Fall 2017

Telepresence robotics in an academic library: A study of exposure and adaptation among patrons and employees

LuMarie Guth
Western Michigan University, lumarie.guth@wmich.edu

Patricia F. Vander Meer
Western Michigan University

INTRODUCTION

A librarian in Bologna, Italy, is invited by a colleague in Michigan to tour her library. She is not planning any immediate travel. She plans instead to visit while sitting at her desk in her office. She downloads software on her computer and awakens a telepresence robot (TR) in Kalamazoo, MI, which becomes her eyes, ears, *and* legs, allowing her to drive around the library taking in the sights and services and conversing with her colleague, library staff, and patrons she encounters along the way.

Telepresence robot technology offers people the opportunity to visit someone across a building or across the world without having to leave their chair. Because of this flexibility the technology is being used in a steadily growing number of applications in a variety of settings (Lehrbaum, 2013). A scan of the literature yields hundreds of results that address TR applications in many settings, with increasing citations since 2008. These settings include, among others, medicine where an RP-7 (InTouch Technologies Inc.) TR was used by an Advanced Practice Registered Nurse to provide wellness visits at a clinic 250 miles away and business where TR is one possible solution to providing work accommodations to employees with ambulatory problems or other disabilities confining them to their homes (Vermeersch, Sampsel, & Kleman, 2015) (Parini, 2016).

This technology has also started to infiltrate public consciousness, appearing, for example, with episodes centered around the telepresence robotics on the popular television shows *Modern Family* (Ko, 2015) and *Bob's Burgers* (Thompson, 2017). TRs start with basic mass market models, such as those sold by Double Robotics (http://www.doublerobotics.com/) and Suitable Technologies (https://suitabletech.com/) accessible at $2000-3500.

Librarians are working with TRs to explore their uses in public services, particularly as an unfamiliar communication method inhabiting a space between video chat and face-to-face interactions. From an academic perspective it is advantageous for students to become familiar with TRs as they can encounter them in their careers as the technology becomes more widely adopted. The academic library is a logical place for this technology to be showcased on campus as it is a high-traffic setting utilized by students of every level and major. This paper discusses patron reactions to the telepresence robot exhibition in the library, beta testing of TRs in various public services tasks, and library employee attitudes toward this unfamiliar technology before and after one-on-one training.

PROJECT BACKGROUND

The University Libraries serves Western Michigan University (WMU), which is a Carnegie Higher Research Activity Doctoral University with a Fall 2016 enrollment of 23,252 including 4,939 graduate students. The main library is used by students in most of the disciplines that are taught at the University and is a high traffic campus location. In Fall 2015 the Western Michigan University Communications and Social Robotics Lab (CSRL) (http://www.combotlab.org/) approached the University Libraries in hopes of forming a collaboration. The CSRL was developed in Fall 2015 in collaboration with Dr. Autumn Edwards and Dr. Chad Edwards in the WMU School of Communication, and Dr. Patric Spence at the University of Kentucky, to analyze human and robot interaction. The CSRL directors were seeking campus partners who could help them more broadly exhibit TR technology on campus and also expand their data collection on the dynamics of human/robot communication with a larger population.

Figure 1. The Beam telepresence robot with charging station and software connection via laptop.

The CSRL robot to be showcased was a Suitable Technologies Beam+ model. This configuration seen in Figure 1 consisted of the robot unit, its docking power station, and operating software that could be easily downloaded onto most devices from the Suitable Technologies website. The software allowed users to navigate the robot with a mouse, touchpad or keyboard, project the webcam view of the pilot and alternatively push a screenshare onto the unit, and control its speed and volume. The software also included a window that displays the view of the user interacting with the robot. The unit was capable of traveling over a variety of indoor surfaces and had an off-dock charge life of two hours.

A project was developed consisting of three phases and primarily involved CSRL Directors Dr. Autumn Edwards and Dr. Chad Edwards, Associate Dean of Libraries Information Technology May Chang and authors Professor Patricia Vander Meer, library liaison to the School of Communication and Assistant Professor LuMarie Guth, library liaison to the College of Business. In the first phase patrons were invited to learn how to drive the CSRL's Beam+ TR in the library and feedback was collected from participants via brief surveys. In the second phase the robot was employed in public services for trial use and data was collected via observations by the authors. In the third phase the authors surveyed library employee attitudes toward the technology before and after personal training with the robot.

