



EDMONTON MAKERSPACE REPORT
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FOR EDMONTON ECONOMIC DEVELOPMENT CORPORATION
MAKE SOMETHING EDMONTON / STARTUP EDMONTON
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1. EXECUTIVE SUMMARY

This report outlines research conducted by Carmen Douville for Make Something Edmonton on the makers' economy in Edmonton, the needs of this industry and an analysis of gaps in the market. Additionally, the report includes discovery and market analysis of the feasibility of a makerspace in Edmonton. It concludes by outlining the needs, feasibility and recommended process to move forward with a makerspace in Edmonton.

Community research and interviews were conducted with 70 Edmonton makers. Their background and experience varied and included:

- architects
- artists, engineers
- bicycle frame builders
- biomedical engineers and
- ceramists
- computer scientists
- crafters
- hardware developers
- hobbyists
- industrial designers
- landscape architects
- metal workers
- millworkers
- physical computer engineers
- set designers
- shoe designers
- small construction companies
- woodworkers

Additional analysis and research was conducted via case studies and online databases.

After detailed analysis, there is a clear need for a makerspace in Edmonton. Edmonton Economic Development Corporation, Make Something Edmonton and Startup Edmonton should advocate for the advancement of a makerspace.

The suggested business structure should be modeled after a recreation centre style. Details of which are outlined in this report. Both private and public financial support and funding should be explored; different models are included for consideration in this report.

Staffing recommendations outline a variety of needs dependent on final decisions for the makerspace; however a minimum of three to six full time staff, additional part time staff and instructors are needed for a sustainable operation.

The makerspace should be a minimum of 8,000 square feet, although 12,000 up to 18,000 square feet should be considered, which would allow for more flexibility and a greater array of tooling and options for space use. Additional physical recommendations include: adequate amount of classroom and workshop space consisting of metal, wood and digital labs, makers and consumables storefronts/retail space, suitable and varied storage spaces for members, and a number of co-working and independent studios available for rent.

A tiered membership structure should be offered. This would offer feasible costs for professionals and hobbyists.

Foreseeable outcomes include economic, social and environmental benefits. An assortment of makers, both entrepreneurs and hobbyists, will have an opportunity to access tools, knowledge, support and a community.

MISSION STATEMENT

To create a community hub and entrepreneurial incubator for makers in the City of Edmonton by providing access to affordable tools, resources, lessons, and a shared space.

2. PROJECT BACKGROUND

MAKERSPACE DESCRIPTION

What started off in the basements and garages of various creators and makers has blossomed into community hubs of innovation and design: the makerspace.

“Makerspace” is a general term to describe a manufacturing and innovation space, which allows people to pursue a variety of interests, including art, electronics, woodcraft, sewing crafts, mechanics, computer software and robotics.¹

Other types of makerspaces include hackerspaces and fab (fabrication) labs. Hackerspaces focus on working with computers, technology, science, digital or electronic art; analyzing and repurposing computer hardware; working on electronic components; and developing software.²

Fab labs, conceived originally at the Massachusetts Institute of Technology, typically allow people to make anything after completing a basic instruction class. They focus on fabrication using 3D printers, basic electronic equipment, laser cutters, vinyl cutters and CNC (computer numerical control) milling machines.³

Makerspace are for anyone; clients may range from school-aged children to seniors. All these spaces for creation have emerged as a haven for “hobbyists, makers, artists, builders, hardware developers, engineers, scientists, and entrepreneurs — anyone with a curious mind who wants to make something”.⁴

Makerspaces offer a physical location for people to collaborate, use tools and often participate in structured or programmed learning opportunities such as specific classes or workshops. They are an incubator for innovation, applications, and products. They combine manufacturing equipment, community and education to enable people to design, prototype and create manufactured works. The products developed in a makerspace may be physical, digital, or a combination of the two.

All makerspaces support peer interaction, a sense of community, as well as personalized learning. They serve as portals for learning, collaboration, problem solving and self-expression. When managed well, they rapidly evolve and reconfigure to support the interesting and new.

Makerspaces grant members’ access to tools, teach people how to use the tools, and introduce them to new techniques and skills through workshops and training. Makerspaces fulfill a need when ownership of a tool is cost or space prohibitive, helping reduce environmental waste, and clutter in the home. As more people downsize to smaller homes or choose to live in urban condos and apartments, makerspaces provide easy access to tools and workspaces like never before. These spaces are helping a new generation of makers create products they never could have before, and are helping launch a whole wave of new creative economy, maker-founded businesses.

¹ G. Cavalcant, ‘Is it a Hackerspace, Makerspace, TechShop, or FabLab?’, <http://makezine.com/2013/05/22/the-difference-between-hackerspaces-makerspaces-techshops-and-fablabs/2013>, (accessed 10 March 2015).

² E. Kroski, ‘The 4 Flavors of Makerspaces’, <http://oedb.org/ilibrarian/4-flavors-makerspaces/>, 2014 (accessed 10 March 2015).

³ G. Cavalcant, ‘Is it a Hackerspace, Makerspace, TechShop, or FabLab?’, <http://makezine.com/2013/05/22/the-difference-between-hackerspaces-makerspaces-techshops-and-fablabs/2013>, (accessed 10 March 2015).

⁴ Staten Island Makerspace, ‘Home’, <http://www.makerspace.nyc/2015>, (accessed 10 March 2015).

Makerspaces are found in a variety of locations in cities across the continent. They're being added to libraries and schools and are popping up in community centres. Libraries view makerspaces as a way to entice new members, and reaffirm their role as community hubs.⁵ At schools, makerspaces allow students to begin making at an early age and provide for new methods of hands-on teaching and learning opportunities.⁶ Community-based makerspaces are often committee-governed startups with membership revenue being used to fund monthly overhead.⁷ Finally, commercial makerspaces are either for profit or non-profit enterprises that positively contribute to the immediate community and surrounding area.⁸

TechShops, a US-based makerspace, is an example of a profit generating commercial enterprise that focuses on providing public access to a variety of spaces, equipment and programs.⁹ Every TechShop includes woodworking, machining, welding, sewing, and 3D fabrication capabilities. Supplementary tooling and equipment are chosen to suit the distinct needs of each market.

Makerspaces are vital to a city's creative economy. People have access to affordable prototyping and manufacturing facilities, spurring on growth of new businesses and the manufacturing and design industries overall.¹⁰

The opportunity for social interaction is a significant part of the success of makerspaces and differentiates them from tool libraries, equipment rental outfits or other small studio spaces. Many businesses and projects have benefited from the collaborative component of makerspaces by connecting people to develop solutions to problems or opportunities together. A makerspace can also include an entrepreneurial centre that incorporates small business development curriculum, incubators, and accelerator programs that can truly jump start people's ideas and projects.¹¹

⁵ E. Kroski, 'A Librarian's Guide to Makerspaces: 16 Resources', <http://oedb.org/ilibrarian/a-librarians-guide-to-makerspaces/>, 2013, (accessed 10 March 2015).

⁶ Makerspace, 'Makerspace Playbook: School Edition', MakerMedia, <http://makered.org/wp-content/uploads/2014/09/Makerspace-Playbook-Feb-2013.pdf>, Spring 2013, (accessed 10 March 2015). Pg. 3.

⁷ Lalande, L., 'Community Makerspace', <http://trueinnovators.com/community-makerspaces/>, 2013, (accessed 10 March 2015).

⁸ Cavalcant, G., 'Is it a Hackerspace, Makerspace, TechShop, or FabLab?', <http://makezine.com/2013/05/22/the-difference-between-hackerspaces-makerspaces-techshops-and-fablabs/>, 2013, (accessed 10 March 2015).

⁹ Cavalcant, G., 'Is it a Hackerspace, Makerspace, TechShop, or FabLab?', <http://makezine.com/2013/05/22/the-difference-between-hackerspaces-makerspaces-techshops-and-fablabs/>, 2013, (accessed 10 March 2015).

¹⁰ The White House, *FACT SHEET: President Obama to Host First-Ever White House Maker Faire*, [media release], 18 June 2014, The White House, <https://www.whitehouse.gov/the-press-office/2014/06/18/fact-sheet-president-obama-host-first-ever-white-house-maker-faire>, (accessed 10 March 2015).

¹¹ NYCEDC, 'An Inside Look at NYC's Incubators: Staten Island MakerSpace', 12 October 2014, <http://www.nycedc.com/blog-entry/inside-look-nycs-incubators-staten-island-makerspace>, (accessed 10 March 2015).

VENTURE ANALYSIS: MAKERSPACE BUSINESS MODEL AND OPPORTUNITY FOR GROWTH

As a concept, organizations, governments and communities are starting to view makerspaces as a viable opportunity. However, few makerspaces have existed long enough, or have seen successful expansion, to be considered established.

Analysis of makerspaces by a group of researchers across Canada found that there are approximately a thousand makerspaces worldwide, with more than 40 located in Canada.¹² Many cities in developed countries already have one or two makerspaces, but larger urban areas can support more. Makerspaces are a means to solve economic problems by encouraging education, product development and business development.¹³¹⁴ Makerspaces can help entrepreneurs and makers shorten the length of time from the conception of an idea to selling it in the marketplace.¹⁵

Commercial makerspaces have an opportunity for revenue generating activities depending on the type of services provided.¹⁶ Beyond supporting education and collaboration, revenue sources include sponsorship, subleasing space, and providing retail space to makers selling goods. In general, the more services that can be provided from the makerspace, the greater the opportunity for a positive revenue stream. The preliminary research that was conducted explored the local makers economy, finding gaps that exists and opportunities in fostering a local makerspace.

ANALYSIS OF MAKERSPACE MODELS

Makerspaces take a variety of forms. Notable makerspaces in Canada include AssentWorks in Winnipeg, Makerspace in Victoria, Helios in Montreal, and The Shop and The Tool Library in Toronto. In the United States, TechShop is one of the largest outfits, with various locations across the country. ADX in Portland, Artisan Asylum in Massachusetts, Staten Island MakerSpace in Staten Island, Makelt Labs in New Hampshire and Maker Works in Massachusetts are other examples.

¹² The Million Dollar Question: Secrets to a Successful Commercial Makerspace, 2013, 'SWOT and Venture Analysis', <http://blogs.ubc.ca/etec522makerspaces2013/analysis/>, (accessed 10 March 2015).

¹³ The Conference Board of Canada, *Valuing Culture: Measuring and Understanding Canada's Creative Economy*, Canada, The Conference Board of Canada, 2008. p. 3.

¹⁴ Action Canada, *Creativity Unleashed: Taking innovation out of the laboratory and into the labour force*, <http://www.actioncanada.ca/wp-content/uploads/2014/04/AC-TF3-Creativity-Report-EN-web.pdf>, 2011-2012, (accessed 10 March 2015).

¹⁵ M. Gryczan, ' 'Makerspace' movement brings invention- and some contention- to Grand Rapids', <http://www.craigslist.com/article/20140209/NEWS/302099997/makerspace-movement-brings-invention-and-some-contention>.9 February 2014, (accessed 15 February 2015).

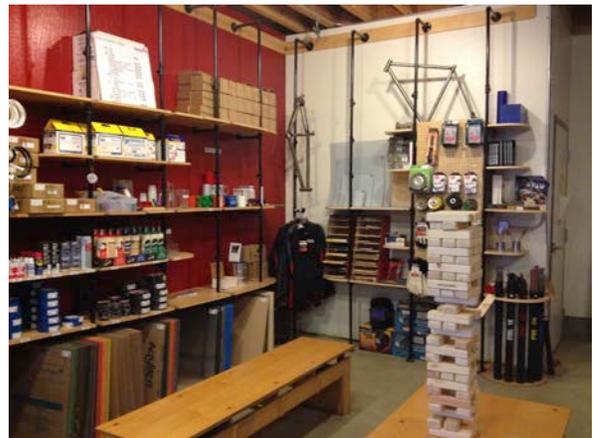
¹⁶ The Million Dollar Question: Secrets to a Successful Commercial Makerspace, 2013, 'Makerspaces', <http://blogs.ubc.ca/etec522makerspaces2013/analysis/>, (accessed 10 March 2015).

Techshop (<http://techshop.ws/>), has locations in San Francisco, San Jose, Detroit, Austin, Pittsburgh, Chandler, Washington DC and soon to be in St. Louis and Los Angeles. Each location offers a range of tools and equipment. TechShop also offers training on each piece of equipment and supports continuous learning through programming and workshops. Facilities typically feature a 15,000+ square foot floor plan including classroom and workshop space, a creative brainstorming lounge and a retail store stocked with convenience materials and consumables. Additional storage is available for members' at an extra charge. A limited number of private workshop/studio rooms are also available to members for rental by the month or by year.



TechShop San Francisco

After they complete safety training and learn the basics on using equipment, Techshop members may use all tools and equipment, and access the spacious workshop with numerous large worktables. Members can pick parts and materials from the bin wall and have free use of conference rooms, computer workstations with software, wi-fi with high speed internet access, and attend members-only meetups and other special events and get access to technicians. Techshop has various memberships for students, individuals, families and corporations at monthly or yearly fees.



TechShop San Francisco Consumables Store

Artisans Asylum (<http://artisansasylum.com/>), in Somerville, MA, started in 2010 with 1,000 square feet. In two and a half years it has successfully expanded and now operates out of 40,000 square feet. Its 300 members use \$3,000,000 worth of tools, access 140 private studio spaces, 45 pallet storage units, and over 80 shelf storage units available for rent.



Artisan Asylum

<https://krash.io/wp-content/uploads/2013/06/artisans-asylum.jpg>

Artisans Asylum offers classes, space, and shared equipment to support disciplines including welding, machining, woodworking, jewellery, hot glass, rapid prototyping, foam, fabrics, plastics, electronics, and robotics. In addition, they have 250-300 students per month attending 40-50 classes. They seek to lower the barriers to creativity by supporting and promoting the teaching, learning and practice of design and fabrication of all varieties.

ADX (<http://www.adxportland.com/>) in Portland, at 14,000 square feet, has a very clear motto: *Share tools, share knowledge and share space*. They cater to both full time makers and hobbyists, and structure their membership categories accordingly. Depending on membership level, users have full access to the digital design lab, tool library, shared and workspace, and get partnership benefits and discounts on classes and services like 3D printing and laser cutting. Other membership levels are based on hours of access or a “drop-in,” set number of visits.



