Unifying Space and Service for Makers, Entrepreneurs, and Digital Scholars

Jennifer Nichols, Marijel (Maggie) Melo, and Jason Dewland

abstract: This article explores the evolution and role of makerspaces in academic libraries, with a particular focus on how libraries are using innovation spaces in support of entrepreneurship and digital humanities on campus. At the University of Arizona Libraries in Tucson, a unique new coworking and makerspace called the iSpace has developed. While many libraries have long supported digital humanities and digital scholarship, the emergence of makerspaces has led to new approaches to learning and knowledge creation within the library and campus ecosystem. Cross-disciplinary collaborations and the cultivation of a community of learners are two among many benefits to this approach and service. As academic libraries aim to meet multiple demands on space, budgets, and changing learning environments, many of them will consider establishing their own makerspaces. Looking at makerspaces through this lens of wide support for both entrepreneurs and digital scholars will provide unique perspectives for wider conversations.

Introduction

Do makerspaces, digital humanities centers, and coworking spaces have anything in common? Makerspaces in libraries are areas where people can create, build, and invent with technology. The spaces often have 3-D printers, computers, carpentry tools, craft supplies, and other equipment. Digital humanities centers support scholarship presented in digital form or enabled by digital methods as well as scholarship about digital technology and culture. Coworking is a style of work that involves independent activity in a shared working environment. What does it mean to bring these things together in an academic library setting? In the following article we examine a pilot facility, the iSpace, at the University of Arizona in Tucson. In the iSpace, the university has explored the marriage of these concepts, creating space and programming
in support of entrepreneurship, emerging technology, and digital humanities for the campus at large. We will examine what has been accomplished in these partnerships, as well as what we aim to achieve in the next iteration of the iSpace, in light of the critical mission of today’s academic libraries—to serve the research and teaching needs of our students and faculty. We seek not only to reiterate the value of academic libraries supporting entrepreneurship and digital humanities but also to exemplify a possible union of services not often linked to one another.

Literature Review

As academic research methodologies continue to align with the advancement of cutting-edge technologies, so too university library spaces continue to change. Libraries are traditionally revered as places with countless books and articles to further scholarly research; however, research is no longer restricted to books and periodicals, and instead extends into innovative technologies such as 3-D modeling and printing and virtual reality. University libraries are experiencing a shift from providing resources for the passive consumption of knowledge (for example, books and periodicals) to the cultivation of active knowledge creation across various media, both analog and digital. The usage of diverse technologies in the academy continues to reshape the role of the university library. Driving the evolution of the library space is the maker movement.

Maker culture, a term coined in 2005 by Dale Dougherty, a pioneer in the movement, continues to gain international popularity within communities and on university campuses alike. The maker movement has permeated the academy’s classroom spaces, challenging libraries to provide innovative resources because libraries are often regarded as spaces for knowledge creation (in its many forms) and learning. The number of makerspaces on university campuses is continuously growing—there are currently more than 70 makerspaces across the United States. Libraries serve as both a central and neutral hub for universities—thus providing an ideal location to allow students across disciplines to interact with front-running technologies, such as 3-D printers, drones, microcontrollers, and credit-card sized computers such as the Raspberry Pi. Access to these costly technologies allows students to reengage their research inquiries differently and, many times, across disciplines. Conversations surrounding the maker movement highlight the movement’s focus on tinkering, posing projects, hands-on learning, and the holistic engagement of the body in learning.
While maker culture extends well beyond the maker movement proper, the branch of maker culture that promotes learning by doing aligns well with the academy, and most notably within science, technology, engineering, and mathematics majors. These academic fields often highlight experimentation and hands-on learning. Maker culture also extends into other disciplines where hands-on pedagogies are less prevalent (for example, the humanities), allowing students to pursue their research in innovative and unconventional ways. The prominence of makerspaces has led to an increase in research being done on makerspaces and the role libraries play in facilitating such spaces. A number of resources help librarians to navigate this new terrain. For example, many libraries and community makerspaces develop supportive partnerships with one another. Conversations about the change in libraries continue to focus on meeting the technological needs of the student and faculty populations they serve.