During the first two phases of the project the authors, who were among the first library employees to navigate the robot, observed that its use yielded mixed reactions among other librarians and staff. Some employees exhibited interest toward it while others were hesitant or had skeptical reactions to the new technology. The Diffusion of Innovations theory posits that innovations are often perceived cautiously early in their life cycle and it's not until after early adopters prove its utility that the technology is more widely accepted (Rogers, 2003). Would this theory extend to the perceptions of telepresence robotics by University Libraries employees, who work in a field that has frequently adopted emerging technology? In order to explore library employees' perspectives more thoroughly, the researchers conducted a training study as the third phase of the project. Employees' comfort levels and perceptions were tested before and after training in using the robot. Although other libraries in recent years have surveyed users

regarding TR technology, those studies did not survey employees (Hartsell-Gundy, 2015). The WMU University Libraries study includes hands-on training and captures quantitative and qualitative data from an employee population regarding perception.

LITERATURE REVIEW

A number of colleges and universities have begun to experiment with TRs and acquaint students and faculty with this growing technology. Varied uses include the University of Central Florida's use of TRs to enhance campus life, service learning and allowing sick professors to work from home (7 Things You, 2013). Another example is Michigan State University's application of this technology to allow distance students to better participate in face to face discussions (Meyer, 2015).

As higher education is opening up more and more opportunities for students to experience new technologies, academic libraries are continuing a tradition of incorporating innovation into spaces and services. For example, a keyword search in Library, Information Science & Technology Abstracts (LISTA) reveals that the makerspace movement emerged in the library literature in 2012 and fablabs in 2014. One of the advantages of the academic library as a place for promoting emerging technology is a that the library offers a central, neutral, and safe setting, which serves all disciplines on campus. Academic libraries typically have existing space to work with, generous hours, and a track record of collaboration with other units on campus (Little, 2014). They also have an early history of forming partnerships and working with other units to develop innovations. For example, university libraries and campus computing centers have been working together for decades and collaboration continues to be a central strategy (Dougherty 1987). Recent emphasis on collaboration is reflected in the Association of College and Research Libraries (ACRL)'s "Top Trends in Academic Libraries" that stated that the theme of "deeper collaboration" most characterized the uppermost trends in academic libraries today (Research Planning and Review Committee, 2014).

Some early cases of academic libraries adopting TRs, in particular, are present in the literature. For example, Central Library at the University of Texas - Arlington, hosted a robot petting zoo in April 2015 and had a beta program where distance users could check out a robot to meet with people and attend events in the library (Central Library to, 2015). Further, designated members of the campus community "robot ambassadors" could check out the robot for use on campus ("UTA Libraries Robots," 2016). The Mary Idema Pew Library, in collaboration with the Information Technology Department, at Grand Valley State University houses the Atomic Object Beam Technology Showcase, a space where students can experience emerging tech on display, including TRs (Raths, 2015). Atlanta University Center experimented with the VGo robot (http://www.vgocom.com/) in a variety of applications including using it as a tour guide for new or prospective students (Decker, 2015). Baylor University used the VGo robot to allow K-12 students in Texas to tour the library, including an educational exhibit, without the need to organize a full-scale field trip (Logan, Orr, Holgersson, 2012). King Library on the Oxford, Ohio campus of Miami University ran a study where they used the Double Robotics TR on two different floors of the library to answer questions remotely in order to assess its utility in providing services. They found that the robot was generally perceived positively by patrons, but that services provided by the robot could be more effectively provided by a roving librarian model (Hartsell-Gundy, 2015).

METHODOLOGY

Assessment of the project took place through several means and was approved by WMU's Human Subjects Institutional Review Board. In study one, feedback forms were filled out by patrons who interacted with or piloted the robot. In study two, observations by the librarians piloting the robot for various public services activities were recorded in a log. In study three, employees were invited to complete a pretest designed to solicit perceptions and attitudes regarding the use of the robot, become trained in navigating the robot, and complete a posttest for comparison purposes.

The researchers did not intend for the size and representation of the total populations in these studies to be a scientific sample. The studies were intended to explore human-telepresence robot interaction and highlight areas for initial discussion regarding the use of this technology in the academic library.