ADX Portland
http://www.adxportland.com/wp-content/uploads/2014/06/8596596084_26b95f6a8d_b.jpg

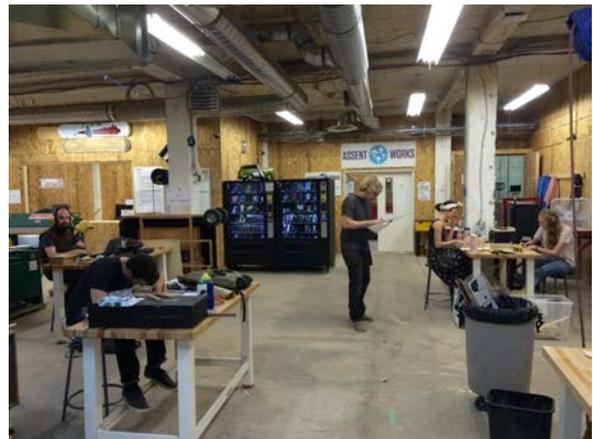
Dedicated workspaces and co-working spaces are available for an additional fee. An additional feature of ADX Portland is that it has an in house custom design and fabrication team. ADX works closely with clients to estimate, design and execute a project by utilizing their extensive network of clients, partners, and suppliers both in-house and nation-wide.

Makelt Labs (<http://makeitlabs.com>) in Nashua, NH was founded in 2012 by Joseph Schlesinger. Less than a year after it opened, this non-profit organization was easily able to cover its costs, with just 57 members signed on.¹⁷ At 6,000 square feet, this makerspace includes metalworking, welding, machining, automotive, carpentry, electronics and programming workshops. Additional bench and 100 square feet plot rentals are available for set monthly fees. Memberships are less than \$100/mo.



Makelt Lab
http://static1.squarespace.com/static/54e78ccde4b0f93fea044610/t/54e79963e4b056f5cc37221b/1424464242082/IMG_2240.jpg?format=1500w

Launched in 2011, **AssentWorks** (<http://assentworks.ca/>) in Winnipeg is Canada’s largest makerspace at 14,000 square feet. A non-profit, it is run by volunteers. Its nearly 150 members and 20+ startup space members produce about three prototypes per week. One product, called The Heft — a clip-on ergonomic handle for long handled tools, such as a shovel,— was recently featured on CBC TV’s *Dragon’s Den*. The owners have just signed a deal to distribute it with a national retailer. AssentWorks also has a larger startup community of about 750 people who participate in meetups. In early 2013, AssentWorks received \$467,000 from the federal

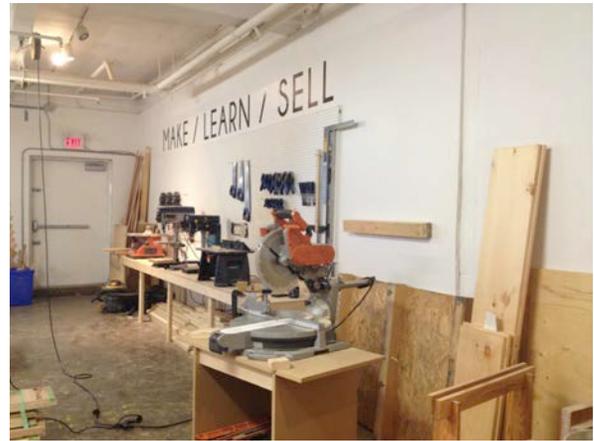


AssentWorks
[://pbs.twimg.com/media/BqB2jB4COAAY3Ww.jpg:large](https://pbs.twimg.com/media/BqB2jB4COAAY3Ww.jpg:large)

¹⁷ D. O’Brien, ‘Trio Plans ‘makerspace’ for Lowell’, *Lowell Sun*, 17 March 2013, http://www.lowellsun.com/business/ci_22810631/, (accessed 10 March 2015).

government through the Western Diversification Program. This funding enabled AssentWorks to expand and enhance their technological capacity to develop prototypes in Manitoba.¹⁸

The Shop (<http://www.theshoptoronto.ca/>) in Toronto, open since Spring 2014, is 1,300 square foot commercial makerspace. The co-owners have created an environment which focuses on woodworking, ceramics and crafts. The Shop hosts a wide variety of workshops and classes taught by local design professionals. The membership base is modest, but programming is proving success with full workshops running approximately 1-3 times per week. In addition, The Shop recently created an online retail platform for members to sell their wares. Memberships range from \$30-\$45 for daily drop-ins to \$95-\$108 for monthly memberships.



The Shop

Kwartzlab Makerspace (<http://www.kwartzlab.ca>), opened in 2009 in Kitchener. At 2,400 square feet, it offers woodworking, metalworking, digital fabrication, electronics and a craft working studio. Kwartzlab is a non-profit, co-operative, member run makerspace. Their members define and set the culture, space and resources. Memberships are \$50/month.



Kwartzlab Makerspace

http://www.kwartzlab.ca/wp-content/uploads/2013/12/DSC_2226.jpg

Helios (<http://heliospace.ca>) in Montreal, opened in mid-2014, is a non-profit workshop. With five co-founders and three volunteers. This makerspace offers access to 1,400 square feet of metalworking, woodworking, plasticworking, electronics, programming and 3D printing. 600 additional square feet is dedicated to rentable space. Helios secured startup capital through a combination of crowdfunding, founders funding, and donations of money and tools. In its first six months, Helios attracted 60 members. Their marketing has been directed at recent graduates looking for space to work, but is open to all makers. Recently the co-founders have expanded their business to provide engineering and design consultation.



Helios

¹⁸ Western Economic Diversification Canada, *Harper Government Announces Support for Innovation in Manitoba*, [media release], 1 March 2013, http://www.wd-deo.gc.ca/eng/77_14436.asp, (accessed 10 March 2015).

3. EDMONTON CONTEXT

PROJECT ORIGINS

Edmonton Economic Development, Make Something Edmonton, and Startup Edmonton are considering the benefits a makerspace could offer to the makers' community in Edmonton. Until now there has been little research on who and what encompassed the makers economy in Edmonton, and what is needed to foster growth in this creative economy.

Seventy people from different backgrounds and with varying experience were interviewed for this research. They included:

- apparel designers
- architects
- artists
- bicycle frame builders
- biomedical engineers
- ceramists
- computer scientists
- crafters
- engineers
- hardware developers
- hobbyists
- industrial designers
- landscape architects
- metal workers
- millworkers
- physical computer engineers
- set designers
- small construction companies.
- woodworkers

In addition to collecting their views on the need for and the role of makerspaces, they were asked about their current costs, challenges, and needs as makers. Everyone expressed great interest in having the ability to access a makerspace. But needs varied: some desired full time access, while others were only interested in access to specific tooling for special projects.

All expressed interest in mentorship or growing their knowledge base, whether that was business and marketing advice, sharing community expertise, or just the opportunity to meet other like minded individuals in the city. Furthermore, there was an almost universal need to have better access to a wide range of tooling and for stronger community and mentorship among makers.

MARKET ANALYSIS

Edmonton has one of the most diversified economies in Canada, with Edmontonians enjoying a per capita income that is higher than the national average. Additionally, Edmonton continues to be one of Canada's fastest growing cities.¹⁹

Edmonton benefits from a younger, growing population– and one actively motivated to work. Over the past decade, Edmonton's population has grown 1.5% - 3% per year with the 2011 Canadian census indicating 11.2% growth for the City of Edmonton between 2006 and 2011, double the national

¹⁹ The City of Edmonton, 'Labour Force to 2008-2009', http://www.edmonton.ca/business_economy/economic_data/labour-force-to-2008-09.aspx, 2013, (accessed 10 March 2015).

average. Almost 40% of the city’s population is between ages 20 to 44. A 73.5% workforce participation rate illustrates a population actively engaged in Edmonton’s economic prosperity.²⁰

Employment by Industry

Total Employed By All Industries	718100	100%
Retail and wholesale trade	119300	17%
Health care and social assistance	81300	11%
Construction	80900	11%
Manufacturing	57100	8%
Professional, scientific and technical services	48900	7%
Accommodation and food services	45000	6%
Educational Services	44600	6%
Other services	38600	5%
Transportation and warehousing	38500	5%
Finance, insurance, real estate and leasing	38500	5%
Public administration	38200	5%
Forestry, fishing, mining, quarrying, oil and gas	28800	4%
Business, building and other support	24400	3%
Information, culture and recreation	22800	3%
Utilities	6200	1%
Agriculture	5000	1%

Enterprise Edmonton, ‘Labour Force: Find Our Strengths In Our Numbers’, <http://enterprisedmonton.com/why-edmonton/labour-force/>, 2013, (accessed 10 January 2015).

The industries highlighted above either directly or indirectly employ, depend, or benefit from the makers economy. As such, it is expected that a makerspace could provide benefit to these industries and those employed within.

Estimated at 29.9% of Edmonton’s workforce by the Creative Alberta Report, Edmonton has a thriving creative class. Edmonton has the fourth largest number of scientists and technicians per 1000 workers amongst all major Canadian metropolitan areas. In addition, the Canadian Federation of Independent Businesses ranks Edmonton as the fifth most entrepreneurial city in Canada, sitting at the 6th largest numbers of business establishments per capita in Canada.²¹

Edmonton’s creative class is the driving client for a makerspace. They are engaged in making and manufacturing. They are looking to expand their skills and knowledge as well as find opportunity within their local economy. They have an interest in hands-on prototyping and production is on the rise.

MARKET DEMAND ANALYSIS

LOCAL MAKERS ECONOMY

The goal of all makerspaces today is to create a community of makers and spark a spirit of entrepreneurialism and invention by providing equipment and space for a range of people: from skilled craftspeople to the weekend hobbyist.

Launching a makerspace requires a deep awareness of the target market.

²⁰ The City of Edmonton, ‘Skilled Motivated Workforce’, http://www.edmonton.ca/business_economy/industrial_development/skilled-motivated-workforce.aspx, 2013, (accessed 10 March 2015).

²¹ Creative Alberta, ‘Edmonton’, http://martinprosperity.org/global-cities/Global-Cities_Edmonton.pdf, 2013, (accessed 10 March 2015).

DEMOGRAPHICS

People interested in makerspaces tend to be explorers, tech savvy, and creative. They are generally between 20 to 50 years old. Many have at least some college or university education. The majority of people involved in makerspaces (65-85%) tend to be male.²² Indeed, of the seventy people contacted for this research, the ratio between male and female was 75:25 male/female.

TODAY'S EDMONTON MAKERS

The maker's economy in Edmonton is extremely diverse. Edmonton is home to numerous thinkers, inventors and creative people with a wide range of skills and talents. Many of these makers work alone, in their own garages or workshops.

Some more established makers work in co-owned workshops across the city, yet there are challenges with access to specialized or higher end tooling, such as digital fabrication. Moreover, makers have few options for local manufacturing of small batches of goods.

MARKET FORCES DRIVING THE MAKERS ECONOMY

University of Alberta, MacEwan University and NAIT feed and nurture the maker community and spawn new makers through their fine arts, design, engineering, computer science and business programs. Maker skills are often passed on from one generation to the next, or through community connections both virtual and in-person.

Societal and demographic factors are also at play. For instance, "millennials" are choosing to live in smaller spaces where a dedicated workspace isn't feasible. There is a growing creative class and a return to Do-It-Yourself culture. Increased overhead costs pose additional challenges for individuals who are leasing dedicated workshop space.

WHAT IS NEEDED

Interviews revealed the need for a stronger entrepreneurial support system so that makers can innovate and develop new skills. A makerspace will support the creative economy, spurring economic growth and diversifying the economy.

Many Edmonton makers believe there is a need for a variety of co-working spaces; what is currently available allows for neither cross-pollination among makers, nor for the creative economy to expand.

No one can design through isolation. We need to adopt each other's strengths. A community is needed. Access to tools and technology is needed.

~ Mike Lam, designer and owner, Mike Lam Designs.

I have an expanding business. I would like to share my knowledge with others as well as learn from others.

~ Clay Lowe, designer and instructor at McEwan University

²² The Million Dollar Question: Secrets to a Successful Commercial Makerspace, 2013, 'Community Assessment', <http://blogs.ubc.ca/etec522makerspaces2013/analysis/>, (accessed 10 March 2015).

With growing costs of overhead and many flexible business models that could be adopted, there is a desire for communal spaces that allow for informal and formal workspaces.

Berlin has a thriving makers economy as there are various small business that are supported by cheap communal spaces and venues for meeting, cross collaboration and sharing of tools and knowledge. There is an informal network, sometimes one big yet independent factory. There is an importance in the security of an assured space and overhead. Marketing and business should be integrated into this community.

~ Bernd Hildebrandt, Designer, Artist and Instructor at the University of Alberta

I don't need a space to prototype 365 days a year, but I do need a space to prototype when a new concept comes to mind. To do that, I need to utilize my extra funds to do prototyping and then to manufacturing my goods for market.

~ Jordan Tomnuk, furniture and accessories designer

Furthermore, manufacturing, and particularly small batch manufacturing, is proving to be very challenging for local makers due to the lack of specialized tools as well as the local manufacturing industry's dedication to the oil and gas sector.

I don't make as much stuff as I used to. I am more a designer now because there are such challenges in manufacturing and particularly small batch manufacturing in Edmonton. As a maker it's important to experiment. But it's hard to afford the minimums in the manufacturing world.

~ Vikki Wiercinski, designer, and co-founder and co-producer of Royal Bison

Access to technology and tools was a common topic among those interviewed:

The technology I need to utilize in my making isn't easy to access. In addition to access, I also need support.

~ John Andrus, computer, IT, physical computing, and inventor

Edmonton's makers stated a need for more programming to support and grow their knowledge base, and for specialized tooling.

People who can teach about the tools or who are great techs are hugely important.

~ Dave Butterwick, carpentry and renovation company owner

Programming and education are most important, and they will also provide some cost-recovery [for a makerspace]. The availability of technicians will help people who want to learn, and who are intimidated using new tools.

~ Ben Zittlau, Programmer and Physical Computing

Other needs cited by the majority of makers were to help expand their business and improve their marketing skills.

It would be great to utilize the minds of marketing and business students, to give them real life experience and help me understand my business more.

~ Jordan Tomnuk, furniture and accessories designer

Landon Schedler of Oliver Apt. and Mel Liles, a local designer, artist and teacher said other challenges include material sourcing and securing manufacturing. Many makers expressed a need for a storefront so makers are able to display and sell their wares.