In particular, considerable attention has centered on two specific domains that the makerspace supports, digital humanities and entrepreneurship. The makerspace becomes a formidable resource for digital-born projects often associated and stemming from digital humanities fields. With the need for skills in coding, motion capture, and 3-D modeling, digital humanist scholars can push beyond the conventional inquiries arising in research by engaging technologies to entertain other questions. Librarians are also challenged to acquire new levels of expertise to guide student research through learning new technologies and programs often found in the digital humanities. Makerspaces also cater to nonacademic organizations and endeavors. With access to rapid prototyping tools and equipment and with a transdisciplinary makerspace that welcomes a host of participants with various backgrounds and expertise, the makerspace becomes a hotbed for start-ups and early venture projects. In particular, this article will describe the way the iSpace, a makerspace at the University of Arizona (UA), seeks to support these two domains, and how these domains also support the iSpace reciprocally.

The integration of makerspaces into the university is just beginning—many questions have arisen from early adopters of makerspaces. Questions regarding diversity in terms of race, class, and gender; metrics to determine success; funding; and space politics are just a handful of challenges that face maker culture in the library. This article, while not accounting for a full response or resolution for any of these challenges, will engage these issues as they pertain to the iSpace on a local level.

**Case Study: The iSpace**

The UA Libraries have been responsive to trends in academic librarianship over the years, unveiling an Information Commons in 2002 and a collaborative classroom in 2014. At a large research institution such as UA, departments and colleges have their own facilities that support the learning and research of their students and faculty. Architecture, art, and engineering all support labs with much of the machinery, software, and expertise one might find in a makerspace. As the library for the UA campus, we occupy a neutral and central space. The UA Libraries have the unique opportunity to provide access to space and service that other units, even those charged with serving all of campus, do not. Libraries subscribe to the central tenet of equal access. Like the academic libraries with makerspaces featured in Samantha Rich’s master’s thesis, we
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 strive to “democratize access.” Firstly, libraries provide a neutral space for researchers of all different stripes to use and tinker with the equipment freely. This is especially important for disciplines with limited resources, including external funding, because it allows for students and researchers to engage in technologies that would otherwise be cost prohibitive, both at the onset and in continued maintenance. Additionally, by sharing a space across disciplines, scholars find dynamic relationships that support multiple points of inquiry, expertise across design, programming, a marriage of science and arts, and a nexus of innovative and scholarly production. The UA campus is benefiting from the expertise of communities of people who can help think through ideas and prototypes in a transdisciplinary setting.

The UA Libraries employ a liaison librarian model, and librarians are assigned to work with departments and colleges to facilitate closer ties with the library in support of both teaching and research. Both InnovateUA, a student-led entrepreneurship organization, and the digital humanities faculty asked for the library’s support in the form of dedicated space to support entrepreneurial efforts among students, and digital humanities or maker activities among both students and faculty. The business liaison librarian worked closely with a number of student start-ups, including one that used the library’s Information Commons as its first office. Citing 24-hour access to the library, including wireless Internet, private study rooms, whiteboards, and large monitors, these young entrepreneurs preferred working at the library. While the Information Commons provided space and furniture, it lacked access to mentors and entrepreneurial support. Together with InnovateUA, the start-up imagined a proposal for a coworking space, providing a secure location within the library. Coworking, popularized over the last decade, is a phenomenon of sharing workspace rather than working in a traditional office. Several other academic libraries have explored the provision of coworking spaces, including California State University San Bernadino. In the spirit of other academic libraries offering such services, UA Libraries perceived this as a way to advance entrepreneurial education for all students, not just those within the business college.

The digital humanities characteristically depart from traditional humanities research and methods by putting a profound emphasis on more “hacking than yacking.” The methods in the digital humanities can often be tech-driven, integrating technologies such as virtual reality equipment (for example, Oculus Rift or Google Cardboard), fabrication machinery (for example, 3-D printers and laser cutters), and the use of small computers and microcontrollers (for example, Raspberry Pi). With these devices, humanists are able to reenvision responses to the guiding question: “What does it mean to be human?” This alternative path of scholarship, consequently, can also come with a price tag. Scholars are
burdened with the need to secure funding to purchase and use such costly technologies. Institutional makerspaces, such as the iSpace, offer critical support in terms of access and support for tech-driven research projects.

Library makerspaces provide an unprecedented centralized working space for digital humanists. Before makerspaces, digital humanist researchers would either procure funding to buy technologies, use their own personal devices, partner with scholars with the technology or funding to perform the research, or reach out to other departments to solicit support or permission to use their equipment. Each option is riddled with complications that can slow the research process, while also straining relationships with other departments in terms of resource and fund sharing. The library makerspace fulfills the need in the research community. No longer are technologies restricted to science, technology, engineering, and math fields but are also engaged in humanities, social sciences, and fine arts.