Study one

This study focused on patrons who interacted with and piloted the robot. During the Fall 2016 semester, student assistants drove the robot in a heavily populated area of the library and recruited individuals who were interested in engaging with the robot and/or learning how to operate it. See Figure 2. Students were also invited to each complete a feedback form. There were five categories, date, time, status, major, whether or not the patron drove the robot, and a section for comments/feedback/suggestions for use.

Figure 2. Students invited to drive the robot in Waldo Library.

The patron study yielded 34 responses, representing 23 self-described majors, that fell into the following broad categories: Science, Technology, Engineering and Mathematics (15), Social Sciences (11), and Humanities (4). Participants ranged from freshmen to graduate students to campus visitors with 4 freshmen, 2 sophomores, 9 juniors, 12 seniors, 4 graduate students, 2 visitors, and 1 unspecified. Out of the 34 interactions, 25 actually drove the robot. Data from the feedback forms collected from the survey was entered into Excel.

Study two

From Fall 2015 to Fall 2016 the researchers trialed the robot with a variety of library applications, including (a) greeting patrons at library events; (b) surprising tours of prospective students and their parents; (c) serving as backup for student assistants at the reference desks; (d) attending departmental meetings remotely while staffing a service point; (e) reciting verse during

National Poetry Month; (f) giving a a global colleague legs to tour the library; (g) providing Freshman library orientations with a scavenger hunt option.

Data was documented regarding these trials in an informal log. This included dates and times, location, purpose of use, number of encounters, comments from participants, and whether or not patrons wished to learn how to operate the robot. The librarians also recorded the advantages and challenges that arose while operating the unit.

Study three

The researchers sought an opportunity in this study to engage other library employees in working with the robot. Volunteers, including library administrators, librarians, staff, and student assistants, were solicited from across the library to participate. Employee attitudes toward the technology before and after training were measured and feedback regarding suggested uses of the robot was collected. The researchers hypothesized that library employee perceptions of the robot would improve after gaining familiarity with the technology through training and use.

Study participants consisted of 25 library employees, which included: 10 library faculty, 7 library staff, and 8 student workers. These employees came from the following areas of the library: Public Services (13), Technical Services (5), Administration (1), Systems/IT (2), and Operations/Building Services (4). Participants had diverse levels of experience working in libraries and education including: less than 5 years (8), 5 to 10 years (4), 10 to 15 years (2), 15 to 20 years (2), 20 to 25 years (3), and more than 25 years (6).

Participants were asked to take part in a 20-minute session, which included the following tasks:

1. Complete a short survey designed to gauge participants' comfort level, perceived difficulty, and perceived utility of the technology in libraries, higher education, and all other industries using a Likert scale.
2. View a brief training video available on the robot manufacturer's software (https://youtu.be/vzXnpmOWb-c).
3. Engage in a few minutes of hands-on training with one of the two researchers.
4. Drive the robot to several destinations in the library and converse with a reference desk employee.
5. Complete a posttest. This contained the same questions as the pretest in addition to demographic questions and an open comment field for feedback and potential uses as illustrated in Appendix A.

FINDINGS

Study One

Results of this study yielded a mix of positive and negative opinions toward the robot that were filtered into the following categories:

Don't Sneak Up on Me--A number of reactions and comments could be put into this category. The robot, by nature, is relatively quiet when in simple motion and can startle someone when approaching from behind. While some users did not seem to mind the proximity of the robot, others were uncomfortable as characterized by one comment, "It should have a route or certain areas it should remain in so people can feel comfortable using the robot and ask questions."

This dovetailed with other comments that reflected some confusion regarding the purpose of the robot or in the words of another user, "Only negative is people's fears of the robots turning EVIL [sic]! So I would encourage more intro sessions to give heads-up."

Fetch Robot, Fetch. Some of feedback collected expressed a desire for the robot to have functionality, such as arms, to retrieve items, or other enhanced interactive capability: "Program was simple to learn… Could be used to find people in the library, or to deliver things...could offer tech support to people as well" and "Needs arms."

Robot as Enforcer. Silence and safety are key concerns when studying in the library. A number of students suggested that the robot be used as a tool to keep law and order in the library. For example, comments included: "Should be used to make sure people are being quiet" and "Needs to be used for security."