As Brad Ferguson, President and CEO of Edmonton Economic Development Corporation stated, the next wave of success and sustainability in the capital region is fostering innovation and diversifying the economy. The makerspace will support this vision by supporting small batch manufacturing and innovation within the capital region.²³

*Please refer to appendix for quotes from Edmonton makers.

LOCAL MAKERSPACES/CO-WORKING/MANUFACTURING

Libraries, schools and non-profits are expanding their services to include makerspaces. Ficus, Edmonton New Technology Society (ENTS), and the Edmonton Public Library makerspace are among the variety of community and co-op makerspaces currently in Edmonton.

- ENTS (Edmonton New Technology Society), in operation since 2009, is a non-profit hackerspace. It is a space for technology enthusiasts to create, build or repair various technology, such as physical computing or small computer goods. ENTS memberships are \$75/month to \$750/year.
- The EPL (Edmonton Public Library) Makerspace is located in the main branch, at the Stanley A. Milner location downtown. Equipment includes a 3D printer, Espresso Book Machine, various Windows and Mac workstations, digital conversion hardware, gaming consoles, a green screen and its newest feature, a small recording studio. Access to the space is free, however the 3D printer and Espresso Book Machine are available at a minimal cost. Currently the 3D printer has a wait list of up to three weeks or more. Many schools tour the space to expose students to various technologies and applications. It is typically an unprogrammed drop in space, however minimal programming includes gaming nights, a makerspace robotics series, and introductions to 3D printing.
- Ficus is a collectively-owned and -run establishment of artists, craftsmen, designers, and creatives. Drawing from pooled resources, it offers opportunities for established and semi established makers to access minimal tooling and space. Fees are based on square footage utilized; the space contains open studios of various sizes.

Several co-working/studio spaces in Edmonton offer desks or small studios at a minimal cost.

Startup Edmonton, Homestead, Unit B, Drawing Room, Creative Industries, Harcourt House, Workhall Studio, SNAP and others offer co-working, sharing and collision space.

²³ Edmonton Journal, 'Video: Edmonton's Economic Development Corporation Impact luncheon', *Edmonton Journal*, Jan 13, 2015, <http://www.edmontonjournal.com/Video+Edmonton+Economic+Development+Corporation+Impact+luncheon+2015/10725320/story.html>, (accessed 10 March 2015).

- Startup Edmonton, Unit B and Homestead offer desks and office spaces below market rate. Various meetups are available at Startup Edmonton, but the focus is on technology, and specifically new startups that have potential to scale rapidly.
- Drawing Room and Creative Industries offers studio or office rentals, as well as small galleries. Harcourt House offers studios for artists, a small gallery, as well as limited fine art programming.
- Workhall focuses on fashion apparel and accessories, and the designers involved are handpicked by the founder. Nevertheless, it runs on a principle of collaboration; which customers see in the store's merchandising. Although there is little to no manufacturing of goods in the space, there is a modest studio space to foster collaboration and conversation between the designers involved.
- SNAP (Society of Northern Alberta Print-Artists), has a small gallery with a large printshop for local print artists, including limited printmaking programming.

Local community centres and programs like AGA Classrooms also offer making and creating opportunities.

NAIT is also exploring opportunities in creating a makerspace campus, providing access to underutilized tools and spaces after peak hours.

These existing facilities encourage collaboration and offer space below market rental rates. Notwithstanding these spaces, gaps exist, specifically around creating strong conditions for cross collaboration between various disciplines.

Also, none currently offers open accessibility for non-specialized hobbyists and citizens. As the majority of spaces are non-profits, there are also challenges to purchasing cutting edge tooling and technology.

A larger makerspace could act as a hub for all makers if it offered state-of-the-art and common tooling, access to technicians, mentorship and cross collaboration all under one roof. Additionally, a central makerspace would cultivate innovation and incubation in the creative industry sector. It could become a funnel or filter for complementary and specialized spaces like Ficus, once a maker has developed foundational skills and interest. Specialized spaces like SNAP, could gain members from people who need particular tools, knowledge and training. For these reasons, there is an opportunity to create a network and an intricate hub to direct people to these resources, developing a stronger community as a whole.

Lastly, there are numerous manufacturers throughout the city, but most do not provide expertise or support in conceptual engineering, nor do they nurture concepts to fabrication. GC Custom Metal Fabrication, CADD Alta Drafting and Design Inc., and Karve Machine Inc. are some of the few companies in the Edmonton region that offer these services. An increase in makers, particularly entrepreneurial makers, could add a new and diversified revenue stream for local manufacturers wishing to expand their business.

4. PRODUCTS AND SERVICES

A makerspace can consist of a variety of services and products. The first component of a makerspace is accessibility to various tools. Workshops and meetups help support the makers utilizing the space whether this be through learning to use tools and systems or entrepreneurship building. Workshops and classes could include technical skills such as woodworking basics, CNC skills or metal lathing, as well as business and marketing classes. Workshops and meetups may also be available to makers outside of the makerspace membership.

Additionally, co-working and private spaces may be available for additional costs. Aspects of the business could include a store for common goods needed and/or a space for makers to display and sell their goods. Also, cafes are seen in some makerspaces. Lastly, some makerspaces have in house fabrication teams which offer design services, engineering and fabrication consultation for a fee. Typically makerspaces are operational for 15 hours each day, seven days a week. This requires that staff is rostered on a two-shift system to provide adequate coverage throughout the week.

MEMBERSHIPS

A tiered membership structure, similar to a recreation centre, should be offered. This will introduce feasible costs for professionals and hobbyists. Unlimited Memberships would provide full shop access during all open hours. Hobbyist Memberships would provide full shop access during non-work hours and weekends. Community Memberships would provide access to the makerspace with the purchase of shop passes on an as-need basis. Discounts should be offered to students, seniors, non-profits, corporate groups and for members who pay for a full year upfront. Individuals would be able to sign up online or in person.

Edmonton has a per-capita income of \$63,967, and a median household income of \$96,030 per year.²⁴ A \$200 per month fee for open access is commonly seen at makerspaces, and would be attainable for most Edmontonians. No formal qualifications are necessary beyond a mandatory safety and equipment test and signing a liability waiver before access can begin. For independent access to specialized tools (ie. CNC, 3D printers) members must complete courses at a minimal cost.

HOURS OF OPERATION

The facility should be open 15 hours a day, seven days a week. Staff can then work in a two-shift system. This length of open hours also allows for professionals and hobbyists to utilize the makerspace.

TOOLS, TECHNOLOGY AND EQUIPMENT

Makerspaces carry a variety of tools. Equipment and technology take up space, require power, and often require some amount of ventilation for proper and safe operation. Creating a marketable makerspace relies on a cohesive set of varied, yet linked, tool choices. Most commonly there is a Metal Shop, Wood Shop, Computer/Electronics Lab and Prototyping Studio. In addition, some have a Sewing/Textile Room,

²⁴ Statistics Canada, 'Family income and income of individuals, related variables: Sub-provincial data, 2012' <http://www.statcan.gc.ca/daily-quotidien/140723/dq140723c-eng.htm>, 2012, (accessed 10 March 2015).

Ceramics Room, Photography Studio, Surfacing/Finishing Studio, Arts/Crafts Studio, Bicycle Studio, Plastics Studio and/or Biology Lab. Some of these studios may share spaces and some need separation.

Traditional and digital tooling would fill a gap that exists among current makerspaces and co-working spaces in Edmonton. They would provide costly tooling at an accessible price with experienced technicians. Particularly, purchasing digital tooling can be very expensive. Without experience or a knowledge base, the tooling can also be quite tedious with a high learning curve. Having these tools available also provides opportunities to teach others how to use these tools and learn skills to fuel economic growth and innovation across sectors. A makerspace with specialized tools would provide an opportunity for innovation, diversity and support in utilizing these tools.

Access to tools is the basis of a makerspace and should be based on individual's membership status. Members should be able to reserve time for selected tools online, ie. CNC, laser cutters.

*Please refer to appendix for list of possible tools purchases.

WORKSHOPS

Workshops and meetups will support professionals and hobbyists utilizing the space. Workshops could include design and technical skills to fabrication skills or business and marketing workshops. In addition, pre-packaged workshops, such as 'How to Make a Chair' could be available. Workshops will provide an opportunity to explore members-driven projects as well as foster new innovations. This will raise the skill level of the community dramatically over time, expanding tool and technology knowledge to entrepreneurship building.

Workshop members will be able to sign up online and in person. Most workshops will run at peak hours-weeknights and weekends. Generally workshops will run 2-3 hours per session and may run from 1-8 sessions long depending on the topic covered. Business and marketing workshops will typically run as a one or two day session; in contrast, some engineering, design and project based workshops will run longer. Depending on the intricacy of the class, there will be a cap of 5-15 students per class.

Workshops will provide a significant amount of income (25%-40%) for the makerspace. Fees for workshops will start at approximately \$50/hour for non-specialized workshops up to \$175/hour for specialized workshops. Materials fees will be included in the cost of some workshops while some may have an additional cost.

*Please refer to appendix for workshop descriptions

CO-WORKING, STUDIOS AND OFFICES

Private desks, small studios and office spaces within the makerspace will offer opportunity for entrepreneurial growth. The spaces will provide dedicated space to work independently, yet providing access to a passionate community of makers.

STORAGE RENTALS

Shelves or lockers will provide storage space for members who wish to leave behind small supplies and personal items. Larger storage spaces will be available for members who need to store larger items such as plywood.

CONSUMABLES STORE

A small store on site will ensure members and non-members have easy access to basic supplies needed for projects.

The following are examples of some items that should be available:

- Plywood: 5'x5' and 4'x8' Birch Ply
- Hardware: Nails, Screws, Drill Bits, Cutters, Sanding Disks, Speciality Wire,
- Safety Equipment: Eyewear, aprons/coveralls, Gloves, Dust Masks,
- Electronic Components
- Other: Sandpaper, Paint Brushes, Paint, Glue, Retractable Knives
- Reading Materials

STOREFRONT FOR MAKERS

A storefront for local makers and members will encourage entrepreneurship and offer locally created goods. Products will be sold on a commission, offering more opportunities for income for the makerspace. Alternatively, or in addition, the makerspace could develop an online storefront.

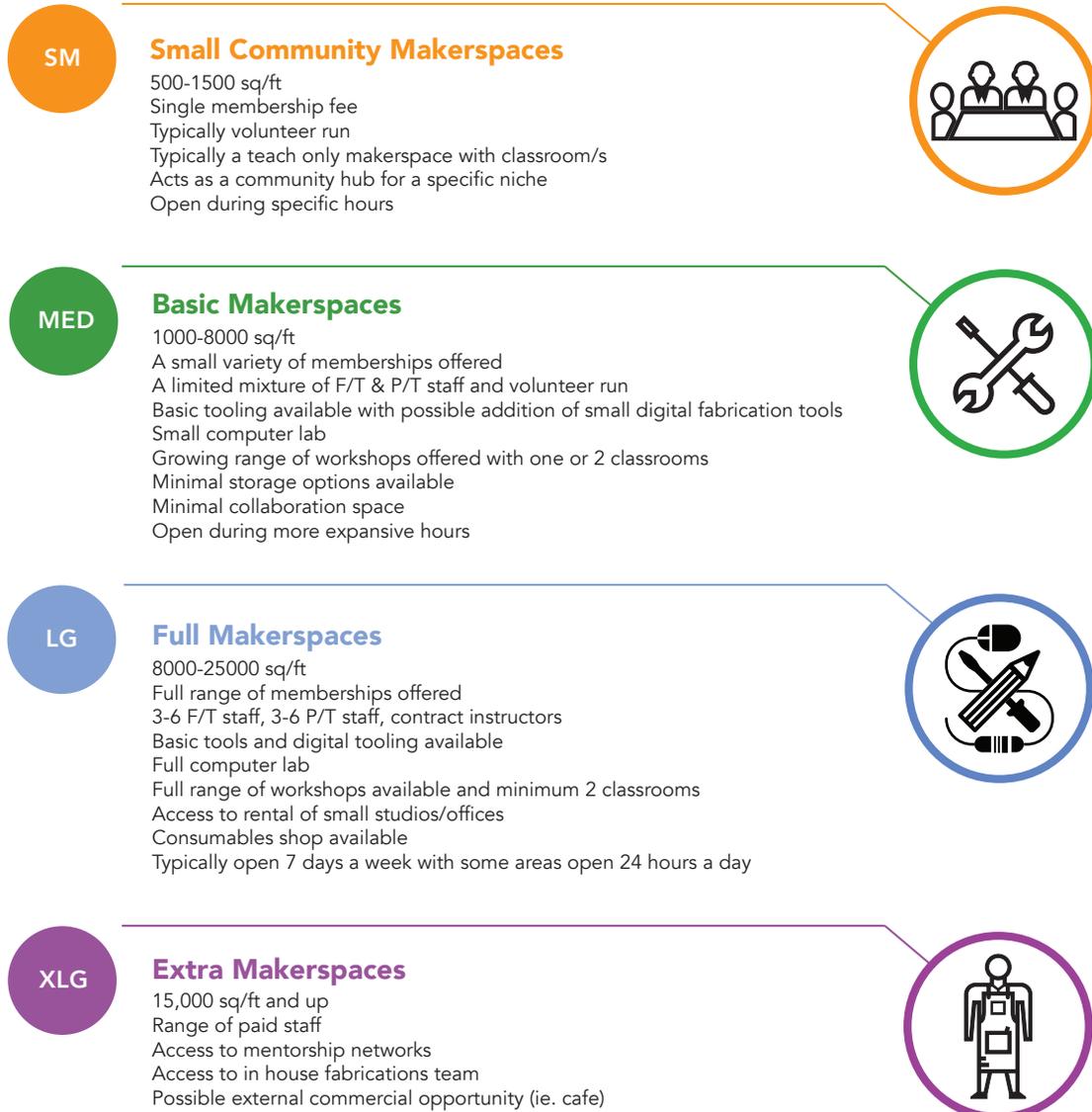
IN-HOUSE FABRICATION TEAM

An in-house fabrication team would support local makers with design, engineering and fabrication services. The fabrication team would work closely with clients to estimate, design and execute their project. Additionally, the fabrication team could provide laser cutting and CNC services for clients who wish to not utilize the tools themselves. Utilizing an extensive network of clients, partners, and suppliers both in-house and nation-wide, the team would help bring visions to life.