As the associate dean of research and program innovation for the College of Humanities networked with others in the library, the idea of collaborating to create a makerspace to support digital humanities work, in concert with the innovation and entrepreneurship efforts on campus, became compelling. With the emphasis on sharing space and cross-pollinating populations of students and faculty, the right combination of resources initiated a space in the library.

As mentioned earlier, the UA Libraries have evolved several learning spaces to support diverse user groups and collaborative learning. In creating the iSpace, the library had the opportunity to test new trends in libraries and to pilot services that will shape future iterations of the library as a whole. In 2014, the iSpace was created in the Science and Engineering Library. Approximately 600 square feet, the two-room iSpace offers visitors one room with whiteboard paint on three walls, a nine-panel data visualization wall operated by a powerful desktop computer for processing 3-D modeling and virtual reality software, a Dremel 3-D printer, an Oculus Rift virtual reality headset, Leap Motion controllers, Google Cardboard virtual reality platforms, motion capture software and hardware, and microprocessors, including Raspberry Pi.

Partnerships

InnovateUA describes itself as “a student-led innovation and entrepreneurship hub, connecting students to resources and providing opportunities to make their ideas a reality.” InnovateUA was founded by a team consisting of the student who created NoteBowl, a fully integrated learning management system; the chief executive of Startup Tucson, a nonprofit group that helps entrepreneurs; and a group of undergraduate students involved in the start-up community. InnovateUA resides in the Office of Student Engagement, under the senior vice provost for academic initiatives and student success, which has the role of providing applied knowledge experience for 100 percent of the student body prior to graduating. Under this directive, InnovateUA develops programming and allows students to innovate and commercialize their ideas.
Table 1.
Events sponsored by InnovateUA at the University of Arizona Libraries 2015–2016

Pitchfest, October–November
More than 200 students “pitched” their ideas, presenting them for consideration. Pitch booths set up in the Main Library and iSpace.

Hack Arizona, January
Approximately 700 students participated in developing improved software and hardware. Entire Science and Engineering Library closed for the event. Logistics support provided by the library.

Startup Weekend, February
Seventy-five student participants submitted their start-up ideas, which were evaluated on the basis of their prototype and business plan. Held in the Science and Engineering Library, with mentoring, logistics, and judging provided by the library.

TEDx, March
More than 300 participants attended live streaming talks on various scientific, academic, and cultural topics. Space and logistics provided by the Main Library.

Perkins Coie Innovative Minds Challenge, April
Accelerator for student start-ups. Twenty teams of students competed for cash prizes to commercialize their ideas. Space and research support provided by the Main Library.

Innovation Chapter, weekly during the semester
An average of 20 participants per week gather in the iSpace to discuss their ideas.

Web development classes, weekly
An average of 5 to 12 students per week study how to design and develop websites, in the iSpace.

InnovateUA has built a program to turn students’ nascent ideas into reality through the start-up process. With the creation of the iSpace, InnovateUA gained a facility in which to work with student groups, highlight the ideas and start-up companies emerging from campus, and support networking on a daily basis. The library provides assistance to this student-led initiative at many different points. These include access to library space, orientation to relevant services, research assistance, advertising, and guidance navigating the university’s rules and regulations.
InnovateUA uses the iSpace for weekly meetings and offers regular workshops to the community. In the spring semester of 2016, InnovateUA officers began facilitating weekly drop-in classes on the programming languages Python and JavaScript; HTML (hypertext markup language), the standardized system for tagging text files to create Web pages; and CSS (cascading style sheets), used to define text styles and other aspects of Web pages. These sessions attracted a variety of students, including those with few or no programming skills, as well as those with expertise seeking to join a community. Since the iSpace is founded on the principle of resource sharing with partners, the workshops helped to create the sense of a community. The library benefits from such programming because it diversifies the types of services offered, while also attracting new users to library resources. Ultimately, the students leading the workshops gain valuable experience, and new users across multiple disciplines are introduced to the iSpace.