Keep it Down to a Roar. The projected volume setting on the robot could be very loud and needed to be adjusted with different persons piloting it and different computers being used. Errors in volume setting on the part of employees resulted in a few instances of the robot blasting sound, which did not set well with patrons and several complaints were lodged.

Remote Teaching and Remote Access Needs. Recognizing the long distance capability of the robot, several students envisioned using the robot in this way:

- "This was cool! I would like to be tutored with this!"
- "☺ I can wave at people without being near them!"
- "This was neat! Great idea to help those with mobility issues."

Face 2 Face Forever. Considering that the TR does not think for itself but is powered by a human in real time, one respondent recognized that it is not a time-saver overall for staff stating, "(I) personally prefer talking face-to-face with a person. The librarian that assisted me (using the robot) ended up having to walk over to me. I'm not sure why we need a 'robot' when someone still needs to drive it."

Study Two

An analysis of the log containing observations made by the library employees trialing the robot for multiple applications in the library yielded a number of discussion points:

Technical Considerations. It should be emphasized that in any application where the robot was driven throughout the library, Wi-Fi was a concern. While some telepresence robots can use both Wi-Fi and 4G, this model was completely dependent on the strength of the Wi-Fi signal. The robot could at times cut out completely for a few seconds leaving a conversation with a patron in the lurch. This caused frustration, especially on the part of the operator who was trying to engage with students and showcase this technology in its best light. Certain areas of the library were found to be particularly problematic, such as elevators, the open atrium lacking in network drops, and the stacks, and were avoided as much as possible.

Future research could include testing new iterations of robot technology with potential enhancements that may include more advanced cameras, the addition of rear cameras, touchscreens, longer battery life, cloud-based software, a privacy mode that would not display

the navigator, GPS tracking of the robot's location, stairs and collision avoidance, and simplified charging that is not dependent on a station. It could also include trying the robot in a more robust Wi-Fi environment or using a robot that can depend on both Wi-Fi and 4G.

Volume. Navigators discovered immediately that the robot required close monitoring of speaker volume levels as it had quite a set of "lungs" if not reigned in at the start with the proper setting. Anyone being trained in the robot was required to test the volume with another staff member prior to interacting with the public. This was especially important considering that the software was cloud-based so each personal device using the software needed to be calibrated.

Multitasking. Although there was an expectation on the part of some that the technology could operate independently, it did not allow the operator to multitask very well. When driving it remotely from one's office, full attention was needed. In addition, an operator had to be engaged, properly in view and cognizant that he or she was on camera. Robots are often framed in the context of replacing employee hours but the TR is not programmed for this type of use. Further, the researchers actively avoided any reference to the robot as a librarian or staff member to avoid any implication that it was a replacement of library employees.

One experience with the robot demonstrates how multitasking challenges can be mitigated. In February 2016 a student worker who was initially trained in Study One had to cover a help desk on another floor of the library during his departmental meeting because of an unexpected staffing shortage. Although the desk was high traffic, he was able to participate in the meeting with the robot by keeping one ear and one eye on both tasks. Key to this was his management of task priorities. The desk was his primary task so at the beginning of the meeting he managed expectations of the other attendees by making sure they knew that if someone came to the desk to seek help, he would have to give the patron his whole attention. The student worker had used video technology before to attend a meeting and he felt that using the robot was preferable because the wide-angle lens and range of movement allowed him to better focus on the different participants.

Advantage of mobility. The session in which the librarian in Bologna toured the library clearly demonstrates the advantage of the robot to enable interaction across distances while moving about. There was also an enhanced perception of presence in the physical environment because of the control the operator had over the movements of the device. May Chang, who arranged for this tour concluded that "Social robotics, such as the TR enable[s] us to communicate and interact at a level not possible with the telephone or video chat." (Telepresence robot collaboration, 2016).

Use as a roving reference tool. Using the robot for reference-related trial applications yielded diverse reactions. For example, some patrons who were approached at points around the library were enthusiastic about seeing and interfacing with it while others were uneasy and questioned its purpose. There were other drawbacks to using this technology in a reference capacity. Although the operator of the robot could show a patron a screen, such as library hours, etc., the size of the robot's screen made it difficult to see text heavy web pages, such as database results. In addition, some patrons expected it to be a touch screen that they could maneuver.