TOOL LIBRARY

A tool library is a tool-lending program where community members can lease residential tools. This will foster sharing within the community and reduce clutter in homes by supporting citizens with the use of basic home tools.

5. SCALE OF MAKERSPACES



6. OPERATIONS

MAKERSPACE BUSINESS STRUCTURES

There are a variety of business structures available for makerspaces. The most successful makerspaces adopt a model that reflects the background of its founders, the goals for the space, and the needs of the greater community.

UBC's makerspace analysis provides a comprehensive analysis of the pros and cons which exist for each model:^{25 26}

Sole Management

A makerspace run by one person.

Pros: Uniform, fast decision-making, consistent strategizing, and no debate.

Cons: Business is dependent upon one individual. There is a lack of a wider perspective and alternate opinions. This business can grow only as fast as the ability for the owner to manage growth and act on opportunities. Depending on the growth trajectory, this model is challenging to scale.

Example: Makelt Labs, founded by Joseph Schlesinger, and ADX Portland founded by Kelley Roy.

Flat Structure

A flat structure is a makerspace run by a small group of founders. There is little to no hierarchy and it is common among small makerspaces.

In a flat structure, day-to-day operations are typically divided evenly between founders, while business development and "maker" tasks are divided according to founder skills and abilities. This type of administrative structure may appeal to commercial ventures started by 2-4 people.

Pros: There are a variety of perspectives on business development. The decision making process is open rather than closely supervised. Duties are split amongst founders. There is always someone with authority to make a decision, in contrast to sole management where decision-making is centralized.

Cons: Issues may arise when there are differences of opinion among the co-founders. This may lead to delays in important decisions, causing great delays in the business moving forward or impact the quality of service offered to members.

Example: Five co-founders started Helios. All founders invested personal funds and energy to start this makerspace.

Co-operatives

²⁵ The Million Dollar Question: Secrets to a Successful Commercial Makerspace, 2013, 'Administrative Models', <http://blogs.ubc.ca/etec522makerspaces2013/analysis/>, (accessed 10 March 2015).

²⁶ Cooperative Development Institute, 'Choosing a Legal Entity', <http://www.cdi.coop/resource-center/stages/startup/choosing-a-legal-entity/>, (accessed 10 March 2015).

Co-operatives are a membership based business structure where members vote on makerspace policies and decisions. Typically, co-ops have a democratically elected board that either provides governance and strategic oversight, or are operational bodies that have day-to-day operational responsibility.

Pros: This model enhances community and encourages active membership. Additionally, when organized as a not for profit, they are able to apply for grants, donations and sponsorships, and possible reduction in overhead costs.

Cons: Due to the democratic nature of cooperatives, decision-making can be prolonged. Lengthy and complex legal, administrative costs and record keeping are required.

Example: KwartzLab is co-operative, member run makerspace. Their members define the culture, space and resources.

Recreation Centre Style

This model could be a non-profit organization (i.e. society or non-profit company) or a corporation. The model is similar to a recreation facility, where members pay a standard fee to join, and use the facilities and take classes.

In both a non-profit model as well as a corporation, a management team would develop strategy and long-term vision for the makerspace and there would be full and part time staff.

Pros: Decision making and strategizing is based on identified goals.

Cons: Need to pay competitive salaries within the local market, which can be cost-prohibitive for startup operations.

Example: TechShop, is a for profit corporation which uses a recreation centre style model of business structure.

Artisan Asylum is a not-for-profit mix of recreation centre style business model with a co-op model of engaging members in decision-making.

SUGGESTED BUSINESS STRUCTURE

The suggested business structure for the makerspace is a recreation centre style. Day to day operations are the responsibility of professional staff rather than members. Members are then able to focus their energy and time on making, innovation and entrepreneurship. Membership packages are similar to recreation centres as there are several tiers available. This ensures accessibility for a variety of users.

Recreation Centre style makerspaces often seeks stability by securing sponsorships and partnerships with local institutions and businesses. This secures an active user base and sponsorship funds from day one. This also creates alliances, support and a network with a local community.

A local Board of Directors should be created to develop policies and procedures that the staff would follow. The Board of Directors would be a governance-based board, leaving day-to-day decision-making to the Executive Director and other staff members.

The size and the business model must operate sustainably with multiple staff members whose entire job was to keep the space running smoothly, keep workshops organized, and keep the tools repaired.

Whether the business structure is for profit or non-profit depends on partnerships, City involvement, and strategic direction of the founding board.

FACILITY AND LOCATION

Setting up a makerspace requires a deep awareness of the target market and location. As noted by Make Magazine²⁷ three key factors determine space size: - affordability, equipment, and services offered. More often than not, successful makerspaces move several times throughout the first couple of years as they expand. Many makerspaces have started off with a smaller scale yet well equipped space and continually expand as the demand and awareness grows.

According to Make Magazine, an informal survey suggested an ideal starting size is around 8,000 square feet, in a low rent area or larger to support continuously paid, full-time staff. Spaces that are smaller than 8,000 square feet can be successful but they usually run on a volunteer basis or are supported by an outside entity.²⁸

SUGGESTIONS FOR FACILITY AND LOCATION

The makerspace should be centrally located, acting as an innovative, creative, entrepreneurial hub. Proximity to educational institutions will contribute to innovative and ever changing thought, collaboration and a greater community. In addition, the makerspace should act as an extension of Startup City in Edmonton. The makerspace should be in close proximity to public transportation and preferably close to the expanding LRT line to allow access for all Edmontonians.

Ideally, an existing structure would be repurposed (i.e. old warehouses, industrial spaces, old schools, etc.) The building acquired should be a minimum of 8000 square feet, with an ideal size of between 12,000 square feet and 18,000 square feet. This will provide enough space for a variety of tooling, room for programming and rental spaces. At a minimum, the makerspace should consist of a metal shop, wood shop, prototyping studio and a digital lab. These four studios require a division of space. The building must have parking and an overhead door, as members will occasionally have large materials that will be transported, in addition to large tools entering the space. There should be access to hardware stores and food services nearby. If this is not met, a consumables store within the makerspace is a necessity. Makerspaces have substantial electrical needs, thus, a minimum of 250V should be available throughout the wood shop, metal shop and digital studio. If the building does not have a sufficient dust collector, HVAC or strong floors, the space must be retrofitted accordingly.

DIVISIONS OF SPACE

There are a variety of spaces needed within a makerspace: studios, workspaces, classrooms, social/lounge areas, storage and a welcoming area. The makerspace should provide flexible and affordable workspaces suitable for a diverse range of users, business types and sizes. This will increase the makerspace revenue as well as a space for growing entrepreneurs. The makerspace should have a

²⁷ G. Cavalcant, 'Making Makerspaces: Creating a Business Model', <http://makezine.com/2013/06/04/making-makerspaces-creating-a-business-model/>, 4 June 2013, (accessed 10 March 2015).

²⁸ G. Cavalcant, 'Making Makerspaces: Creating a Business Model', <http://makezine.com/2013/06/04/making-makerspaces-creating-a-business-model/>, 4 June 2013, (accessed 10 March 2015).

meeting lounge to foster engagement and collaboration. Two to three classrooms should be built for various workshops generating revenue and cultivating knowledge within the community. A tool library (300 square feet) would be a positive addition, particularly if the makerspace were centrally located. Local residents are able to rent tools rather than purchase tools that are infrequently used.

Classrooms, storage, and rental studios all take up significant amounts of space. A rule of thumb for determining a number of occupants in a Makerspace is to allocate 50 square feet of space per person: roughly 7ft x 7ft area.²⁹ This allotment allows for safe use of floor space, especially as the occupants will be working in a lab environment.

Workspaces are suggested at 75-150 square feet per person.³⁰ Workspaces provide space for all major equipment, and can be organized by craft. Minimum workshop space is 300-500 square feet per type of craft. As an example, Staten Island Makerspace have private 8' x 10' or 6' x 4' studios with 24 hour access for a flat rate in addition to their monthly membership fee. 6' x 4' Studios are \$75 per month and 8' x 10' Studio are \$150 per month.³¹

*Please refer to appendix for specifications of divisions of space

STAFFING

The need for defined positions varies depending on the size of the space, products and services being offered and the business model chosen. Smaller spaces will be dependent upon a few staff with instructors. Larger makerspaces may require marketing and financial managers.

Artisan's Asylum in Somerville, Massachusetts at 40,000 square feet, supports 3-5 full-time staff and 40+ part-time instructors. Artisan's Asylum hosts 140 private studio spaces, 45 pallet storage units and over 80 shelf storage units available for rent with 250-300 students per month in 40-50 classes. Maker Works in Ann Arbor, Michigan, a 30,000 square foot makerspace, has 2 full time staff, plus 8 part time as well an executive management team. At 20,000 square feet, a typical TechShop employs 12-15 full time staff and 15-25 part time staff. Bolt, a Boston 10,000 square foot makerspace, has 8 full-time staff. Some spaces like Hacker Dojo in Mountain View, California, require members to spend time running and maintaining the facility and others like Makelt Lab in New Hampshire at 6,000 square feet has only one staff member and various volunteers. Instructors are common staff at makerspaces. Instructors are normally paid between \$30-150 per hour. Some makerspaces offer members a discount if they are willing to teach a class, in lieu of paying instructors.³²

All makerspaces generally require the following roles to be filled:

- Executive Director- Responsible for the company vision, organization and business strategy.
- Financial Manager- Accountant and tax specialist - does not need to be a staff member, can be hired to conduct annual audit and keep makerspace's financial books.

²⁹ G. Cavalcant, 'Making Makerspaces: Creating a Business Model', <http://makezine.com/2013/06/04/making-makerspaces-creating-a-business-model/>, 4 June 2013, (accessed 10 March 2015).

³⁰ G. Cavalcant, 'Making Makerspaces: Creating a Business Model', <http://mzine.com/2013/06/04/making-makerspaces-creating-a-business-model/>, 4 June 2013, (accessed 10 March 2015).

³¹ Staten Island Makerspace, 'Home', <http://www.makerspace.nyc/>, 2015, (accessed 10 March 2015).

³² G. Cavalcant, 'Making Makerspaces: Creating a Business Model', <http://mzine.com/2013/06/04/making-makerspaces-creating-a-business-model/>, 4 June 2013, (accessed 10 March 2015).

- Facilities Manager- Performs regular repairs and maintenance of the space and tools.
- Development Manager- Brings new business and helps grow the organization. May also be responsible for marketing.
- Services Coordinator- Responsible for greeting members, providing a point of contact, answer phones, email, social media. They may also be responsible for volunteer coordination.
- Marketing Coordinator- Responsible for marketing, website, promotion, social media publicity, etc.
- Technician - Responsible for taking care of tools, teaching about tools, and day-to-day shop management.
- Program Developer- Design classes and curriculum.
- Instructors- Prepare and teach classes.

SUGGESTED STAFFING FOR RECREATION MODEL

Commonly seen in a Recreation Centre model, day-to-day operations are the responsibility of professional staff rather than members. Three to six full time staff supports the overarching operations of the makerspace. Additional part time staff fills the gaps. Volunteer staff should be employed at a minimum in order to avoid volunteer burnout. Paid staff offer opportunities for members to do what they do best, make.

- A CEO/Executive Director, will act as a primary point of contact and head manager of the facility.
- A COO or Facility Manager will be in charge of day-to-day tasks within the facility. This will include managing staff, programming and services, and rentals.
- As programming and workshops are a large source of revenue for recreation style makerspaces, a full time staff member will be hired to employ instructors and create curriculum.
- A Marketing Coordinator should be hired full time or part time. They will be responsible for marketing, website consistency, promotions, social media, publicity and possibly event management.
- A variety of technicians should be hired, as they are critical to the success of members. 5-7 full time and part time technicians are needed. Their expertise will be varied, such as in 3D printing, laser cutting, CNC milling, wood, metal, craft (sewing, pottery, etc). Additionally, technicians will be responsible for taking care of and repairing, tools, educating members on tooling and day-to-day workshop management. They essentially act as the eyes of the shop space.
- Full time or part time staff will support the roles of Service Coordinators or Membership Organizers. They will be responsible for greeting members, providing a point of contact or as staff for the consumables storefront.
- Salaries will meet the local market to acquire leading employees.

CONTRACT STAFF

In order to cultivate a varied expertise throughout the region, instructors should be contracted on a course-by-course basis. Instructors could be paid by the length or hours of class time and preparation time. Alternatively, instructors could be paid out with 50% of class proceeds.

INSURANCE

INSURANCE CHOSEN BY CANADIAN MAKERSPACES

The research conducted explored the variety of insurance chosen by makerspaces across Canada.

Helios in Montreal is paying approximately \$0.70 per square foot for insurance with Assurart. This covers all their assets and the company's liability.

The Shop in Toronto insurance policy with Intact covers everyone in the space, including the owners, members, instructors and tools. Additionally, their waiver does include a clause stating no outside or personal tools may enter the shop, nor tools of The Shop may leave the space.

The Tool Library in Toronto uses HUB International, paying around \$2,500 per year for two locations to cover on-site injuries and potential injuries with their tools. Their policy does not cover thefts and non-returns of tools.

Assentworks', in Winnipeg, general liability/property insurance policy covers all equipment and leasehold improvements. In addition, the policy covers bodily injury at \$2m and a \$5m aggregate. No equipment is insured off their site. Their approach was to insure the building and contents are insured. Members and visitors must sign a waiver indicating that their own insurance will cover damage to their persons. The insurance requires Assentworks to provide access control and 24/7 video recording of all areas.

Consideration should also be given to acquiring directors and officers liability insurance.

LANDOWNER INSURANCE

General Liability and Property

This catchall insurance category covers injuries within the space, equipment damages, and theft. Artisan Asylum has found that the cost of this insurance can be roughly predicted as \$0.20 – \$0.40 per square foot per year.

Umbrella Policy

This insurance covers any overages that might be incurred if any one situation requires more money than the per-occurrence limit. (Site) A common limit is \$3 million per occurrence and \$3 million in aggregate (to cover both a per-occurrence and aggregate overage situation). This insurance usually costs 15-25% of the price of general liability & property insurance.³³

SAFETY, SECURITY, GUIDELINES AND RULES

An injury waiver and user agreement will be part of the standard membership agreement. Safety and security will be emphasized with every aspect.³⁴

A risk evaluation should be conducted in order to minimize liabilities and help identify what mitigating strategies need to be implemented in the space.

