Technology Innovation Design and Entrepreneurship Studio

Addlestone Library Proposal

February 2017

Introduction

by Christopher Starr

Mission

The mission of TIDES is to connect all liberal arts students at the College of Charleston who have ideas, creative potential and a desire for self-directed learning with the digitally enabled tooling of the 21st century to safely explore, experiment, create, test and learn.

Vision

The vision of TIDES is to grow and support an inclusive, interdisciplinary, autodidactic maker community of student scholars through state-of-the-art digital design, automation, and fabrication technologies.

TIDES as a Community

TIDE Studio is supports maker services and a maker community. The distinction is important for the success of this makerspace initiative for Addlestone.

TIDE Studio supports maker services. A maker service (Service) is a production-oriented service offered to students, faculty and staff. Just as the library provides 2D laser printers at stations that queue and release jobs, TIDE Studio can offer services such as 3D printing. One or more 3D printers with a standard filament type such as PLA, would be positioned as library services. Students could print their models to a queue for the printers in the service group. Like 2D printing a paper, services would be as automated and reliable as possible. A service level agreement would define the minimum service performance expectations.

TIDE Studio supports a maker community. A maker community (Community) is a focus on the interaction and mentor support of students, faculty and staff. The focus of Community is on abstractions above the level of a 3D printing service or any Service for that matter. The notion of Community is based on the notion of academic community where people work with or near each other on the same or different problems through which problem solving, creativity, innovation and design are explored and shared.

TIDES Community and Services can be set up near each other, but likely to not exist in the same footprint. Applying the principle called separation of concerns, the Services are manned and monitored with processes that are already in place for other library services, including scheduling, access, training and maintenance. The TIDES Community is the hub of human-centered activities supported by TIDES for its makerspace, enabled by services and other tooling that has not yet risen to the level of service.

Inevitably technology matures. Through incremental improvements in hardware and software, digital maker tooling in the TIDES Community space such as 3D printing will become more stable, expertly understood from perspectives of reliability, availability, maintenance and productivity. It is at these points that a technology can be added to the Service offerings of TIDES in Addlestone. The Community in fact will be the progenitor and enabler of new Service offerings over time.

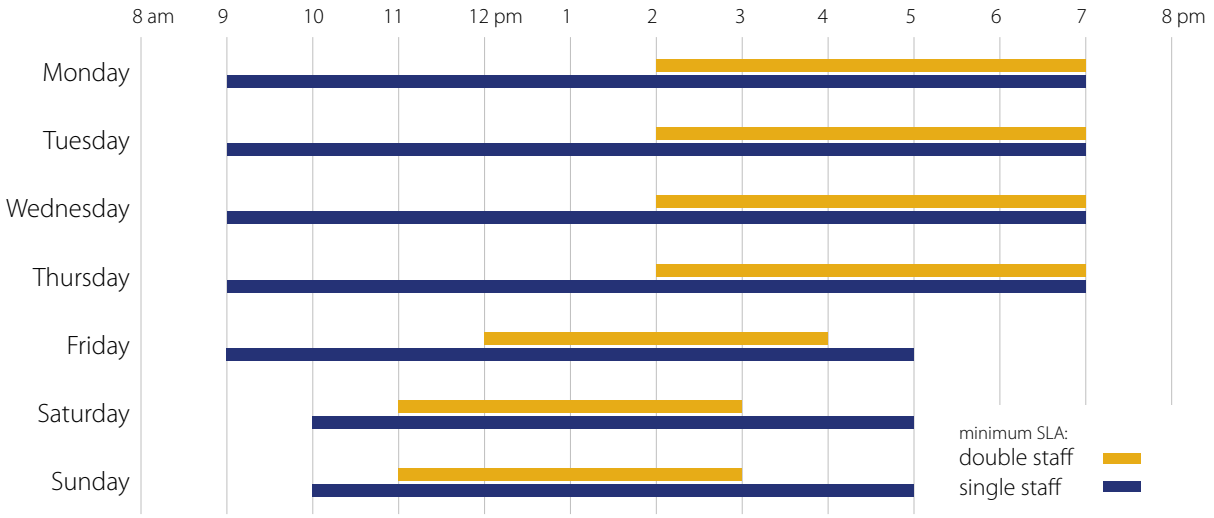
TIDES Services will be important to the student, faculty and staff population in support of scaling out to larger and larger groups of service consumers. The TIDES Community is equally important for different reasons, in support of new types of individual and group interaction that will be possible in the library.