Conversely, the librarian running the robot could not see the patron's computer screen if she was having a problem and needed help. This was due to the fact that the camera on the robot

had a wide-angle focus and was not equipped for that purpose. The reference interviews were hindered in that the operator was less able to express whole body language, which would have been possible in a face-to-face interaction. For example, a librarian typically sits with a patron at their level to establish a sense of familiarity.

Future studies could be conducted that involve using the robot for applications such as remote participation in study sessions taking part in the library or expanding library services to satellite campuses. Permitting outside groups to check out the robot for use in the library may allow other applications to emerge and be tested.

Use at the reference desk. When the robot was stationed at the reference desk as a backup, some student assistants wondered if the robot was there to monitor the quality of their service or to carry out some other subversive purpose. This is interesting in that the students periodically work with a librarian or supervisor in the immediate vicinity within earshot but the robot technology was somehow perceived differently. This could possibly be attributed in part to the height of the robot, which was akin to someone standing, as opposed to a librarian who would normally be seated. Also, the robot was stationed a bit closer to them then a librarian normally would be.

When answering a complex question, one of the librarians said that she felt more pressure to answer it quickly. This was because the patron was standing in attendance and could not read the effort that was taking place in searching for information since he or she was only seeing the face on the robot as opposed to keyboard activity, etc. This could be contrasted with online chat where the patron is used to a slight delay in the give and take of the interaction while the librarian looks up information and the patron is free to multitask at his or her end while chatting.

Clarity of purpose and promotions. While some patrons responded enthusiastically to the robot with selfie requests, offers to drive the robot and even concern for the robot when it became unavailable for trial during the summer, it became clear early on that the robot was intimidating to some patrons. This may be due to technophobia, a sense of being monitored, or unfamiliarity with the intended purpose of the robot. One of the ways the Library minimized any sinister associations was to give it a whimsical flair with a paper bow tie emblazoned with images of the campus mascot. This approach can be seen in pictures of robots used in other colleges or universities.

In later applications, such as Research Night and freshman orientation tours, distinct signage on the robot was provided to express its purpose. The robot was confined to a designated area as its home base and patrons who approached it were offered a chance to see it move or even learn to drive it. This helped to establish a setting with purpose and provide the patrons a chance to investigate it without discomfort.

Public relations ambassador. One of the greatest strengths of the robot is its novelty as an exciting new technology. In this vein, it was perhaps most successfully deployed in quick greeting interactions where the technology could be showcased. Some examples of this type of use included a space for the robot to interact with patrons at library events, short “drivebys” of prospective student and family tours that stopped at the library, and visits with freshmen groups touring through the library as part of their orientation class. One of the most intriguing employments of the robot was as a poet. During National Poetry Month, a librarian recited poems remotely from a staff area while projecting thematic images on the screen as seen in

Figure 3 and Figure 4. One library employee commented that aside from any practical applications of the robot, it was good for the optics of the library to be presented as a technology leader.