³³ G. Cavalcant, 'Making Makerspaces: Creating a Business Model', <http://mzine.com/2013/06/04/making-makerspaces-creating-a-business-model/>, 4 June 2013, (accessed 10 March 2015).

³⁴ M.B. Hlubinka, 'Safety in School Makerspaces', <http://makezine.com/2013/09/02/safety-in-school-makerspaces/>, 2 September 2013, (accessed 10 March 2015).

Safety guidelines will be drafted detailing appropriate instructions to follow when in the space and operating any equipment. Copies of the guidelines will be clearly visible throughout the space.

Staff will be trained on safety and usage rules in addition to basic first aid.

Safety and security items to consider include:

- Installing security cameras in shop areas.
- Installing heat detectors and fire suppression gear in welding areas.
- Installing a door access system or burglar alarm.
- Restricting access hours for members.
- Requiring members and students to be at least 18 years old.
- Requiring a tool training and testing process for all members, regardless of prior experience.

SWOT ANALYSIS

Commercial makerspace SWOT analysis:

Strengths:

- Successful models have proven to spur innovative growth and engagement
- Over 50% of industries in Edmonton have a related manufacturing or making component. All could benefit from a central makerspace.
- Job creation
- Support incubation and entrepreneurship

Weaknesses:

- Large start-up costs and monthly expenses
- Business must not be redirected from current fabrication
- Initial membership number not entirely certain
- Sentiment that larger scale makerspaces take away from the passion of small scale craft industries and unduly focus on commercialization of product

Opportunities:

- Foster expertise and knowledge
- A hub for a broad range of knowledge and expertise
- Drive down cost of local innovation
- Invigorate design and manufacturing for local economy
- Attract valuable creative class
- Collaborate other makerspaces and education institutions

Threats:

- Failed makerspaces reported
- Business must foster relationships with local manufacturers
- Changing technology can prove to be costly
- Possible competition from other makerspaces and education institutions

7. FINANCIAL ANALYSIS

STARTUP EXPENSES

Initial startup costs will vary depending upon the scale chosen. As an example, a typical investment model for TechShop facility size at 15,000-20,000 square feet is:

Building Conversion Cost: \$1,000,000

Hardware Purchases: \$1,500,000

ACQUISITION OF TOOLING

Acquisition of tooling could consist of a combination in-kind donations, company sponsorships (leasing or donation) and purchasing of tools.

FUNDING A MAKERSPACE

As the maker movement continues to gain momentum, various strategies for funding have emerged. Options that may be available for include:

Pre Sales of Memberships- Offering pre sales of memberships are a great technique for funding a makerspace and gauging interest in the project. Various packages can be made available at a reduced cost. This strategy typically utilizes a crowdfunding practice, yet typically will not provide sufficient startup capital.

Corporate Sponsorships- Many local businesses look for opportunity to support the communities in which they reside. Makerspaces can prove to be a positive match for various companies in manufacturing, tech or science, construction or building industries, among many others. This collaboration can also provide exposure for the company and a creative space for their employees. In addition, many makerspaces have tools and software sponsored by various manufactures.

Collaboration with Education Institutions - Co-funding opportunities with Edmonton based education institutions could be explored. The makerspace business would provide state of the art equipment while the educational institution can provide space and a network of resources. This offers students and community access to cutting edge technology and resources, fostering interdisciplinary collaboration and innovation across the community. Reduced-priced memberships should be offered to students.

Additional options such as crowdfunding, bank loans, grants, and founders' income are all common means of obtaining funding for makerspaces.

FINANCIAL PROJECTIONS

Below are the financial projections for the Edmonton makerspace as at, approximately, the 3 year mark. It is expected that the first year gross revenues would be approximately $\frac{1}{2}$ of the revenue noted below at \$1,061,417 and the second year gross revenues would be approximately $\frac{3}{4}$ at \$1,592,125.

As such, net income projections are -\$452,263 for the first year and \$78,445 for the second year.

INCOME AT 12,000 SQ.FT.		Details	Rate	Income Per Month	Income Per Year
Memberships					
	Unlimited Hours	150 members	\$200/month/member	\$30,000	\$360,000
	Hobbyist Hours	250 members	\$150/month/member	\$37,500	\$450,000
	Community Member	400 members	\$100/year/member	\$3,333	\$40,000
	Rental Shop Hours	200 members at 1.5 shop day a month	\$40/day/member	\$12,000	\$144,000
Total Membership Income					\$994,000
Classes/Workshops					
	Craft and Digital Fabrication Workshops	\$50-100/class = average \$75/class	@ 1 classes a day/ 6 per week @ average 15/per/class 48 weeks per year	\$27,000	\$324,000
	Design and Fabrication Workshops	\$75-\$175/class = average \$125/class	@ 1 classes a day/ 6 per week @ average 8/per/class 48 weeks per year	\$24,000	\$288,000
Total Classes/Workshop Income					\$612,000
Rentals					
	Shelf Space/Locker	75 available	\$30/month/member	\$2,250	\$27,000
	Storage 5' x 5' (25 sq.ft.)	30 available	\$120/month	\$3,600	\$43,200
	Small Studio 15' x 15' (196 sq.ft.)	6 available	\$1500/month	\$9,000	\$108,000
	Medium Studios 20' x 20' (400 sq.ft.)	3 available	\$2500/month	\$7,500	\$90,000
Total Rental Income					\$268,200
Other					
	Retail Store: Supplies	mark up on raw materials for sale	\$200 / 400 member / year	\$6,666	\$80,000
	Retail Store: Makers Storefront	commission	Maker 60%, Retailer 40%	\$5,000	\$60,000
	In House Fabrication and Design Services	custom design, cnc, lasercutting, 3D printing	\$100/hr	\$5,000	\$60,000
	Tool Library Memberships	lending of residential tools	\$45/year x 250 people	\$937.50	\$11,250
	Space Rentals	special event rentals (ie.classrooms)	\$40/hour / 3hrs / 2x week	\$1,032	\$12,384
	Grants, Donations and Sponsorships	local businesses/sponsored software/yools	x	x	\$25,000
Total Other Income					\$248,634
TOTAL INCOME PER YEAR					\$2,122,834
EXPENSES AT 12,000 SQ.FT.		Details	Rate	Expenses Per Month	Expenses Per Year
Operating Costs					
	Rent	\$12.00-\$15.00 per sq.ft./year	@ \$13 per sq.ft.	\$13,000	\$156,000
	Operating Costs	\$5.00 per sq.ft./year	@ \$5 per sq.ft.	\$5,000	\$60,000
	Building Repairs and Maintenance	\$1.00-\$2.00 per sq.ft./year	@ \$1.50 per sq.ft.	\$1,500	\$18,000
	Insurance	\$0.15-\$0.35 per sq.ft./year	@ \$0.25 per sq.ft.	\$250	\$3,000
	Property Tax	\$1.00-\$7.00 per sq.ft./year	@ \$4.00 per sq.ft.	\$4,000	\$48,000
	Utilities (Gas, Electricity, Water, Trash, Internet)	\$1.00-\$4.00 per sq.ft./year	@ \$4.00 per sq.ft.	\$4,000	\$48,000
	Security	\$0.50 per sq.ft./year	@ \$0.50 per sq.ft.	\$500	\$6,000
	Janitorial	\$0.50 per sq.ft./year	@ \$0.50 per sq.ft.	\$500	\$6,000
	Tool Maintenance and Consumables	Blades, bits etc.	\$1500/month	\$1,500	\$18,000
	Legal Fee	Annual return fees, employment issues, misc. contracts	\$3000/year	\$250	\$3,000
	Miscellaneous Expenses	Supplies, Discounts, Volunteer Goods, etc	\$1500/month	\$1,500	\$18,000
	Marketing and Promotion	Mailchimp, Survey Monkey, Ads, etc.	\$10,000/year	\$833	\$10,000
	Charges and Fees	2% of total Memberships, Rentals and Workshops	2% of \$2,122,834	\$3,538	\$42,457
	Materials Store	Cost of goods for sale	50% of cost of goods sold	\$3,333	\$40,000
Total Operating Costs					\$476,457
Employee Salaries and Compensation					
	Executive Director	Average Albertan Income	\$75,000/year	\$6,250	\$75,000
	Facility Manager	Average Albertan Income	\$65,000/year	\$5,416	\$65,000
	Admin and Finance Assistant	Average Albertan Income	\$60,000/year	\$5,000	\$60,000
	Programs Developer	Average Albertan Income	\$55,000/year	\$4,583	\$55,000
	Technicians	Average Carpenter & Sheet Metal worker	\$60,000/year x 6	\$30,000	\$360,000
	Marketing and Social Media (p/t)	Average Albertan Income	\$20,000/year/pt	\$1,666	\$20,000
	Instructors	3hr classes + 3hr prep time @ 2 classes/day/6 days a week	\$50/hour/avg	\$15,480	\$185,760
	PT Employees	Services Coordinators, Membership Organizers, etc.	8 p/t x \$18/hr @ 20hr/week	\$12,384	\$148,608
	Employee Benefit and Compensation	7%-15% of payroll	12% of payroll	\$9,693	\$116,324
Total Employee Salaries and Compensation					\$1,085,692
TOTAL EXPENSES PER YEAR					\$1,562,149
NET INCOME					\$560,685

8. MARKETING STRATEGIES

Marketing and promotion is critical to establish a critical mass of members for the makerspace. Direct marketing towards engineers, designers, artists, inventors, trades people and educational institutions should be carried out. For any good marketing strategy, a mix of marketing tools to help spread the news will be utilized. Product and services will be clear. Additionally, marketing strategies will target niche demographics. As outlined by UBC's makerspace analysis the following are some possible marketing tools:³⁵

Strong Website

- Photos and description of the facility with map
- List of tools available and ability to sign up for specialized tools
- List classes/workshops offered with a calendar
- List of available rentals with costs
- All added services: consumables shop, in house design and fabrication, etc.
- Photos and biographies of staff and members
- Photos of work being created
- Testimonials
- A running blog, news and events
- Other various opportunities and events happening throughout the community
- Create 'How to' videos

Social Media

- Establish tags #nameofmakerspace #makerspaceyeg #yegmakerspace
- Create network and conversation with members and possible members
- Expand brand awareness and identity
- Share various trends with makers

Advertise in the Local Community

- Run advertisements in newspapers and local magazines
- Offering limited discounts (ie. first month free with year purchase)
- Getting involved in similar making events and pop ups
- Engage local like minded groups: Alberta Craft Council, Alberta Wood Council, APEGA (Association of Professional Engineers and Geoscientists of Alberta), Alberta Association of Architects, Student Design Association, Tec Edmonton, Startup Edmonton, ENTS, Workhall, SNAP, Drawing Room, Harcourt House, Creative Industries, local schools (K-Universities and Colleges), etc.
- Promotional material to be handed out at strategic locations and meetups
- Setting up a booths or running workshops in education centre or community events with mini maker projects, engaging people with the maker tools/mind set/environment and potentially spark interest.

PR events and open houses

- Offer an experience for local citizens to a new and innovative space

³⁵ The Million Dollar Question: Secrets to a Successful Commercial Makerspace, 2013, 'Marketing Strategies', <http://blogs.ubc.ca/etec522makerspaces2013/the-million-dollar-question-guide/marketing-strategies/>, (accessed 10 March 2015).

9. IMPLEMENTATION PLAN

The following steps should be taken in fostering a makerspace in Edmonton Alberta:

- Present report to Edmonton Economic Development Corporation, Make Something Edmonton and Startup Edmonton
- If project is approved, present documents to the City of Edmonton and Government of Alberta
- Seek strategic partnerships with corporations such as: PCL Construction, Kellerdenali, Clark Builders, Telus, Shaw Communications, ATCO, Ellis Don Construction, Stuart Olson Construction, EPCOR, Stantec, Alberta Treasury Bank, Canadian Western Bank, Servus, Urban Systems, Suncor, Enbridge, Dialog Architects, Dub Architects, Group 2 Architects, Kasian Architects and Manasc Isaac Architects, etc.
- Develop and nurture partnerships with leading educational institutions: University of Alberta, NAIT, Grant MacEwan, Kings College, K-12, etc.
- Develop and nurture partnerships with leading local manufacturers
- Create buzz through local newspapers and magazines: Edmonton Journal, Edmonton Sun, Metro, Avenue Magazine, Alberta Venture, Western Living Magazine, etc.
- Relationship building with local organizations: Startup Edmonton, Make Something Edmonton, Alberta Craft Council, MADE, Next Gen, TEC Edmonton, On The Spot Pop-Ups, Royal Bison, Unit B, Drawing Room, Varscona Theatre, etc.
- Explore possible existing buildings/facilities in core region
- Develop finance funding model
- Inquire into sponsorship/donations for tooling (i.e.. Auto Cad, Emco, Chiron)
- Recruit experts and professionals to teach courses within the facility
- Recruit key staff members to operate makerspace
- Work with broker to find appropriate insurance
- Work with lawyers to prepare various agreements, waivers, incorporation documents, etc.

10. FINDINGS AND RECOMMENDATIONS

Based on the information presented, it is recommended that Edmonton Economic Development Corporation, Make Something Edmonton and Startup Edmonton advocate for the advancement of a makerspace. The findings of this report demonstrate that this initiative will be highly beneficial to the organizations and local makers/creative economy and has a high probability of success.

Key recommendations are as follows:

BUSINESS STRUCTURE

- Suggested business structure is a non-profit or corporation with a recreation centre format. Day to day operations will be the responsibility of professional staff rather than members. Members are able to focus their energy and time on making, innovation and entrepreneurship.
- Recreation Centre formats often seeks stability by securing sponsorships and partnerships with local institutions and businesses. This creates alliances, support and a network with a local community.
- Create membership packages to create a variety of available tiers for members.
- A Board of Directors should be created to develop policies and procedures that the staff can follow. The Board of Directors will ensure to leave day-to-day decision-making to the Executive Director and other staff members. The Board of Directors will be governance based.

