data-management requirements or local resources for data storage and curation are becoming more common. To address these needs, both the translational research liaison and the bioinformationist participated in a library-wide project to interview researchers and administrators regarding their needs and UM's data-management environment. As these integrated relationships grow and develop, they generate new opportunities for collaboration or provision of information management services. This ever-changing environment requires a variety of skills and the ability to adapt these skills to provide timely and responsive services.

In addition to working with basic science laboratories, the translational research liaison collaborates with clinical researchers on systematic reviews and meta-analyses and provides training on information and data-management tools, including Access or citation management products. Training includes consultations and lab-specific workshops: she is involved in the postgraduate curricula of several basic science and clinical departments, the Robert Wood Johnson Clinical Scholars Program, and the postgraduate translational scholars program and clinical research summer program with MICHR's translational research training programs.

Finally, the translational research liaison participates in a number of university-wide committees whose charges relate to supporting and advancing UM's research enterprise. She is a voting member of the UM Committee for the Use and Care of Animals. She also serves on the UM Research Policies Committee, which is charged with advising the vice president for research on all matters pertaining to research and research personnel. These committee

Table 2
Collected metrics, July 2012–June 2013

Indicator	Number
Total questions received	237
NCRC LibGuide (page views)	1,247*
Venture Accelerator LibGuide (page views)	58*
Technology Transfer LibGuide (page views)	948*

* Page view equals 1 click (e.g., download) of a page and is not necessarily a unique view.

appointments enable the liaison to learn more about issues in various research domains, identify potential opportunities, and promote MLibrary services and resources as appropriate.

ASSESSMENT

To ensure that they are providing services and resources that NCRC-based researchers need and creating novel services that meet unmet needs and to evaluate the impact of established services, MLibrary@NCRC librarians have designed and implemented a robust assessment plan. At the time of writing, MLibrary@NCRC is still in its infancy; however, usage has increased and the variety of projects with which librarians have been involved demonstrate the need for customized services. Examples include working with Institute for Health Care Policy and Innovation leaders on utilizing SciVal Experts information and other strategies to understand the impact of individuals' research, participation in the planning of a yearly event to foster collaboration at the NCRC, and creation of information feeds to track scientific discovery.

Additionally, librarians developed a series of metrics to determine the value of MLibrary@NCRC. As is the case in both health sciences libraries and academic libraries overall, determining robust metrics for library impact and library value is challenging. Established metrics include the number and type of interactions at MLibrary@NCRC and usage of LibGuides (online resource guides) created for NCRC residents, the Venture Accelerator, and Technology Transfer (Table 2). To help track the impact of MLibrary@NCRC on the use of electronic collections, computer web browsers at the library are set to the NCRC LibGuide. The distribution of request types for 237 requests was: 35% reference , 25% directional, 25% research, 7% technical support, 6% referral to other service, and 2% circulation. The distribution by format for these requests was 76% walk in (in person), 10% consultations off desk, 12% personal email, and 2% by phone. Finally, NCRC librarians are developing metrics such as costs avoided by providing access to information resources, time saved by researchers by working with librarians, and number of collaborations between librarians and NCRC units.

Future assessment plans include implementation of an annual survey to measure library value over time. The first annual survey, distributed in August 2013, gauges awareness of and satisfaction with library

services, and identifies unmet needs and interests. Librarians will also implement an ''exit interview'' with clients after large projects to measure service quality and make improvements, and they will utilize Google Analytics on LibGuides to create more meaningful online resource usage statistics.

FUTURE PLANS

Mlibrary@NCRC has been well received, but librarians have long-term goals to increase its utilization and guarantee the continuous provision of responsive, tailored services and information resources to support the NCRC's mission. The NCRC librarians will (1) proactively continue outreach to new residents and identify ways to remain relevant to existing constituents; (2) increase subject expertise by identifying opportunities, including continuing education, to keep abreast of subjects relevant to the NCRC population, such as data management, collaborative information tools, and the role quality information plays in team science; and (3) continue assessment and evaluation by identifying further metrics that indicate positive impact on researchers' and other residents' goals and increase awareness of constituent information needs. Finally, raising awareness and marketing library services is an ongoing challenge.

CONCLUSION

Meeting the information needs of a diverse population required NCRC librarians to ''pursue customized, innovative, and previously unimagined library and information models in collaboration with researchers and other NCRC colleagues'' [8]. MLibrary@NCRC librarians will continue to focus on embedding information resources and services at researchers' points of need. This positions MLibrary@NCRC to assume a role as both an information resource and a service core for the research complex, and to strengthen the relationships between the academic, industry, and nonprofit sectors to improve the efficiency and quality of research.

The strategies utilized by librarians at the NCRC can be implemented by other libraries. As with any new venture, proactive outreach to identify and understand user's needs and openness to opportunities that may seem outside the realm of traditional library work can facilitate the development of relationships with a previously underserved patron base. As other libraries consider implementing similar services at university research complexes, gaining an understanding of institutional context and the mission

of the complex is of paramount importance. A thorough understanding of that context is essential to establish responsive, relevant services and to develop the visibility of librarians as trusted partners and collaborators.

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