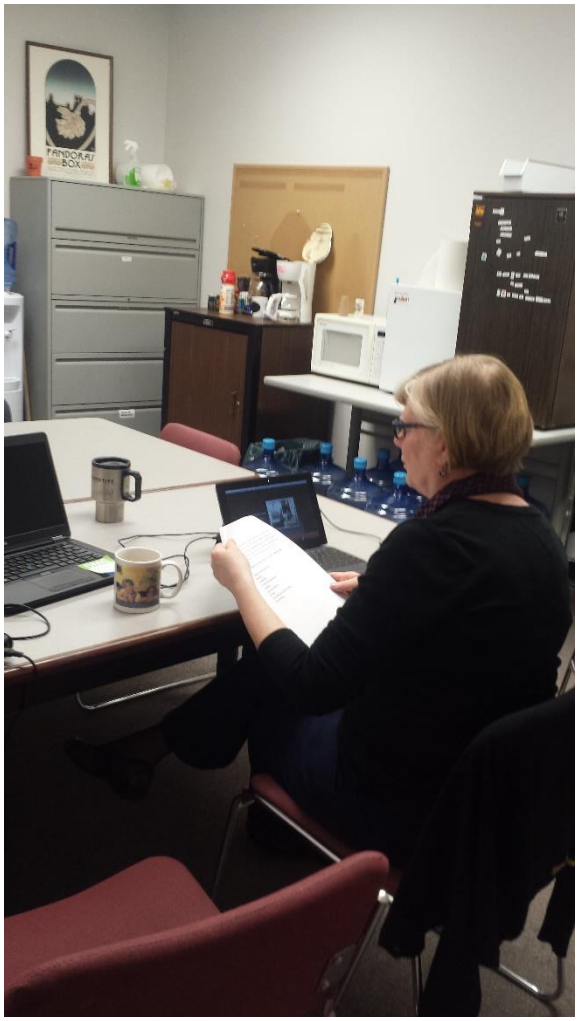

Figure 3 A librarian conducts a poetry reading from a staff area in Waldo Library.

Figure 4. Students observing the poetry reading from a public area of Waldo Library.

Study Three

Study participants consisted of 13% of all library employees. The sample had representation across demographic categories within the library including department, employment status (student worker, library staff, or faculty librarian), and years experience as shown in Table 1. Overall, the results confirmed the researchers' hypothesis that library employee perceptions of the robot would improve after gaining familiarity with the technology through training and use.

Table 1

Library Employee Robot Study Participants

Employment Status			Library Department			Years Experience working in Libraries or Education		
Category	n	Percent	Category	n	Percent	Category	n	Percent
Student Worker	8	32%	Public Services	13	52%	Less than 5 years	8	32%
Staff	7	28%	Technical Services	5	20%	5 to 10 years	4	16%
Faculty	10	40%	Administration	1	4%	10 to 15 years	2	8%
			Systems/IT	2	8%	15 to 20 years	2	8%
			Operations/Building Services	4	16%	20 to 25 years	3	12%
						More than 25 years	6	24%

Although the sample size was small, it can be noted there was no significant difference in perceptions of the robot based on employment type and department. Some literature theorizes that younger people are more comfortable with new technology (Dempsey, 2015). Although participants were not asked to give their age, they were asked to indicate their years of experience. There was no significant difference in responses based on experience. There was a consistent increase after training for all participants in perception of ease of use and usefulness of the robot in universities and the library as shown in Table 2.

Table 2

Mean Scores Based on Pre-Training Comfort Level with Piloting/Driving the Robot

	Low Comfort Piloting/Driving (1-3) n=9			High Comfort Piloting/Driving (4-5) n=16			Low and High Piloting/Comfort Driving		
Category	Pretest	Posttest	Percent Change	Pretest	Posttest	Percent Change	Pretest	Posttest	Percent Change
Comfort Interacting	3.11	3.78	22%	4.06	4.50	11%	3.72	4.24	14%
Comfort Driving	2.56	3.89	52%	4.19	4.53	8%	3.60	4.29	19%
Usefulness in Libraries	3.00	4.11	37%	3.50	4.06	16%	3.20	4.08	28%
Usefulness in Universities	3.67	4.11	12%	3.69	4.06	10%	3.68	4.08	11%
Usefulness in Non-university Setting	3.67	4.44	21%	3.75	4.00	7%	3.72	4.16	12%
Ease in Proficiency	3.00	4.22	41%	3.50	4.56	30%	3.32	4.44	34%

In analyzing the data, the researchers filtered participants into two groups: low comfort participants who ranked one to three on the Likert scale and high comfort participants who ranked four to five on the Likert scale in their responses to the pretest question, "On a scale of one (strongly disagree) to five (strongly agree), indicate your response to the statement, 'I am comfortable with the idea of piloting/driving the robot.'" Low comfort participants had higher gains in every category in the pre and posttest and actually surpassed the high comfort participants in their perceptions on the utility of the robot in libraries, education, and non-university settings. Mean scores for ease in proficiency using the robot (34%) and usefulness of the robot in libraries (28%) had the highest growth from the pretest to the posttest. The most significant increases in mean scores for the low comfort group were in comfort driving (52%), ease in proficiency (41%) and usefulness in libraries (37%), while the most significant increases

in mean scores for the high comfort group were ease in proficiency (30%), usefulness in libraries (16%) and comfort interacting with the robot (11%).

