3D Printing: Establishing a Legitimate Service through Skyforge

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3D printing seems to be blowing up the internet and the world right now. From owners printing prosthetic legs for their dogs, to a Sonic Screwdriver for our Teen Doctor Who Christmas Party, the applications and uses of this technology continue to excite and amaze us. In addition to democratizing manufacturing, it has equipped entrepreneurs with easy access to prototyping, and given students the ability to see their theoretical designs take shape in the real world. Although several staff members, and a few Friends of the Library, were interested in 3D printers, it didn't seem like an attainable project for my library. The Community Library Network is a rural county system in North Idaho. We have seven library locations including Athol, Harrison, Hayden, Pinehurst, Post Falls, Rathdrum, Spirit Lake, as well as a Bookmobile. Altogether we serve over 100,000 Idaho residents across 1,150 square miles and two counties.

Offering programs, events, community outreaches and online services for members of all ages, 3D Printing was something we hoped to do in the future, but it was an ambition that didn't have wheels on the ground yet. But then, my library was dropped into this new world when we received an open source RepRap MendelMax 3D printer through the Idaho Commission for Libraries pilot project, "Make It @ the Library." Seeking to bring the concepts of makerspaces into libraries, "Make It" has trained three different cohorts of librarians in robotics, circuitry, building, and 3D printing, and provided tools to use with members in each subject.

Immediately after having our 3D printer shipped to us, we couldn't wait to bring it out into the community. We scheduled several school showings during Teen Tech Week 2014, and also featured it at several library events. Every teacher, student, and library member was dumbfounded not only that we had a 3D printer, but also by the potential it had. Several community members heard about our printer and requested we print their designs. Immediately we realized there were many aspects of facilitating a 3D printer service that we had not yet considered. A few key questions we asked included who will handle the manufacturing process of the 3D printer? who will troubleshoot designs? who will pay for printing? and how will all of these things flow together?

In these initial prints, a staff member received a 3D design from a library member, typically through email, and carried it through the entire process of 3D printing. Most of the time this included three different computer softwares, knowledge on troubleshooting failed prints, and sometimes up to fifteen hours of calibrating, baby-sitting, and troubleshooting the 3D design. Bear in mind that staff members were still unfamiliar with many aspects of 3D printing and were having to research and experiment with different fixes to common 3D printing problems. It quickly became obvious that the ratio of staff time to completed prints was too great to consider it a legitimate model for a public access service. Consequently, staff still used the 3D printer at special events in the library and out in the community, but community members did not have access to the technology.

Fast forward a few months, and a networking opportunity at Gizmo-CDA, a Coeur d' Alene Makerspace, completely changed the story. Staff had the chance to meet Chris

Walker, the CEO of Element Robot, when our hot pink 3D printer, Pinkie Pie, caught his eye. Element Robot is a local tech company based in Moscow, Idaho. After some calibration and network setting, he was able to demonstrate his Skyforge system. In the simplest terms, Skyforge is a cloud-based service that streamlines and simplifies the 3D printing process. Skyforge allows organizations and their members to upload designs, adjust the settings of a design, accept payment, and finally automates the 3D printing itself: from heating up the nozzle to cooling down the bed. Impressed with the potential of the service, staff asked for and were granted a trial period with Skyforge.

The trial period consisted mainly of visits to high school classrooms. Students were initially familiarized with the underlying concepts of 3D printing and design, given instruction on using the Skyforge network, and then asked to order a design from the library using the Skyforge system. Close to ninety students were included in this preliminary test of the service. Without counting the time of actually 3D printing the designs themselves, or any allowance for troubleshooting difficult jobs, ninety prints would have taken far too much staff time to undertake without Skyforge. Staff members would have had to collect ninety different files, ensure the files had the proper 3D printing settings, change any that didn't, and then ensure the 3D printer correctly manufactured each of the designs.

Skyforge allowed us to complete the printing of ninety student prints in about a month and a half. Putting that into perspective, Skyforge allowed us to print an average of three designs every workday. This was in addition to the regular work of staff members who still hadprograms, events, and other responsibilities to complete. Some of the primary benefits of the Skyforge system are the ability for users to upload files from any internet-connected computer and to adjust design settings themselves, thus automating the 3D printer manufacturing process. Each of these aspects of the service cut down on staff time dramatically. Besides offering the initial training, clicking a start button to begin the print, and removing the finished object from the printer, the only task staff had was troubleshooting a few student attempts at uploading their designs.

Following the simplicity and success of the pilot project, the Community Library Network currently has a contract with Element Robot to use the Skyforge 3D Printing system. While we have had the service, we have been greatly impressed with its features. Several members who have had experience with 3D printing enjoyed the ability to complete a 3D print without having to oversee every step of the process. Members who had no experience whatsoever were also given access to a 3D printer and became familiar with the process of 3D printing. Payment has also become easier since joining the Skyforge network. Members pay for the volume of 3D printer filament their design uses; Skyforge estimates this price before the design is ordered, and members can pay for their design online using Stripe, an alternative to PayPal. Finally, the customer service and support of Element Robot has been invaluable with our 3D printing service. The small team of 3D printing enthusiasts at Element Robot has worked tirelessly to improve the user interface, quickly respond to any technical difficulties in the hardware or software, and has given advice when a design does not work.

While Skyforge was a very effective answer for our library's needs, it is obviously not the only method for delivering 3D printing services to a community. Several libraries across the state of Idaho have automated services, or offer 3D printing services in another fashion. The Albertson's Library on the Boise State University (BSU) campus has built a system for handling a large quantity of 3D designs, and the Meridian Library District is another example of a library that is putting 3D printing services into practice. If your library is considering 3D printing services, there is further information included at the end of this article.

So many of our library members have watched a YouTube video describing some awesome feature of 3D printing, have an uncle with a 3D printer for his business, or an older sister who uses a 3D printer with her robotics team at school. This project has allowed us to find ways to take 3D printing from the theoretical idea to offering services that allow anyone to get exposure and experience with 3D printing. Will 3D printing change the future of manufacturing? Will it revolutionize medical practices? Will it change the way we buy things? Very possibly; and because of

that possible future, let's get 3D printing into the hands of as many people as we can, and get those ideas extruding into the future.

Albertsons Library 3D Printing Service
https://makerlab.boisestate.edu/makerlab/3d-printing/

Gizmo-CDA; Coeur d'Alene's Makerspace
http://www.gizmo-cda.org/

Make It @ the Library Facebook Page
https://www.facebook.com/MakeItIdaho?fref=ts

Meridian Library District's Nick Grove on 3D Printing
http://splat.lili.org/2014/03/3d-printing-in-libraries/

Skyforge 3D Printing System
https://skyforge.co/home/

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