FUNDING

- The proposal should be brought forward to the City of Edmonton for funding. Additionally, the City of Edmonton owns buildings throughout the city that are underutilized. One of these buildings could offer a wonderful opportunity for a makerspace.
- Corporate sponsorships should be sought. This will provide for local fund stability and create engagement for the makerspace by local corporations.
- Financial support and partnerships with local educational institutions could offer opportunities for students to utilize the makerspace through student memberships.
- EEDC, Make Something Edmonton and Startup Edmonton should seek out pre-sales of memberships or intent from local makers.
- Federal and Provincial funding should be explored such as Western Economic Diversification grants, Canadian Manufacturers & Exporters, Industrial Research Assistance Programs, Business Innovation Access Programs, Alberta Innovates Technology Grants.
- Crowdsourcing, by potentially selling memberships in advance, should also be explored. This could have the added benefit of engaging the local community before launch.
- Sponsorship from various tooling and software companies should be explored, such as, Autodesk (software), Stratasys (3D printers), EMCO Germany (CNC milling), Telus (internet), etc.

STAFFING

- The size and business model should foster a sustainable operation with multiple staff who are to keep the makerspace running smoothly. Operations and programming would be pre-organized and tools and space would remain in good condition.
- 5-10 full time staff should be hired to support administrative duties, staffing, etc. Additional part time staff would fill the other needs of the makerspace. Volunteer staff should be used at a minimum in order to avoiding volunteer burnout. Paid staff offer opportunities for members to do what they do best, make.
- A CEO/Executive Director, would act as a primary point of contact and head manager of the facility. They should be in charge of finances, setting a vision, assembling the Board of Directors, developing the initial makerspace goals and strategy, and creating alliances and sponsorships.
- A COO or Facility Manager would be in charge of day-to-day tasks within the facility. This would include managing staff, programming and services, and rentals.
- As programming and workshops are a large source of revenue for makerspaces, a full time or part time staff member could be hired to employ instructors, foster development of classes and engage local education institutions for use and workshops.
- In order to turn a profit, marketing is essential to the success of a makerspace. A Marketing Coordinator should be hired, whether full time or part time. They should be responsible for marketing, website consistency, promotions, social media, publicity and possibly event management.
- A variety of technicians should be hired, as they are critical to the success of a makerspace. 5-7 full time and part time technicians are needed. Some should have a variety of experience while others more specialized in tools such as 3D printing, laser cutting, CNC milling, wood, metal, craft (sewing, pottery, etc.). This will vary upon programming and space decisions. Additionally, technicians should be responsible for taking care of and repairing tools, educating members on tooling and day-to-day workshop management. They will essentially act as the eyes of the shop space.
- Some of the following roles could be supported by full time or part time positions, such as, Services Coordinators or Membership Organizers. They would be responsible for greeting members, providing a point of contact or as staff for the consumables storefront.
- In order to cultivate a varied knowledge base throughout the region, instructors should be contracted on a course-by-course basis. Instructors could be paid a set fee depending on hours of class time and preparation time or a portion of class sales.
- The facility should be open 15 hours a day, seven days a week. Staff can then work in a two-shift system. This length of open hours also allows for professionals and hobbyists to utilize the makerspace.
- An in-house fabrication team should be considered as it could support local makers with engineering and design services, fostering greater innovation.
- Salaries should meet the local market to acquire leading employees.

TYPE OF SPACE

The physical attributes of a makerspace should consists of the following:

- Acquire a building of a minimum of 8000 square feet, with an ideal size of between 12,000 square feet and 18,000 square feet. This will provide enough space for a variety of tooling, room for programing and spaces for rentals such as storage or studios.

- The makerspace should be centrally located in the City of Edmonton. This will allow for engagement from all corners of the city. Additionally, there are a large proportion of corporations that are centrally located.
- At a minimum, the makerspace should consist of a metal shop, wood shop, prototyping studio and a digital lab.
- The makerspace should have a meeting lounge to foster engagement and collaboration.
- The makerspace should have a materials/consumable goods store. This will benefit members as well as non-members as it would provide easy access to materials.
- A tool library would be a positive addition, particularly if the makerspace were centrally located. Local residents could then rent tools to use at home rather than purchase small tools.
- A storefront for local makers and members would encourage entrepreneurship, diversifies revenue, and engages the community with locally created goods.
- The makerspace should provide flexible and affordable workspaces suitable for a diverse range of users, business types and sizes. This will increase the makerspaces revenue as well as a create a space for growing entrepreneurs.
- A building with a loading dock is needed for transportation of goods and tooling.
- Parking should be available as members will frequently be transporting large goods.
- 2-3 classrooms are needed for various workshops. This will generate revenue and encourage knowledge within the community.
- Offices or an open concept office is needed for staff.
- Makerspaces have substantial electrical needs. A minimum of 250V is needed throughout the wood shop, metal shop and digital studio.
- A dust collector is needed throughout the building as well as sufficient HVAC and strong floors.
- Space and storage for members' materials or personal tools and small workspaces are needed. This offers additional revenue for the makerspace as well as support for members.

PRODUCTS AND SERVICES

Tiered memberships are recommended.

- Unlimited Membership would provide full shop access during all open hours. This would provide space, time and opportunity for professional makers. Pricing should be approximately \$175-\$200/month.
- Hobbyist Membership would provide full shop access during non-work hours and weekends (Monday to Friday 5pm-close and weekends). Pricing should approximately be \$125-\$150/month.
- A community membership would provide access to the makers community and access to the workshop on an as need basis. Pricing should approximately be \$100/year.
 - Shop passes would be available for community members on a day-to-day basis. A full day of shop access should be \$30-\$40/day. Bundled packages should additionally be available for \$160-\$175 for a 5 pass.
- A discount should be offered to members who pay for a full year upfront (i.e. save 20%).
- Additional discounts should be available for students, seniors and non-profits (i.e. save 20%).
- Group and corporate packages should be made available.

A variety of storage rentals should be available to suit needs.

- Shelf or locker space could provide storage for members who wish to leave behind small personal items. Pricing should be approximately \$25-\$30/month.
- Larger storage space should be available for members who need to store larger personal items such as plywood. This storage space could be partitioned off by chain link fence at 7'x7'. Pricing should be approximately \$100-\$120/month.

A variety of co-working, studios and offices should be available for growing maker entrepreneurs.

- Small studios and offices should be available for growing entrepreneurs. Small studios could be approximately 200 square feet with pricing at approximately \$1500/month.
- Medium studios and offices should be available for more established maker entrepreneurs. These makers could provide mentorship for fellow makers. These studios should be approximately 400 square feet with pricing at approximately \$2500/month.

The makerspace should have an element which focuses on education and workshops.

- Workshops and classes should be offered in woodworking, metalworking, upholstery, 3D design (software), laser cutting, 3D printing, sewing, and more. Class sizes should be small enough to give members plenty of time to work with instructors. Pricing should approximately be \$50-\$200/class.
- Custom designed workshops should be available for schools and other organizations.
- Business and marketing workshops should be made available for local makers who want to expand their business.
- Self directed modules/kits should be available for hobbyists. These ready-made kits could consist of materials needed and instructions. Pricing would vary depending upon scale and types of materials needed.
- Meetups for various groups should be available at a makerspace. This would foster a community within the makerspace.
- Refer to appendix for a list of suggested workshops.

Other components

- A mentorship program should be encouraged. This would help provide incubation for entrepreneurial makers.
- Dependent upon a variety of factors, additional space could be leased for a food/cafe retailer.
- A database of manufacturers, local makers, and mentors should be created, providing opportunities for matchmaking and opportunities for collaboration. This will further engage the makers and creative community to identify further gaps, needs and strengths surrounding the growing creative economy.
- An online member management and booking tool is vital. Specific tooling such as CNCs, laser cutters and 3D printers should be able to be booked online.
- An in-house fabrication team should be considered as the space develops as it could support local makers with engineering and design services.

TOOLS AND TECHNOLOGY

- The makerspace should consist of a variety of standard tools in addition to digital fabrication tools that are costly and a challenge for the makers' community to access.

- The makerspace should consist of tools to populate a metal shop, wood shop, prototyping studio and a Digital Lab consisting of a 3D printer, a laser cutter and a CNC machine at a minimum.
- Dependent upon size chosen/found, additional studio/workshop spaces which should be considered are: Sewing/Textile Room, Ceramics Room, Photography Studio, Surfacing/Finishing Studio, Arts/Crafts Studio, Bicycle Studio, Plastics Studio and/or Biology Lab.
- Free internet access should be available for all members.
- Refer to appendix for suggested tools.

10. CONCLUSION

Creating a central, large makerspace in Edmonton has the opportunity to create an epicenter for the local creative maker economy. Not only is the makerspace expected to enable professionals, hobbyists, and amateurs the opportunity to access otherwise cost-prohibitive tools, but it has the potential to spur an already innovative industry into a sustainable and substantial sector of Edmonton's economy.

The makerspace being proposed has a strong education and community component. This ensures that learning is at the centre of all work being conducted at the makerspace and that strong relationships are formed amongst all members to encourage collaboration and mentorship. Also, the business plan anticipates an expected year over year profit. This substantiates the initial capital and building investment required to start the makerspace. In summary, it is recommended that Edmonton Economic Development Corporation, Make Something Edmonton and Startup Edmonton advocate for the creation of a makerspace in Edmonton.

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RESOURCES

Craft – an artistic division of MAKE (<http://craftzine.com/>)

Hackaday – online community (<http://hackaday.com/>)

Make – a television show (<http://makezine.tv/>)

Make – Magazine that publishes projects and workshop on skills (<http://makezine.com/>)

Make Photo Essay Contest (<http://makezine.com/>)

Make workshops – (<http://www.makeworkshop.com/>)

Maker Faire – Annual maker fair (<http://www.makerfaire.com/>)

Makeshift – Competition to build lifesaving equipment (<http://makezine.com/01/makeshift/>)

Makerspace Playbook, School Edition- (<http://makered.org/wp-content/uploads/2014/09/Makerspace-Playbook-Feb-2013.pdf>)

The Blueprint – Directory of Makerspaces (<https://theblueprint.com/lists/makerspaces/>)

Workshop Safety and Guidelines example- (<http://fablabadelaide.org.au/wp-content/uploads/2013/07/Fab-Lab-Adelaide-OHS-and-TC.pdf>)

Canadian Tool Libraries

<http://torontotoollibrary.com/>

<http://calgarytoollibrary.org/>

<http://vancouvertoollibrary.com/>

<http://hamiltontoolibrary.ca/>

APPENDIX

EDMONTON ORGANIZATIONS

Edmonton Economic Development Corporation- is a not-for-profit company established by the City of Edmonton and is responsible for providing leadership to the economic growth strategy for Edmonton and the Capital Region, with specific accountability for: supporting industry growth and diversification; stimulating entrepreneurship and innovation; marketing the city image in target markets; managing the Shaw Conference Centre; boosting tourism, events and attractions; and enriching the Edmonton Research Park. (<http://edmonton.com/>)

Make Something Edmonton- is a community building initiative that resulted from the creation of a task force on City image and reputation in July 2012 in Edmonton, Alberta. Make Something Edmonton is a citizen-led celebration and call to action: to inspire and help you make something... anything... born out of your own talents, obsessions and imagination, to make your city more fun, more attractive, more fascinating, more caring, more profitable, more challenging, more fulfilling. A richer, stranger, stronger Edmonton: the city you already live in and love, only more so. (<http://www.makesomethingedmonton.ca/>)

Startup Edmonton- is an entrepreneurial campus and community hub. Since 2009, they have been creating collisions – between developers, designers, makers, founders, investors and mentors – transforming ideas into companies. They are a non-profit company headquartered in Edmonton, Alberta. (<http://startupedmonton.com/>)

NON LOCAL MAKERSPACES VISITED & ENGAGED DESIGNERS AND ORGANIZATIONS

- Alex Ryan- We Distill, Experience and Interactive Designer, San Francisco
- April Dean- Executive Director of SNAP (Society of Northern Alberta Print-Artists), Edmonton
- Christina Hug- Founder of The Makers Nation, Toronto
- James Irmiger- General Manager at TechShop San Francisco
- Kerry Stevenson-AssenWorks Makerspace, Winnipeg
- Lambert Le- Co-Founder of Helios Makerspace, Montreal
- Marissa Maislin and Michelle Organ- The Shop Toronto
- Michael Kulpa- President of ENTS (Edmonton New Technology President), Edmonton
- Paul Duggan- Managing Director of TechShop International
- Peter Schoenberg, EPL (Edmonton Public Library) Makers Space
- Ryan Dymont- Executive Director of Institute for a Resource-Based Economy, Tool Library Toronto
- Zoe Mowat- Maker and Designer, Montreal

LOCAL MAKERS INTERVIEWED

- Aaron Pedersen- Photographer
- Adam Larson- Lahnert Larson Design Fabrication
- Adam Skoreyko- Business Analyst at Canadian Western Bank/Entrepreneur
- Annalise Klingbell- Public Woodshop / Free Oliver Library

- Ashley Reddy- Rational Robotics, Innovator, Information Technologist
- Ben Zittlau- Electrical Engineer, Hardware Developer
- Bernd Hildebrandt- Designer and Entrepreneur
- Brad Goertz- Nomadic Infrastructure Labs, Co-Founder Ficus
- Brahm Ollivierre- Bike Manufacture, Bike Troubadour
- Brandon Webber- Self Employed Writer & Strategist, Organizer of Creative Mornings, Founder of Co-Work Edmonton, Maker
- Brendan Gallagher- Medical Modeling Technician, Institute of Reconstructive Science in Medicine (iRSM)
- Cam Linke- Entrepreneur, CEO of Touch Metric Inc, Partner at Flightpath Ventures
- Cameron Schuler- President, CEO and Co-Founder of VibeDx Diagnostic Corp, Executive Director of Alberta Innovates Centre for Machine Learning.
- Chelsea Boos- Designer and Co-Founder of Drawing Room
- Chris Dambrowitz- NAIT, Associate Vice President of Research and Innovation
- Chris Kirchen- Karve Machine/ Mechanical Engineer
- Chris Kubash- Kubash Furniture Studio
- Chris Mikulin- Engineer/ Yo Yo Wikki
- Chris Vander Hoek- Architect/ Group 2 Architecture
- Christina Melnychuk- Western Living Magazine, Marketing Communications Enthusiast, and Creative Strategist
- Clay Lowe- Design Director/Designer/Educator
- Curt Stout, Engineer/ OKB-200- Previous instructor at University of Alberta
- Cynthia Dovell- Architect/LGA Architectural Partners
- Dan Hlus, River City Metalworks
- Daniela Masellis- Set Designer
- Dave Butterwick- Butterwick Construction & Carpentry
- David Munoz-Paniagua, R&D Manager, Sensor Development Lead, Chemist
- Devin Hobbins- University of Alberta, Industrial Design, Technician, 3D printing and CNC
- Dion Bews- Dion Guitars, Co-Founder Ficus
- Geoffrey Lilge-Industrial Designer/On Our Table, Edmonton Construction Association
- George Heagle- George Heagle Furniture
- Graham Haunholter- Freelance Designer
- Granville Froese- Student and Makerspace Enthusiast
- Greg Morgan- Ryaton Boots
- Janice Manuel- NAIT, Associate Chair of Cabinetmaker Program
- Jeff Johnson- University of Alberta, Fabrication Workshop Coordinator, Instructor at University of Alberta
- John Andrus- Livi Design, Computer, IT, Physical Computing, Inventor
- Jordan Tomnuk- Industrial Designer/Tomnuk Design
- Joshua Kupsch- Landscape Architect/ Designer/ M.A.D.E
- Ken Horne- University of Alberta, Industrial Design, Technician, Wood and Metal
- Kenton Jeske- Furniture Designer
- Landon Schedler - Oliver Apt
- Mack Male- Owner of Paramagnus Developments Inc. and Computer Software Consultant
- Marissa Loewen- Communicator, creator, community enthusiast and personal coach.
- Matt Heide- Concrete Cat
- Max Amerongen- Industrial Designer