InnovateUA’s major initiatives often attract a significant audience. Because of the limited footprint of the iSpace, the library has committed to supporting and hosting programming and events in other appropriate library spaces. Beyond space allocation, librarians provide expertise with business research. Business research for nonbusiness students has been a prominent offering by librarians at several InnovateUA events. Student participants are experts in their areas of research but often lack a basic understanding of researching for business as well as awareness of the suite of business research tools available through the library.

InnovateUA has also benefited from the library’s collaboration with the College of Humanities. As a result of sharing space, InnovateUA has attracted numerous participants who originally came in support of digital humanities projects. These students have added to the diversity of InnovateUA and helped move it beyond a strict focus on computer science.

The iSpace has served not only as an office to InnovateUA but also as a recruiting base. The library has supported student innovation through hosting events and assisted student entrepreneurs by providing business research instruction and a place to consult with business experts.

**College of the Humanities/Digital Humanities Partnership**

The popularization of maker culture, and thus the proliferation of makerspaces, has served diverse transdisciplinary projects—most notably digital humanities projects. The digital humanities, a major component of the humanities at large, have steadily gained global traction since the early 2000s. The definition of digital humanities can and is being debated regularly. For the purposes of this article, digital humanities is broadly defined as research performed at the intersection of technology and humanist inquiry. This article will not pursue the debates within the digital humanities field regarding its definitions and the politics thereof. Instead, this article conceptualizes
the field in its broadest sense to frame the way the iSpace plays a supportive role in the research trajectories of scholars across disciplines. Digital humanities in this case will allude to the integration of technologies to engage questions regarding the human condition, questions that can arise from various humanist traditions such as philosophy, history, and English, for example. This broad interpretation of the digital humanities is not restricted to research performed in the humanities proper. The formalization and organization of digital humanities groups varies. Some institutions, such as California State University of Northridge’s Center for Digital Humanities, have formalized digital humanities centers, while other institutions, such as the University of Arizona, support digital humanists in various spaces such as the iSpace.

Several digital humanities projects have leveraged the support of the iSpace since its early inception. One project team in particular was the Focused Associational Thinking Virtual Reality (FAT-VR) group. The FAT-VR project sought to develop creative, associational fluencies in people engaging within their virtual environment. From the ideation process to the actual testing of the environment, the FAT-VR team convened in the iSpace for over a year to harness the multiple resources the space offered.

While the iSpace provides multifaceted assistance to digital humanities projects, such as the FAT-VR project, support can also emerge from the project side. The reciprocity is seen on various levels. For example, the FAT-VR project has been featured in several campus periodicals throughout the university, and while the main focus is on the project itself, the iSpace inadvertently receives the benefit of publicity—making for a stronger argument showing the “need” for the makerspace. Moreover, reciprocity manifests from the project side, in that it stimulates further training and skill acquisitions for library liaisons. Getting a feel for the various skills, tools, and software needed in each project allows liaison librarians to keep abreast of the way that scholars create new knowledge. This enables liaisons to find additional ways to support their respective colleges.

As host to multiple projects, including clubs and occasional class visits, the iSpace struggled to create balance between scheduled and open space. While the premise of a coworking or makerspace is to provide ample open work time and space, the iSpace initially did not have regular staff to manage user expectations. If someone was meeting in the space, others who entered might feel uncomfortable and might ultimately be displaced. With the addition of multiple student workers and graduate assistants this year, the iSpace is attempting to address these challenges. The next stage of the pilot will prototype staffed open hours Monday through Friday, 10 a.m. to 4 p.m., with regular programming multiple evenings a week and overflow space for special programs.

Supporting Digital Humanities in Africana Studies

As a pilot space, the iSpace aims to engage faculty and students with space and services that best support their work. In the summer of 2015, Bryan Carter, associate professor of Africana studies, joined librarians to discuss his research and teaching in digital humanities. As a leading digital humanist, his engagement in the iSpace exemplified our ambitions for faculty collaborations within the pilot space. His current work with virtual reality and motion capture pushed the boundaries of what the library had considered within the scope of the iSpace.
The partnership with Carter was immediately reciprocal. Student staff at the iSpace learned about inexpensive models for motion capture and assisted in troubleshooting grant-funded ideas he and his colleagues had for enhancing a virtual environment he had created, Virtual Harlem. Virtual Harlem brings to life Harlem, New York, in the 1920s and 1930s, during the Harlem Renaissance, when African American art and culture flourished. In return, Carter’s virtual reality and motion capture equipment was housed in the iSpace to maximize access to the tools. With the acquisition of Oculus Rift, Microsoft Kinects motion-sensing input devices, and Leap Motion controllers, the iSpace not only contributed to the projects of his students but also provided access to others throughout the university to learn about virtual reality and explore applications for future projects in other disciplines.