Operations

Schedule and Staffing

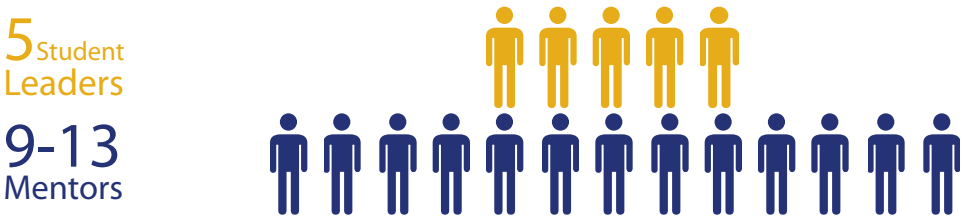
Schedule

This semester TIDES is open 40 hours per week, operated entirely by a team of seven volunteer mentors who are committed to the vision of TIDES. For the Fall 2017 semester, we will be open an additional 22 hours each week, with the goal of adding even more hours as we grow. TIDES will operate seven days a week throughout the semester. Our hours of operation will be Monday-Thursday from 9am-7pm, Friday 9am-5pm, and Saturday/Sunday 10am-5pm.



Staffing Requirements

In addition to one or more library staff members, there will be one TIDES mentor on duty at all times, and a second mentor on duty during the busiest 50% of each day (*see above*). Paying $10/hr, we estimate our wage expense to be $16,000 per semester. We will look to hire and train between 9 and 13 mentors before the third week in August. Mentors will be asked to make at least a one semester commitment.