- Melanie Liles- Teacher/Artist/Crafter
- Michael Dub- Architect/ Dub Architects
- Michael Rivest- Architect/Dialog
- Mike Lam- Industrial and Furniture Designer and Entrepreneur
- Neil Fassina- NAIT, Provost and Vice President Academic
- Neil Lamoureux- VP Engineering at Code Baby, Co-Founder of Physical Computing Meetup
- Nigel Hinds- Mechanical/Electrical Engineer, Co-Founder of Physical Computing Meetup and Maker
- Paul Roberts- NAIT, Program Chair of Cabinetmaker Program
- Phil Chan-Bike Manufacturing
- Physical Computers Meetup, Edmonton
- Rachelle Bugeaud- Industrial Designer
- Rajesh Jaiswal- TEC Edmonton, Industry Liaison
- Ray McAdam- University of Alberta, Industrial Design, Technician, Wood and Metal
- Rose Marie- Panache Ceramics
- Sara Jackson- General Manager-Leva, Partner- Makers and Mentors, Owner- Connect Communications
- Scott Benoit, Clark Builders
- Selene Yuen and John Saunders- Selenium Interiors, Millworkers and Designers
- Shafraaz Kaba- Partner at Manasc Isaac Architects
- Shawn Cunningham- Frontstepforge, Metalsmith
- Tai Ziola- Architect/Designer/NewStudio
- Vaughan Hoy- Senior Architect at KENNEDY
- Vikki Wiercinski- Graphic Designer, Entrepreneur, Organizer of Royal Bison
- Zac Atkinson- CADD Alta Drafting and Design, Head of Design and Drafting

SELECT QUOTES FROM LOCAL MAKERS

Collective space should have access to machinery, collaborative space and a custom/in-house or prototypes facility. -Mike Lam, Designer and Company owner

No one can design through isolation. We need to adopt each others strengths. A community is needed. Access to tools and technology is needed. -Mike Lam, Designer and Company owner

The need for a space to create specialized pieces - Cynthia Dovall, Architect

Strong belief in small batch manufacturing -Greg Morgan, Ryaton, Shoe Manufacturer

Material sourcing and finding manufactures to work with is a great challenge. -Landon Shedler, Oliver Apt

I have an expanding business. I would like to share my knowledge with others as well as learn from others. - Clay Lowe, Designer and Instructor at Grant McEwan

There need to be a facilitation of a community of who want to create. A place of teaching and sharing; being able to connecting to others, offering and receiving critique- Sarah Jackson, part owner in Leva Cafe and Cafe Tech as well as Maker.

I don't need a space to prototype 365 days a year, but I do need a space to prototype when a new concept comes to mind. With this, I need the extra funds to do prototyping and then to manufacturing my goods for market. -Jordan Tomunuk, Furniture and Accessories designer.

There is a great challenge in working in isolation. I miss the concept of being in a studio, where you can bounce ideas off of each other and critique each others work. -Jordan Tomunuk, Furniture and Accessories designer.

It would be great to utilize the minds of marketing and business students, to give them real life experience and help understand my business more. -Jordan Tomunuk, Furniture and Accessories designer.

My experience in being in a makers market in a place like Brooklyn is "The cost of getting a prototype done vs. a case of beer. -Jordan Tomunuk, Furniture and Accessories designer.

There is a need for a sense of belonging and relate-ability for makers in the city. -Jordan Tomunuk, Furniture and Accessories designer.

I don't make as much stuff as I used to. I am more a designer and there is such challenges in manufacturing and particularly small batch manufacturing in Edmonton. -Vikki Weircinski, designer

It's hard to be able to afford minimums in the manufacturing world. -Vikki Weircinski, Designer and Organizer of Royal Bison

As a maker there is an importance in the opportunity to experiment. -Vikki Weircinski, Designer and Organizer of Royal Bison

There is a need for knowledge and process in making -Vikki Weircinski, Designer and Organizer of Royal Bison

A makerspace must be centrally located, an element of affordability and the opportunity to share your wares year round. -Vikki Weircinski, Designer and Organizer of Royal Bison

Berlin has a thriving makers economy as there is various small business that are supported by cheap communal spaces and venues for meeting and cross collaboration and sharing of tools and knowledge. There is an informal network, sometimes one big yet independent factory. -Bernd Hildebrandt, Designer, Artist and Instructor at the University of Alberta

There is an importance in the security of an assured space and overhead. -Bernd Hildebrandt, Designer, Artist and Instructor at the University of Alberta

Marketing and business should be integrated into a makers' economy. -Bernd Hildebrandt, Designer, Artist and Instructor at the University of Alberta

People (makers) need to get out of their basements and garages. -Brad Gertz, Nomadic Industries, Furniture Maker and Millworker.

It would be great to have a meeting of the minds, a meet up group. -Brad Gertz, Nomadic Industries, Furniture Maker and Millworker.

Promotion and business skills can be a challenge. -George Heagle, Fine Furniture Maker.

Working in isolation is a shame. Networks have a great potential to unify people. Exchanging and trading in cooperation = great success. -George Heagle, Fine Furniture Maker.

The need to make enhances peoples' lives. -George Heagle, Fine Furniture Maker.

There is a purpose to design in making efficient and purposeful objects -Rachelle Bugeaud, Designer and Maker

Space to share with others, share ideas, critiques and interaction in general. -Rachelle Bugeaud, Designer and Maker

A store or venue to showcase local work would be amazing. -Rachelle Bugeaud, Designer and Maker

Design and material library would be a fantastic resource. -Rachelle Bugeaud, Designer and Maker

There would be an opportunity to take a job from start to finish. -John and Selene Yuen, Selenium Architectural Millwork and Custom Fine Furniture

The need to educate the public on the community. -John and Selene Yuen, Selenium Architectural Millwork and Custom Fine Furniture

There should be room for collaboration but people can be protective of their work. - John and Selene Yuen, Selenium Architectural Millwork and Custom Fine Furniture

There is no easy access to technology which I would like to utilize in my making. There is a need for access and support. -John Andrus, Computer, IT, Physical Computing, Inventor

I have had to send my work to Japan to prototype. -John Andrus, Computer, IT, Physical Computing, Inventor

Cost of living keeps on going up which is creating challenges to opportunity. -Mel Lilies, Local Designer, Artist and Teacher.

There is an importance to creating connections and sharing knowledge. -Mel Lilies, Local Designer, Artist and Teacher.

It takes time to do test runs, prototyping and experiments. There is a fine line between business and producing your own goods. -Mel Lilies, Local Designer, Artist and Teacher.

It would be great to lean more about economics and breaking into international markets as well as proposal and grant writing. - Matt Heide, Concrete Cat

We need a space where makers can be marketed and found like the Copenhagen Makers website. -
Kenton Jeske, Fine Woodworker

A makerspace should be centrally located for ease of all. As for a storefront, it could be interesting to have something at a place like South Edmonton Common. -Kenton Jeske, Fine Woodworker

People who can teach about the tool or great techs are hugely important. -Dave Butterwick, Carpentry and Renovation Company

How do we bring architects, builder, engineer and owners together. -Geoffrey Lilje, Edmonton Construction Association and Designer

Programming and education will be of greatest importance as this will also provide some cost-recovery. The availability of technicians will help with the intimidation of tools and any knowledge base. -Ben Zittlau

Great value in having a space available. There is an ability to get things done. - Cameron Schuler, Vibe DX

The makerspace should be a utopia that can help makers realize their ideas can come to life. - Graham Haunholter, Designer

A storefront for makers is important -Rose Haugland, Panache Ceramics

TOOLS, TECHNOLOGY AND EQUIPMENT

The makerspace will have a cohesive set of varied, yet linked tools. The following tools will be purchased for a makerspace at a scale of 12,000 square feet:

Workspace Outfitting: Benches, Tables, Chairs, Stools, Shelves, Whiteboards, Makers, Brushes, Erasers, Brooms, Vacuum, Trash Cans, Garbage Bags, Vacuum Bags, Cleaners, Paper Towels, Rags

General Makerspace: Drills, Drill Bits, Hammers, Screwdrivers, Wrenches, Sockets, Pliers, Knives, Various Saws, Measuring Tools, Clamps, Glue Guns, Heat Gun, Safety Glasses, First Aid Equipment, Fire Extinguisher, Gloves, Earmuffs, Earplugs, Extension Cords, Sharpening Stones, Aprons, Mounting Boards, Hooks, Glue, Tape, Staples

Metal Shop: Disk Sander, Belt Sander, Sand Blaster, Sand Blasting Cabinet, Wire Wheel, Vibratory Polisher, Chop Saw, Drill Press, Horizontal and Vertical Band Saw, Tubing/Pipe Bender, Angle Iron Bender/Notcher, Mig Welder, Tig Welder, Spot Welder, Plasma Cutter, Milling Machine, Metal Grinder, Lathe, Roller Press, Throatless Shear, Knee Mill, Box and Pan Brake, English wheel, Planishing Hammer, Rotary Turret Punch, Sheet Metal Shear, Slip Roll, Corner Notcher, Finer Brake, Jump Shear, Torches, Welding Safety Accessories and Assorted Hand and Power tools. A possible addition is Jewelry Specific Tools (ie Soldering Irons)

Wood Shop: Table Saw, Band Saw, Panel Saw, Disk Sander, Belt Sander, Oscillating Spindle Sander Mitre Saw, Scroll Saw, Jointer, Planer, Bench Top Drill Press, Radial Arm Drill Press, Lathe, Milling

Machine, Table Router, Dust Collectors, Chisels, Rasps, Vices, Saw Horse and Assorted hand and Power Tools

Computer/Electronics Lab: Air Compressor, Moisture Analyser; Control Chamber, Incubator; Circuit Board prototyping machine, Pick and Place Plotter, Multimeter, Oscilloscope, Soldering Station, Power Supply (DC), Signal Generator, Frequency Counter, Digital Voltmeters, Magnifiers, Variable Transformer, Various Computers with Various Software, Scanners, Printers

Prototyping Studio: 3D Printers, Laser Cutter (Compressor, Air Filtration, Fire Extinguisher, Computer), CNC's, 3D Scanner, WaterJet Cutter, Vinyl Cutter

Sewing/Textile Room: Sewing Machine (industrial), Sewing Machine (standard), Serger, Embroidery Machine, Shears, Rippers, Needles, Measuring Tapes, Leather Punch, Awl, Ironing Board, Iron, Large Tables, Cutting Mat

Ceramics Room: Kiln, Ceramic Wheels, Glass Cutters

Photography Studio: Cameras, Back Drops, Lights

Surfacing/Finishing Studio: Powder Coating Station and Oven, Spray Painting Booth

Plastics Studio: Vacuum Former, Heat Strip Bender, Injection Molder

Packaging Studio: Vinyl Cutter, Box Cutter

Bicycle Studio: Frame Jigs, Other Specialized Tools

Biology Lab: Microscopes (both inspection and biological), Pipettes, Centrifuges, Incubators and Water Baths, Glassware and Sterilization Facilities, Analytical Balance, PCR Machine, Microplate Reader, and Other Basic Microbiology Equipment

ADDITIONAL TOOL NOTES

3D Printers

There is a great variety of 3D printers available. For prototyping, MakerBot 3D printers currently retail from around \$3000 in Canada, with more expensive models up to around \$8500 and budget printers from around \$600. Plastic costs are an additional consideration. ABS plastic costs from around \$42 to \$70 for 1 kilogram in a single color. CAD (Computer Aided Design software) is also required to create objects for printing such as Solidworks or Sketchup.

Photo Editing

Adobe products such as Photoshop are generally accepted as standard. A number of free alternatives also exist.

Adobe Photoshop – photograph and image editing

Adobe Illustrator – used for graphic design and illustration

2D animation, video editing and visual effects software

The industry-leading software packages are:

Final Cut Pro – video editing software (Mac OS only)
 Adobe Premiere – video editing software
 Adobe After Effects – visual effects and motion graphics
 Adobe Flash – Animation and multimedia content creation

3D animation software 3D animation can be achieved using a number of popular software packages including:

Autodesk 3D Studio Max \$200 (approx.)
 Autodesk Maya \$200 (approx.)
 Autodesk Softimage – \$3000 (approx.)
 Lightwave – \$1200 (approx.)

