

A Basic Guide to 3D Printers in Libraries



Seeing Libraries Through Fresh Eyes

Libraries across the country are undergoing exciting changes as they adapt to forces unleashed by the digital revolution. The communities they serve are changing, their constituents' needs and expectations are changing, and libraries are responding in order to serve the important needs of their communities in ways that only libraries can. As bookshelves give way to ebooks, centers of learning and creative spaces, there is a growing need for proactive strategies to integrate 3D printing into libraries and library systems. 3D printing offers one of the most dynamic new ways for libraries to reach a wider audience than ever before in very meaningful ways.

Libraries are beginning to offer inspiring hands-on learning experiences for their communities and 3D printers are one of the most important dimensions to this new format. For library administrators these developments bring inspiring opportunities as well as operational challenges.

3D printing is proving to be a big winner for libraries in the battle to attract a wider and more diverse audience than ever before.

3D Printing is a Compelling Offer

Library-based 3D printing is helping expose communities to this fast-emerging technology and empowering people to engage in creative learning, develop new marketable skills, and launch business ventures. For librarians who have already seen the reaction of children looking at a 3D printer for the first time, or a pre-teen printing a gadget that they conceived and designed themselves, or an entrepreneur printing their own product prototype, the benefits are clear.

Instant Attention – 3D printers automatically attract a lot of attention. The 3D printing space in a library is guaranteed to be a popular draw for traditional library patrons as well as entirely new demographics.

Public Engagement – Libraries are playing an important role in introducing this fascinating technology to the general public. Invariably when people see 3D printers and begin to develop a concrete understanding of their potential, it sparks new ideas, brings out creativity, and generates excitement.

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From Idea To Object

Library Promotion – A 3D printing center is one of the best ways to draw attention to the vital role libraries play in enriching people’s lives. Providing access to this technology helps constituents open doors to the workplaces of tomorrow and positions the library as a center for creative activity.

Encompassing all Ages – 3D printing is for everyone - from elementary school children to senior citizens and everyone in between. 3D printing is used by artists, architects, builders, designers, engineers, entrepreneurs, doctors, dentists, scientists, students, and teachers.

What does 3D Printing Involve?

Its relatively simple for libraries to get started with 3D Printing. But there are a few important things to know and be prepared for from the start.

3D Printing Technologies. At the core is of course the 3D printer itself. There is a range of different 3D printing technologies, brands, and types and sizes of 3D printers, so it can be a little confusing. But only a relatively narrow range of 3D printers is actually suitable for the library environment. Libraries should not seek to provide industrial 3D printers, or printers that require skilled operators. Rather, there is a variety of high-quality options in the range known as “desktop” 3D printers which are perfectly suited to the task. Examples of some of the most common FDM printer manufacturers are listed below.

Materials. There is an array of materials available for 3D printing, but the practicalities of library environments call for use of those that are safe, clean and easy-to-use. The options are generally dictated by the capabilities of the 3D printer. For desktop 3D printers these are thermoplastic composites, including types referred to by acronyms such as PLA, CPE, TPU and specialty materials such as nylon or carbon fiber.

Designing Objects to Print. There are three ways for makers to get an object that can be 3D printed: (1) download a model from one of the many free or paid Internet sites offering 3D prints, (2) use a 3D scanner to scan an object into a 3D form suitable for 3D printing or, (3) design an object using any of the many different types of CAD software that are available for free or for a license fee.

Time to Print. The 3D printing process has become more efficient and continues to get faster and produce higher quality prints. However, generally speaking 3D printing takes hours, not minutes. A small object can easily take 1 to 2 hours to print and a medium sized object can take four to ten hours to print. Indeed, large projects can take 24 to 48 hours to print. This is an important issue when considering scheduling the use of printers among different users and having sufficient printer capacity to meet the demand.

Challenges For Libraries

Staff Resources. Introducing 3D printing into a library is much like any other new technology – there will have to be someone available who can provide instruction and guidance to users. In the case of 3D printers, a relatively small amount of staff training for as many staff members as possible at the beginning can be extremely valuable. It helps overcome the natural fear of new technology, and saves a lot of time and frustration in the long run. If you choose one of the leading consumer-friendly desktop 3D printers it will help to minimize the time required from library staff to become familiar with them and be able to assist users.

Facility Space. Most desktop 3D printers require surprisingly little space. Their footprint is generally no bigger than a regular desktop paper printer. You will also need space for users to work, and possibly space for a computer for use of CAD software and to prepare the models for the printer. Many different configurations are possible and it isn’t necessary to have the 3D printer, computer and post-print work station all in one place. In addition to the workspace, some storage space for the spools of material used in the 3D printers will be needed. You will also want to take into consideration the sound of 3D printers and the traffic in your 3D printer space. Most desktop 3D printers are about as noisy as a regular paper printer, but users involved in the creative process may not be! The current trend is for 3D printers to be located in spaces designated for maker activities.