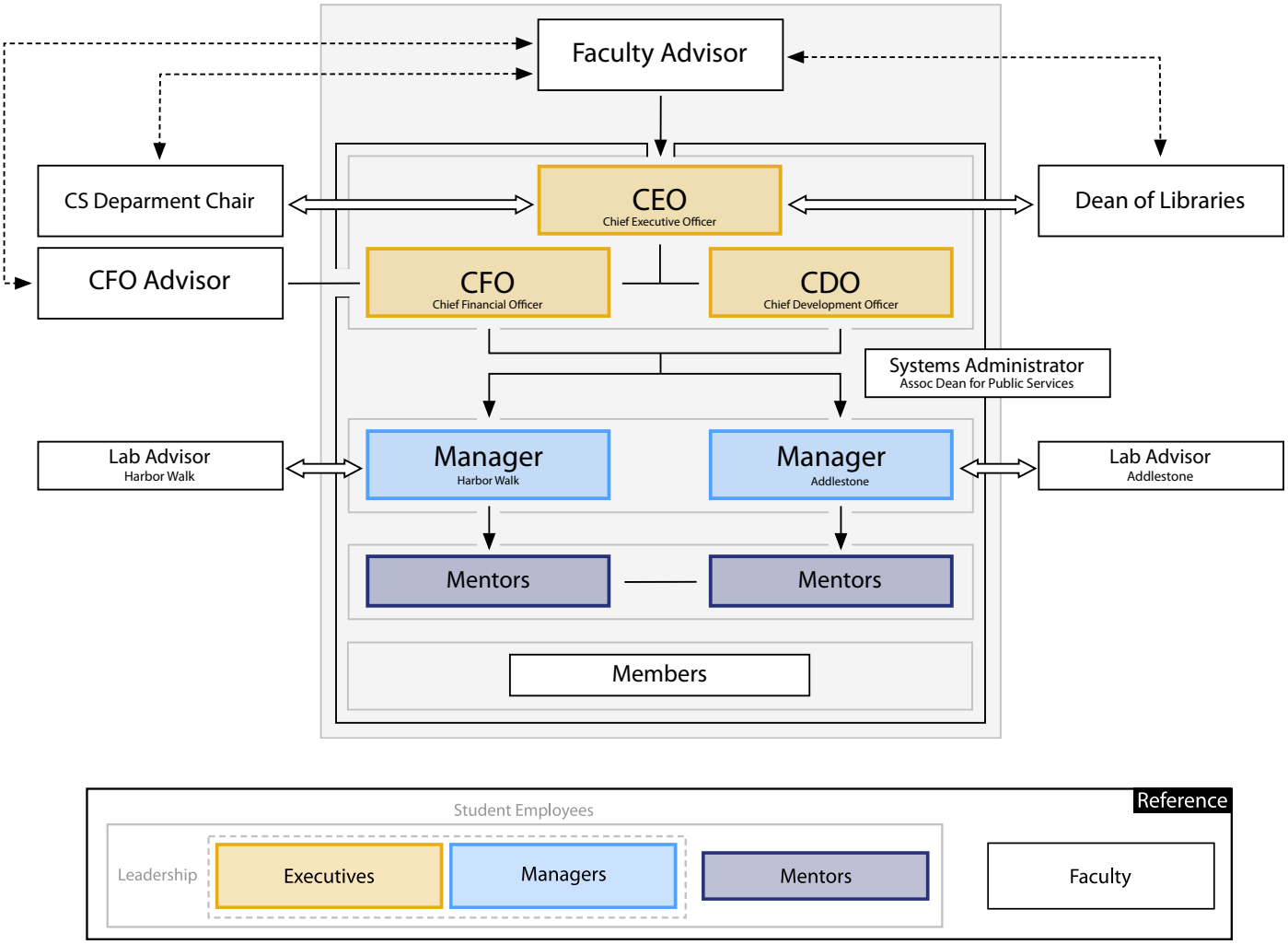


Operations

Leadership and Members

TIDES' leadership team will consist of five undergraduate or graduate students. The Chief Executive Officer (CEO) will be chosen by the Faculty Advisor. The CEO and Faculty advisor will then choose a CFO, CDO, and two lab managers. Each member of the leadership team will serve a term of one academic-year, and may serve in the same position for multiple terms. TIDES executives, managers, and mentors are at-will employees. The CEO may terminate a mentor or member of the leadership team only with written approval from the Faculty Advisor. The Faculty Advisor reserves the sole right to terminate any mentor, manager, or executive.

Membership is available to all CofC students, faculty, and staff. Prospective Members must complete training on at least one piece of lab equipment, complete safety training, and sign a membership agreement.



Technology and Capabilities

2D Design and Fabrication

Vinyl Cutter

Because of its ease of use and widespread application, the vinyl cutter lowers the barrier to entry for novice Members. The vinyl can be used to create both stickers and t-shirt graphics, and requires little or no experience to get started. Cuts often take less than five minutes and have extremely high reliability, which makes it a useful tool to engage students visiting TIDES for the first time. The vinyl cutter requires very little maintenance, and in our first year of operation has never been out of order. TIDES mentors monitor supplies to ensure that students always have access to an assortment of colors of both sticker vinyl and t-shirt vinyl. Due to its popularity, the vinyl cutter will only be made available for reservation during hours of low community traffic .

T-Shirt Press

Members can make a t-shirt from any SVG design using our t-shirt press. TIDES provides access to over 15 different colors of heat press vinyl that can be transferred onto a t-shirt in less than 30 seconds, and Members must supply their own t-shirts. Our heat press vinyl is safe for wash and extremely durable, which allows any CofC student to create professional quality t-shirt graphics. We encourage student entrepreneurship, and makes every reasonable effort to accommodate Members wishing to use TIDES to launch their business. We currently enforce a 50 shirt limit for members selling shirts made in TIDES. After reaching the 25 shirt limit, members wishing to continue their business may still use the t-shirt press, however they must supply their own vinyl. In addition, the t-shirt press will not be available for reservation for Members or businesses that exceed the 50 shirt limit.

SVG Design Software

The vinyl cutter requires files to be in scalable vector graphics (SVG) format. Members who wish to use the vinyl cutter will have access to our SVG design applications, however, our desktop iMac is required for transferring data to the vinyl cutter, therefore Members using the vinyl cutter will have priority access to the computer. Each member is encouraged to download appropriate software on their personal device. TIDES recommends that Members use the open-source software program Inkscape — a beginner friendly vector-based design application that can be downloaded for free on Windows, Mac, and Linux. For advanced work, Members may opt to use either Adobe Illustrator or Affinity Designer. In our first semester of operation, we have observed that most students wishing to use the vinyl cutter are unfamiliar with SVG graphics and require assistance transferring pixel-based designs over to SVG. All TIDES mentors are required to be proficient in SVG design to the extent that they can assist novice Members, however in the spirit of the DIY community that TIDES envisions, mentors are asked to avoid converting multiple designs for a single member as it discourages the growth and learning that ultimately supports services.