14 out of 25 participants gave comments in the posttest. Common themes pertained to the technical aspects of operating the robot, human-computer interaction, the robot as a novel technology, and the usefulness of the robot in the library setting. In analyzing these comments in the posttest, seven were positive toward the technology, four were negative, and three were neutral.

One librarian who participated in the study made a comment that echoed the observations of several others:

> I think the robot is a fun, novel way of interacting with patrons. However, I wonder how much more effective it will be (over a human interaction) once the novelty wears off. Since a librarian has to drive the robot and pay attention to it, it does not save the librarian time that could be used for other tasks. In that sense, it is similar to a "roving" librarian model. I do, however, think that showcasing technology such as the robot in the library is beneficial to students who can have the experience and [also adds] to the reputation of the libraries.

CONCLUSION

A TR can offer academic libraries a chance to showcase an emerging, engaging technology to its community in an era where students can encounter the technology in careers after they graduate. Students are intrigued by the remote capability and mobility of the technology, offering advantages not available with simple video chat. For example, the operator can focus on different speakers, zoom in and out, and navigate the physical space. The researchers recommend teaching patrons how to drive the robot, which is easy to use.

Throughout the course of the project, the researchers noted the utility of the TR in various applications. Using the robot in a public relations capacity can enhance library offerings. The robot is well suited to casual interactions, especially at library events or as an element of library tours. In addition to greeting tours, it can also be used for others to remotely visit the library, given special arrangements. Libraries may consider including simple interactions with the robot as an activity in a course-related capacity, such as an option in first-year experience classes that visit the library. Our project found limited use for reference applications due to the nature of the technology. It is not well suited to uses where it is necessary to view patron screens or conduct in-depth research consultations requiring database searching, etc. However, future developments of the technology may address the challenges.

There are several important considerations when planning to use a TR. Technical requirements, such as Wi-Fi, should be carefully tested with a robot in the area it will be used. Volume is another important consideration that needs to be monitored. It is difficult to multitask when driving the robot. Therefore, it is recommended that those using the robot set dedicated hours aside that require no more than a low level of engagement with other tasks.

Libraries should deliberately plan promotions when adopting a telepresence robot or any novel technology with a clear explanation of its purpose. Consider giving the robot a friendly or whimsical appearance to minimize patron anxiety and limiting the robot activity to a designated area to establish boundaries for interaction with patrons. It is wise to avoid referring to the robot as a librarian to avoid implying that the technology may reduce the need for staff.

Library employees may be more receptive to unfamiliar technology when personal training is offered and their feedback and ideas for use are actively solicited. Telepresence robots

can be used to foster communication within the libraries, filling a niche between Skype and face-to-face interactions. For example, it can enable library employees to remotely attend and more fully engage in meetings in a multi-branch library system.

Embracing innovation often carries the potential to form collaborations within the library and across university departments and establish the library's reputation as a forward thinking campus unit. Early experimentation with technology is also a natural extension of the academic library's mission to aid students in discovery. The TR project allowed Western Michigan University students and library employees one such opportunity to expand their knowledge and experience through engaging with an emerging technology.

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Appendix A

Library Employee Robot Response Survey

Pretest and Posttest Questions

1. Please indicate your response to these statements.
   (Strongly Disagree, Disagree, Neutral, Agree, or Strongly Agree)
   I am comfortable with the idea of interacting with the robot.
   I am comfortable with the idea of piloting/driving the robot.
   I think the robot is a useful technology in libraries.
   I think the robot is a useful technology in universities.
   I think the robot is a useful technology in non-university settings.
2. Please indicate your response to the following question.
   (1 – very difficult, 2 – difficult, 3 – neutral, 4 – easy, or 5 – very easy)
   On a scale of 1 (very difficult) to 5 (very easy) how difficult/easy do you anticipate it will be to become proficient in driving the robot?

Posttest Only Questions

1. Please provide feedback, comment or suggestions for use. (open text box)
2. What best matches your level of employment?
   (Student Worker, Staff, or Faculty)
3. Which best matches your job duties?
   (Public Services, Technical Services, Administration, Systems/IT, or Operations/Building Services)
4. How many years have you worked in library or educational settings?
   (Less than 5 years, 5 to 10 years, 10 to 15 years, 15 to 20 years, 20 to 25 years, more than years)