Redefining a Corporate Library with a 3D Printer

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Established to Serve the Public Interest

Part of the ecosystem of federal research centers
Today We Operate Seven FFRDCs

Our customers benefit from our breadth of experience

- CMS Alliance to Modernize Healthcare
- Center for Enterprise Modernization
- Center for Advanced Aviation System Development
- Judiciary Engineering and Modernization Center
- Homeland Security Systems Engineering and Development Institute
- National Cybersecurity Center of Excellence
Our Employees

7,300 employees
67% advanced degrees
25 average years experience
12 years average tenure

Our employees have a passion for public service
### MITRE Information Services

<table>
<thead>
<tr>
<th>InfoDesk Services</th>
<th>Custom Research and Knowledge Services</th>
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<tbody>
<tr>
<td>first point of contact for answers to research questions and document delivery</td>
<td>subject matter experts providing research, analysis, and current awareness</td>
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<tr>
<th>Information Resources Suite</th>
<th>Knowledge Stewardship Services</th>
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<tr>
<td>negotiates and deploys the paid external information resources</td>
<td>maintains high value content so that it is findable and actionable</td>
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InfoDesk Services

- InfoCenters in McLean, VA and Bedford, MA
- Research and reference support
- Self-service and mediated electronic database access
- Learning commons
- Business centers and mobile worker kiosks
- Collaboration spaces
- Print journal and newspaper collections
- Training on information resources
3D Printing at MITRE
Why Offer 3D Printing?

- Libraries have a tradition of fostering learning, innovation, and collaboration
- Hands-on experience leads to discovery
- People less risk-adverse in a neutral location
- Passion builds community
- 3D printers have become smaller, cheaper, and easier to use
Types of 3D Printing

- Photopolymerization (e.g., stereolithography)
- Granular materials binding (e.g., selective laser sintering)
- Fused deposition modeling aka fused filament fabrication
InfoDesk 3D Printing Service Defined

- First-come first-serve
  - Self-service
  - No cost to user
- No weapons or objects covered by copyright
- Work-related use
What You’ll Need to Get Started
Uses

- Replacement parts
- Custom parts (e.g., prosthetics)
- Functioning prototypes
- True-to-life replicas
- High-resolution models
- Visual aids
- Real world products
Marketing and Promotion

- Display screens
- Signage
- Employee news articles
- Demos
- Social media
- 3D-printed object display
Consumer vs. Professional 3D Printers
3D Builds

- Housing for micro camera lens filters
- Virtual reality goggles
- Electronics cases
- Raspberry Pi cases
- Mathematical structures
- Custom parts for securing components
- Prototype enclosure for custom electronics
- Adjustable wrenches
- RepRap 3D printers
- Pebble watch chargers
- Mobile phone cases and holders
- Cookie cutters
- Commemorative coins
- Medical products
Reception

- **3D printer sparks conversation**
  - “This is great. Whose idea was it and who funded it?”
  - “One finger splint, printed in just under an hour! That thing works like a champ.”

- **Brings awareness to InfoCenter spaces and InfoDesk Services**
Things to Consider When Setting Up a 3D Printing Service

- Equipment costs
- Product reliability
- Health and safety
- Use policy
- Staffing
- Staff training
- Firmware and software updates
- Volatile market space
- Noise
- Modularity
- Documentation

- Internet-based software functionality behind corporate firewall
- Furniture, power and network
- Tools and spare parts
- Samples collection
- Service cost model
- Down-time and maintenance support
- Differing levels of user coaching needed
- Intellectual property
- Product liability
What's Important from the Perspective of a User?

Source: IDC, 3D Printing Moves from Hype to an Innovative, Disruptive Force in 2015 and Beyond, March 18, 2015.
Common Problems with 3D Printers

- Extruder clogging
- Curling
- Surface quality
- Poor extrusion
- Filament tangling
- Power outages
What’s Next?

- Tethered iPads
- Microsoft Surface table
- 3D pens
- Arduinos
- Raspberry Pis
- LittleBits
- Conductive thread/LED craft kits
Resources

- Make: Magazine Annual Guide to 3D Printing
- Makerspaces in Libraries distribution list: librarymakerspace-l@lists.ufl.edu
Conferences

- MakerCon
- 3D Printer World
- Consumer Electronics Show
3D Model Repositories

- Thingiverse (MakerBot) [http://www.thingiverse.com](http://www.thingiverse.com)
- GrabCAD [https://grabcad.com/library](https://grabcad.com/library)
Free 3D Modeling Programs

- 123D Design (Autodesk), [http://www.123dapp.com/design-alt](http://www.123dapp.com/design-alt) (Download)
- Meshmixer (Autodesk) [http://www.meshmixer.com/download.html](http://www.meshmixer.com/download.html) (Download)
- Tinkercad (Autodesk) [https://www.tinkercad.com/](https://www.tinkercad.com/) (web-based); best with Chrome and FireFox
- NetFabb Basic [http://www.netfabb.com/](http://www.netfabb.com/) (Download); use to fix/repair 3D printer files
- Sculptris (Pixologic) [http://pixologic.com/sculptris/](http://pixologic.com/sculptris/) (Download); works like virtual modeling clay
**MITRE InfoCenter 3D Printing Log Sheet**

Please log each 3D print job. Include start and estimated end times.

**Restrictions on use:** The InfoDesk 3D printers are restricted to work-related use. You may not print weapons such as guns and knives or objects under copyright protection.

**Safety concerns:** The MakerBot Replicator extruder nozzle heats up to 215°C. Do not touch the extruder nozzle during or right after use. Also, use caution when using tools (i.e., spatula, snips, pliers) to remove objects from the build plate or to trim support structure and rafts. Work gloves and eye protection are provided for your safety.

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<thead>
<tr>
<th>Brief Description of Object Printed</th>
<th>Name and Phone Number</th>
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<tbody>
<tr>
<td><strong>Date:</strong></td>
<td><strong>Name:</strong></td>
</tr>
<tr>
<td><strong>Start Time:</strong></td>
<td><strong>Phone (if leaving InfoCenter):</strong></td>
</tr>
<tr>
<td><strong>Est. End Time:</strong></td>
<td></td>
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Questions?

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