Initially the arrangement to share equipment was informal. As more constituents learned about not only the possibilities of working with virtual reality but also the availability of such equipment through the library, the need for more formalized arrangements arose. Currently, the library is adding Carter’s equipment to the catalog with barcodes, and it requires faculty and students who use the equipment without iSpace staff assistance to be trained on proper usage before they are granted access. Student workers and staff of the iSpace are developing formalized training sessions to be implemented by the end of fall 2016. Only a few select patrons can check out the equipment, including Carter and his students. The library will monitor usage within the iSpace and purchase equipment with library funds as demand increases.

Collaborating with faculty on grant writing as they approach digital projects has contributed to the iSpace adding new technology. One grant proposal with English faculty will yield software and hardware purchases that will initially be used by a Shakespeare class, but the equipment will remain in the iSpace where students and faculty will have access to both expertise and technology. Additionally, Carter’s recent (internal) grant proposals request duplicate devices, with the intention of reserving one for his classroom use and supplying one for the iSpace. This supports the College of Humanities partnership in the iSpace and is another avenue for adding emerging technology to the library and iSpace inventory.

As Carter has hired students to work in development of Virtual Harlem and as preceptors assisting students in his class on their digital media projects, this project partnership leveraged the coworking aspect of the iSpace as well. The nature of a coworking space allows for different types of work to happen without that work being centrally managed by the library. Therefore, these students are not library employees, but they work or study under faculty direction. Everyone benefits from this model. Some of Carter’s students with virtual reality expertise do their work in the space, and those who use the space for other activities can see the work in progress, ask questions, and get assistance. One student of Carter’s has become significantly involved in the InnovateUA activities due to his many hours working at the iSpace. This type of cross-pollination is something that all partners consider a key success.
Conclusion

As libraries continue to evolve with ever-changing technological opportunities, it will be imperative that librarians seek partnerships to maximize learning potential across campus. Academic libraries have a particular opportunity to couple services with partners, which in turn diversifies their audiences and extends learning opportunities to new populations. The University of Arizona has had the unique opportunity to pilot a marriage of entrepreneurship and digital humanities services under one roof, all the while collecting data and feedback to inform a future expansion of space and service. By applying entrepreneurship principles to the iSpace and the inherent services and programs, the library has made possible maximum flexibility and feedback. The iSpace has helped expand entrepreneurship, supported student-led initiatives, and brought focus to the sometimes lonely work of digital scholarship in a more community-based operation.

As UA Libraries look forward to renovations in the near future, the iSpace pilot will inform multiple decisions regarding space. The university is in the midst of a capital campaign to remodel the main floors of both the Main Library and the Science and Engineering Library. The data collected from the iSpace, in addition to information about liaison activities with faculty across multiple disciplines, will inform the creation of new collaborative spaces, including an expanded footprint for coworking, makerspace, and digital humanities/digital scholarship. With just two years of activity, the iSpace has learned that coworking and makerspaces require significant space allocations. The conflicting demands of hosting formal classes and workshops in the space while simultaneously supporting drop-in, informal learning opportunities can be alleviated with more space.

Arguably more important than the consideration of allocating more space to a service like a makerspace is having the proper staff and faculty expertise. New potential partnerships with appropriate colleges and units on campus, such as a planned Office of Data Visualization, can leverage transdisciplinary efforts and allow strange new marriages to evolve, delivering us to the next unlikely opportunity.

Jennifer Nichols is an assistant librarian in the University Libraries and the library liaison to the College of Fine Arts and the College of Humanities at the University of Arizona in Tucson; she may be reached by e-mail at: jtn@email.arizona.edu.

Marijel (Maggie) Melo is a teaching assistant and a PhD student in the Department of English and a graduate assistant in the iSpace at the University of Arizona in Tucson; she may be reached by e-mail at: marijelmelo@email.arizona.edu.

Jason Dewland is an assistant librarian in the University Libraries and the library liaison to the Eller College of Management at the University of Arizona in Tucson; he may be reached by e-mail at: jasondewland@email.arizona.edu.
Notes

3. Ibid.
13. Van Holm, “Makerspaces and Contributions to Entrepreneurship.”