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Service, Support and Maintenance. Like any other piece of technical equipment 3D printers need care and service from time to time. Library staff can easily learn to upload files, load and unload filament and clear the occasional filament jam, but shouldn't be expected to handle support calls and repairs for more challenging issues. If the library system has a tech service center, it would be good to get them trained on 3D printer operation and maintenance. If possible have a quick-response service and support contract in place with a qualified vendor to keep things running smoothly.

Public Use. For 3D printing to be viable in libraries, the users themselves rather than library staff have to be the ones who primarily use the equipment. With today's 3D printers, this generally isn't a problem provided there is a minimum age and/or experience requirement. The most challenging task usually

use 3D printers for free or very low cost without limits because inevitably clever local "makers" will take advantage and tie up the printers continuously. With that in mind, another way to control access is to require users to schedule time with the printer. This is being done in some libraries but because of the long print times often involved it tends to be challenging and users can't realistically sit and wait for hours.

3D Printer Hardware and Software Solutions

There are four types of 3D printer hardware solutions deployed by libraries, schools and maker-spaces: individual workstations, labs, innovation centers and networks. These are distinguished mainly by the number of 3D printers involved and how they are managed.



involves changing filament or clearing a filament jam, which a library employee may in fact want to keep control over or at least limit these processes to more experienced users.

Pricing Model. Libraries are testing different pricing models for use of 3D printers. In most cases fees are being charged that reflect the cost of consumable materials (much like the cost of paper in a regular printer or copier). Once the 3D printers are paid for, the main operating cost is for the materials used in printing. Electricity costs are negligible -- about the same as for a PC. For the most part the materials are plastic composites which cost a few cents per gram. It's relatively easy to fix a price per gram that reflects all the costs of operating the 3D printer. Some libraries choose to simply charge users the cost of the material without any markup. We caution about letting people

Libraries typically start with one or two individual 3D printing work stations and grow from there. It doesn't take long to run into capacity problems since a single user can tie up a printer for 4 to 24 hours. For individual libraries deployment of a 3D printer lab or maker-space configuration is usually a better place to start if it is financially feasible. Beginning with three to six 3D printers makes it possible to offer different technologies and materials to users as well as more capacity in terms of available print time.

Increasingly, "smart" 3D printers can be networked and managed as a centralized resource for greater efficiency.

Library administrators should develop a system-wide strategy for the 3D printing program early-on. 3D printers can be deployed in different numbers and

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A helpful tip for choosing 3D printers for libraries is to look at those brands that are being deployed most often in print labs and innovation centers.

configurations across multiple libraries to match usage demands. And of course, there can be price efficiencies gained through higher volume purchases.

3D Printers. The desktop 3D printer space is crowded with options, but only a few are backed by companies that have sufficient infrastructure to provide the kind of service, support and reliability needed for use in libraries, schools and commercial environments. In addition to these critical factors the choice of printers should be based on ease of use across multiple dimensions, feature sets, technology, materials and much more. While certainly not a definitive list, brands with a solid track record and a focus on continuing investment in development include MakerBot, Ultimaker, Lulzbot, Markforged, Robo3D and XYZPrinting among others. There's no substitute for having a strategy and doing good research.

Design and Slicing Software. There are two levels of software involved in 3D printing. The software used to design a 3D model is referred to as CAD software. There are many choices of CAD software, some free and others licensed. Importantly, CAD software is independent of the 3D printer and libraries may or may not choose to provide this to users.

The software used to prepare the 3D model for the printer is generally referred to as the slicing software because its primary function is to "slice" the 3D model into layers and generate instructions that can be understood by the 3D printer. Most 3D printer manufacturers provide their own free versions of slicing software that is compatible with their 3D printers. And there are open source slicing engines that can be used for the same purpose.

To learn more, visit: 3dherndon.com

About 3D Herndon

3D Herndon is a unique provider of 3D printing solutions and services. Our expertise is relied upon by libraries, educational institutions, and commercial firms. We can scope your requirements, identify your options, and help implement successful solutions. Whether you are considering putting a single 3D printer in your library, setting up a makerspace, or building out a system-wide 3D printing program, we can help you get it right.

3D Herndon has deep expertise in 3D printing and scanning. It's what we do. The company operates its own unique 3D printing, scanning and design studio for testing, teaching and prototype printing. Based in Northern Virginia, just outside of Washington, DC, 3D Herndon has a fully-equipped 3D printing lab and a state-of-the art training facility that is available for public, private and commercial use. Our specialists are all passionate about 3D printing and extremely knowledgeable in nearly every aspect of the technology and its applications.



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