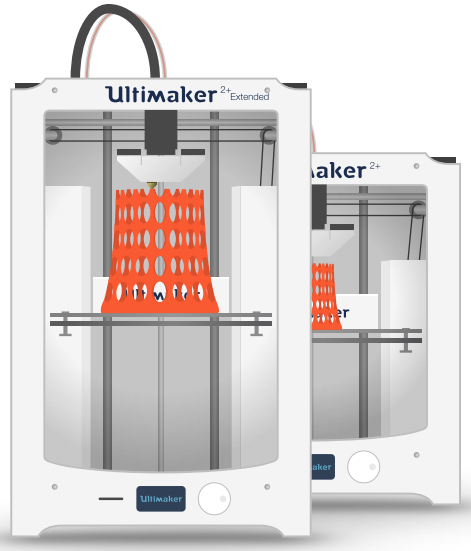
Technology and Capabilities

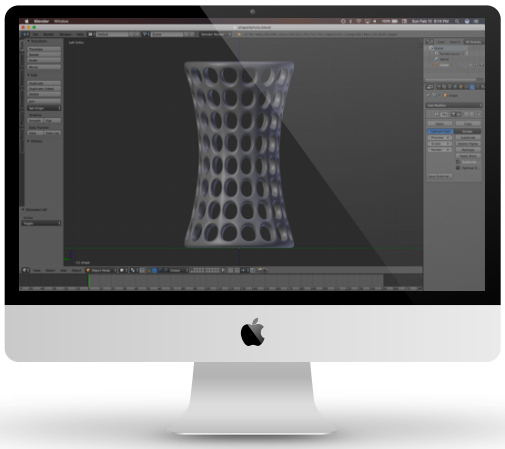
3D Design and Fabrication

Ultimaker 3D Printers

TIDES has three Ultimaker 3D printers that can be used to create anything from functional prototypes to stunning works of art.The vast majority of prints are done using PLA filament due to its ease of use, however, we capable of printing with a wide range of specialty materials such as elastic, nylon, CPE, and carbon fiber.

Extrusion-based printers such as the Ultimaker, require regular maintenance and servicing.TIDES mentors are trained perform all maintenance necessary to keep printers in use, and have been able to resolve all repairs in less than 24 hours. With three printers, we estimate at least one printer will be operable 95% of business days. In our first five months, we have never had more than one printer out of order at any time.





Software

Our desktop iMac is loaded with an array of 3D design software programs. This allows novice users the opportunity to be exposed to an assortment of GUIs before beginning a project. Some of our most popular 3D design programs include Blender, TinkerCAD, SketchUp, Autodesk Fusion 360, AutoCAD, and Maya. In spirit of the DIY community that TIDES aims to develop, we encourage our Members to install their preferred design software on their personal device so that they can continue to develop their skills independent of our laboratory. Although TIDES does provide access to proprietary software, we strongly promote the use of free, open source software such as Blender for all Members because of the abundant learning resources available online.

Occipital Structure Sensor

The Occipital Structure Sensor is a 3D scanner that allows Members to use our 3D printers and design software to their full potential. It is now easier than ever to design and print models to augment elements of the physical world. Structure is attached to the back of a 9.7-inch iPad Pro, which provides the requisite processing power, as well as a friendly, easy to use GUI. We believe Structure Sensor's performance, versatility, and ease of use will cause greater demand as our membership grows. In preparation, we intend to purchase at least two more sensors to be made available for checkout through the library help desk.

Technology and Capabilities

Internet of Things

Microcontrollers and SBCs

The Internet of Things (IOT) is one of the largest technological developments of the 21st century. Due to the low cost of microprocessors everyday items are now capable of sharing information in real time in the cloud, creating entirely new classes of 'smart' products. TIDES gives Members the opportunity to develop products in the IOT via powerful microcontrollers and single-board computers.

TIDES Members have access to both Arduino and Raspberry Pi development kits as well as an assortment of electronic components (sensors, dials, switches, etc.). For any projects that require components that TIDES does not carry, Members can request necessary components through a member purchase order (MPO) form.

For the Fall 2017 semester, five (5) Arduino and three (3) Raspberry Pi will be made available for check out, as well as supplementary electrical components (not including monitors, keyboards and mice). Demand for both Arduino and Raspberry Pi kits will be monitored closely, and TIDES' inventory will be scaled as necessary. Members who have not worked with electronic hardware will be encouraged to develop their skills using free online learning tools and simulators such as Autodesk Circuits. In addition, TIDES will hold occasional teaching seminars on Arduino and Raspberry Pi development.

	Arduino	Raspberry Pi
Category	Microcontroller	Single-Board Computer
Operating System	n/a	Linux
IDE	Arduino 1.8.1	n/a
Programming Language	C	Python, Scratch
Required Supplemental Components	• PC (Windows, Mac, or Linux) • Arduino IDE	• HDMI monitor • USB type-A mouse/keyboard
Main Component Board		

Technology and Capabilities

Equipment Summary

	Quantity	Difficulty	Available for Reservation	Available for Checkout	Available as a Service	Requires Consumables
Vinyl Cutter	1	Low	✗	✗	✗	✓
T-Shirt Press	1	Low	✓	✗	✗	✗
Button Maker	1	Low	✓	✗	✓	✓
iMac 5k 27-inch	1	Low	✗	✗	✗	✗
Ultimaker 2+ (a)	1	Medium	✓	✗	✓	✓
Ultimaker 2+ (b)	1	Medium	✗	✗	✗	✓
Ultimaker 2+ Extended	1	Medium	✗	✗	✗	✓
Occipital Structure	1	Medium	✗	✓	✗	✗
Arduino Uno	10	Medium	✗	✓	✗	✓
Raspberry Pi	6	High	✗	✓	✗	✗