APPROXIMATE COST OF SELECT TOOLS

METAL STUDIO

Disk Sander/ Belt Sander \$3,800per
 Sand Blasting Cabinet \$2,000per
 Wire Wheel \$500per
 Vibratory Polisher \$500per
 Chop Saw \$300per
 Drill Press \$1,200per
 Horizontal Band Saw \$3,500per
 Vertical Band Saw \$3,500per
 Tubing/Pipe Bender Angle Iron Bender and dies \$7,000per
 Mig Welder \$3,600per
 Tig Welder \$4,000per
 Spot Welder \$2,500per
 Plasma Cutter \$5,000per
 Metal Grinder \$500per
 Lathe \$20,000per
 Roller Press \$5,000per
 Throatless Shear \$250per
 Knee Mill \$12,000per
 Box and Pan Brake \$5,000per
 English Wheel \$4,000per
 Planishing Hammer \$2,000per
 Rotary Turret Punch \$3,000per
 Sheet Metal Shear \$4,000per
 Slip roll \$3,000per
 Corner Notcher \$2,500per
 Torches \$3,000per
 Welding Safety Accessories and Assorted Hand and Power Tools \$5,000total

WOOD SHOP

Table Saw \$6,000per
 Band Saw small \$2,000per
 Band saw large \$5,000per
 Panel Saw \$3,500per
 Floor Disk Sander \$1,500per
 Floor Belt Sander \$2,200per
 Floor Drum sander \$10,000per
 Floor Oscillating Spindle Sander \$1,500per
 Miter saw \$600per
 Scroll Saw \$650per
 Jointer \$8,000per
 Planer \$10,000per
 Bench Top Drill Press \$400per
 Radial Arm Drill Press \$1,200per
 Lathe \$6,000per
 Table Router \$2,500 per
 Dust Collectors \$500per
 Chisels \$1,000 total
 Rasps \$500total
 Vices \$400per
 Saw Horse \$150per/set
 Assorted hand and power tools \$10,000total

PROTOTYPING STUDIO

3D Printers \$5,000per
 Laser Cutter \$40,000per
 CNC's \$60,000per
 3D Scanner \$12,000per
 Water Jet \$80,000per
 Vinyl Cutter \$2,000per

WORKSHOP DESCRIPTIONS

Introduction to shop

Training and testing for incoming members.

Wood Working

Introduction to Woodworking
Tool Training: Tablesaw Fundamentals
Wood Hand Tool Basics
Traditional Wood Joinery
Wood Lathing
Wood Carving and Inlay
Tool Training: Jointer, Planer, and Table Routing
Building a Chair
Making a Cutting Board

Metal Working

Introduction to Metal Working- Basics of cutting, bending and welding
Introduction to TIG Welding
Introduction to MIG Welding
Intermediate Welding
Build Your Own Bike Frame
Sculptural Metalworking

Machining

Tool Training: Milling Machine
Tool Training: Intro to Metal Lathe
Intermediate Metal Lathe

Rapid Prototyping and Digital Fabrication

Concepts of CNC Router
CAD/CAM Software
CNC Plasma Cutter
Intro to Laser Cutter
Intermediate Laser Cutter- Etching on Metal and Wood
3D Printing
3D Scanning and Editing

Computer Studio

Illustrator for CNC
Photoshop for Laser Cutter
CAD/CAM Software
Introduction to 3D Modeling

Electronics and Robotics Shop

Soldering and Electronics basics
Introduction to Arduino- Building
Introduction to Arduino- Basic Programming
Intermediate Arduino- Displays, Inputs and Outputs
Introduction to Raspberry Pi
Building Analog Electronics- Synthesizers

Fabrication

Vacuum Forming
Injection Molding
Carbon Fiber Basics
Vinyl Cutting
Box Cutting
Powder Coating
Silicone Mold Making and Resin Casting
Concrete Casting
Metal Casting

Textiles and Fiber Arts

Basics of Sewing
CNC Embroiderer
Sergger Sewing Machine
Fabric Dyeing
Intro to Loom Weaving
Macramé
Intro to Knitting and Crochet

Business and Marketing

Starting a Company
Introduction to Running a Business
Starting a Startup
Running a Business: For Artists and Makers
Introduction to Marketing
Moving from Prototype to Production
Bringing your Product Into a New Market

Jewelry and Metalsmithing

Introduction Jewelry Making- fine soldering
Intermediate Jewelry Making- casting
Ceramic Jewelry
Introduction to Metalsmithing
Soldering for Jewelry Making
Using Laser Cutting and 3D Printing for Jewelry

Assorted

Silkscreening Basis (with SNAP- Society of Northern Alberta Print-Artists)
Woodblock Printig (with SNAP- Society of Northern Alberta Print-Artists)
Clay- Hand Forming
Clay- Wheel Forming
Spoon Carving
Introduction to Hand Rendering
Introduction to Hand Script
Introduction to Leatherworking
Fundamentals to Mechanical Design

DIVISIONS OF SPACE

Taken from: Cavalcant, G., 'Making Makerspaces: Creating a Business Model', <http://makezine.com/2013/06/04/making-makerspaces-creating-a-business-model/>, 4 June 2013, (accessed 10 March 2015).

Welcoming Area: Front desks, sign-in kiosks generally take 50-250 square feet, to welcome members, provide assistance etc.

Socialization and FoodService Area: Members need to gather somewhere to eat and socialize. Also given that collaboration is a key aspect of makerspaces, people will naturally socialize. Seated people need a minimum of 15 SF per person.

Dedicated Classroom/Conference Rooms: Spaces all over the world have found that quiet, noise-isolated classroom areas are invaluable if you're offering educational programs. Consider including one in your floor plan, and consider that you'd probably need 20-50 square feet per seated person.

Dedicated Workshops/Studios: A separation of dedicated space for dedicated tools is needed. A good minimum size for workshop space of any one craft type is 300-500 square feet, with approximately 75-150 square feet per person working independently in a space. Different craft types need separate areas (especially woodworking, fabric arts, and welding).

Rental Studios: One of the big keys to the success to many larger Makerspace is in offering a large number of private rental studios and a great way to raise money, and cover rent. Typically 50 square feet is the minimum size of a studio, and up to 250 square feet.

Storage Space: Members need some way to store their projects, especially if they don't have a studio of their own. Most makerspaces rent out storage space in addition to membership fees. Storage space can be as simple as a locked box on a shelf for a few bucks, a whole shelf (8-12 SF) or storage lockers/rooms for hundreds of dollars.

Gallery/Display Area: Makers like to show off their work, plus it can draw in potential members or promote partnerships, so having some room for everyone to display their achievements might be a good draw.

Retail Space: Having a place for members to sell their makings is important. Moreover, having a space for members to sell their work, by charging a minimum commission, is also another way to make a little money. There is a need to have display space, storage space for stock and a sales terminal, plus someone to staff it.

Fire Lanes: As a layout estimation, there is a need to take 25-35% of the floor area to devoted to-code fire lanes. The dead space cannot be use, and must keep clear in order to pass fire and building code inspections.

Additional Space: Space for ventilation, electrical equipment and other code requirements. Space will need to be dedicated for various washrooms, cleaning stations and plumbing. Additionally, the possible requirement for universal design and for those who have mobility issues. Space is needed for emergency equipment.

*Artisan Asylums membership numbers have held steady between 120-180 sq. ft/person throughout their history with numerous private spaces. TechShop has limited private studio space and a incredibly effective marketing campaign, significant new-member discounts, prominent positioning of its locations, and very high end tools. The density of their locations tends to vary between 20-40 sq. ft/person after 5+ years of operation.

BROAD COST GUIDELINE

Supplied by Makerspace, 'Makerspace Playbook: School Edition', MakerMedia, <http://makered.org/wp-content/uploads/2014/09/Makerspace-Playbook-Feb-2013.pdf>, Spring 2013, (accessed 10 March 2015).

Activity	Equipment	Consumables	Staffing	Building works	Overall cost bracket
3D printing and digital fabrication	Low to High Eg 3D printer: \$500 to 3000 ~ 3D scanner: \$500 to \$2000 ~	Medium Eg 3D printer plastic: \$40–70 p/kg ~	Medium	Medium	Medium to high (but it is possible to operate in the low price bracket depending on how many items you buy & at which price point)
Digital design	Medium	Medium Eg Software: free, \$200 to \$1000+ ~	Medium	Low to medium	Medium
Multimedia/AV production	Medium	Software: \$700-1500 ~	Medium	Low to medium	Medium
Electronics e.g. robotics, electronic gadgets, circuit boards	Low to Medium Eg Makey Makey Kits: \$50 Robotics: \$100+ Lego Mindstorms EV3: \$500+	Low to medium	Low to medium	Low to medium	Low to medium
Mechanic, pneumatic, industrial, e.g. woodwork, metal, radio-controlled and other 'real object' fabrication	Low to medium Eg Precision squares & triangles: \$50 Hook carving knives: \$30 –\$150 Medium to high Eg Table saw system: \$1000+	Low to high	Medium to high	Medium to high	Medium to high
Craft, eg sewing, quilting, crochet	Low to medium	Low to medium	Low to medium	Low	Low to medium
Modelling, moulding, or casting, e.g. plaster, plastic, clay, fiberglass, acrylic sheets	Medium	Medium	Medium	Medium	Medium
Wordsmiths: e.g. zine creation, poetry workshop, bibliotherapy	Low	Low	Low	Low	Low

EXAMPLE OF WAIVER FORM PROVIDED BY HELIOS

Membership Registration
Year 2014

Atelier Helios Makerspace
137 Saint-Ferdinand, Suite 270
Montréal, QC, H4C 2S6



Member's Information

Date (YYYY-MM-DD)	
First Name	
Last Name	
Birth Date	
Address	
City	
Postal Code	
Contact Number	
Email	
Emergency Contact Name	
Emergency Contact Number	

<p>Office User Only Member Number: Notes:</p>
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Atelier Helios Makerspace's Rules

1. General

Be respectful to the staff, volunteers, other members and guest of the space.

Maintain a safe and clean environment at all times.

Follow all posted notices and rules.

Do not initiate or participate in unlawful activities.

It is the responsibility of each member to enforce the Code of Conduct.

2. Guests

One guest may come with the member into the space.

Guests must be at least 12 years of age.

The member is responsible for the guest.

The member must directly supervise all the guest at all times that the guest is in the space.

3. Cleanup

Vacuum or sweep the space I use before I leave.

Restore the Atelier Helios Makerspace to its state in which I found it before I leave.

4. Personal Materials

Label the materials and tools that you own before leaving them at the Atelier Helios Makerspace.

The label must contain my name, my phone number, and my email address.

Atelier Helios Makerspace is not responsible for lost or stolen tools or materials.

5. Safety

I agree to abide by all posted safety rules and take all appropriate safety precautions while on the Atelier Helios Makerspace premises.

I understand that access to a given piece of Makerspace equipment will not be permitted until I have received safety and basic usage training from a qualified member of the Makerspace.

In consideration for Member's participation in the activities of the Atelier Helios Makerspace, Member agrees to the following waiver and release

Member Release Form

1. Assumption of Risk

Member acknowledges the inherent risks in the use of tools, equipment, devices, and hazardous materials of any kind. The Atelier Helios Makerspace only used in electronics construction, fabrication, software design and other technology related activities and that Member's participation in such activities and/or use of such tools may result in injury, illness, death or damage to Member or Member's personal property. Further, such risks and dangers may be caused by Member or Guests or other Members. Finally, such injury, illness death or damage to Member or Member's personal property, may arise from foreseeable or unforeseeable causes including, without limitation, electrocution, burns, impalement, or slip and fall injuries. Member hereby fully assumes all such risks and any others which arise because of Member's association with the Atelier Helios Makerspace.

2. Release of Liability

Member releases the Atelier Helios Makerspace, its officers, agents, board members and assigns from any liability whatsoever arising out of any damage, loss or injury to Member or Member's property while participating in any activity on the premises of the Atelier Helios Makerspace and/or using any equipment owned by the Atelier Helios Makerspace or another member or guest of the Atelier Helios Makerspace regardless of whether such loss or injury is as a result of negligence of the Atelier Helios Makerspace or its members, guests, agents and assigns, or is a result of some other cause.

3. Covenant Not to Sue

Member agrees that Member will not, under any circumstances, initiate any legal action against the Atelier Helios Makerspace, its members, guests, agents and assigns, nor will Member assist in the prosecution of any such legal action filed by another, arising out of an injury to the person or property of Member while participating in the activities contemplated by membership in the Atelier Helios Makerspace. This covenant extends to include the heirs, executors, administrators or assigns of Member.

4. Third Party Indemnification

Member indemnifies, saves and holds harmless the Atelier Helios Makerspace, its members, agents and assigns from any and all losses, claims, actions or proceedings of every kind and character which may be initiated by any other persons or organizations and which arise directly or indirectly from the actions of Member while engaged in the activities contemplated by membership in the Atelier Helios Makerspace. Member hereby acknowledges that Member has carefully read all of the above provisions, fully understands same, and voluntarily signs this document as a condition of membership in the Atelier Helios Makerspace.

J'ai exigé que cette demande soit rédigée en anglais.

Member's Name & Signature

Date:

EXAMPLE OF STUDIO AGREEMENT PROVIDED BY HELIOS

Studio & Coworking Space Agreement

Atelier Helios Makerspace
137 Saint-Ferdinand, Suite 270
Montréal, QC, H4C 2S6
Canada



This agreement is executed in the City of Montreal, Province of Quebec on _____
(yyyy-mm-dd)

BETWEEN:

Helios Makerspace
137 Saint-Ferdinand
Montreal, Quebec
H4C 2S6

AND

Terms of Agreement

In consideration of the rents and agreements contained herein which you undertake to pay, keep and perform, HELIOS MAKERSPACE hereby provides a premise having a net superficial area of approximately _____ square feet.

Description and Location of Premises

The term of this Agreement will be for a _____ Month period commencing on the _____ and ending on the _____ inclusive.

Payments

You will pay to HELIOS MAKERSPACE during the term of this Agreement: a minimum monthly rental of

_____, payable in lawful money of Canada, payable in advance on the first day of each month without any compensation except for the first and last month if already paid.

You shall pay to HELIOS MAKERSPACE, at the time of the signature of this Agreement, an amount of

_____ representing the monthly rent of this Agreement for the first and last month (s) of the present Agreement.

As a user, you are not required but it is strongly suggested that post dated cheques are produced at the beginning of this Agreement.

Description of Services

HELIOS MAKERSPACE may provide you with access to office space, workstations, Internet access, office equipment, conference space, knowledge resources, and other services (collectively, "Services"). The Services at all times are subject to this Agreement.

No Unlawful or Prohibited Use

You will not use the Services for any purpose that is unlawful or prohibited by these terms, conditions and notices. You may not use the Services in any manner that could damage, disable, overburden, or impair any Services offered by HELIOS MAKERSPACE, or interfere with any other party's use and enjoyment of any Services. You may not attempt to gain unauthorized access to any Services, or property.

You hereby represent and warrant that you have all requisite legal power and authority to enter into and abide by the terms and conditions of this Agreement and no further authorization or approval is necessary. You further represent and warrant that your participation or use of the Services will not conflict with or result in any breach of any license, contract, agreement or other instrument or obligation to which you are a party.

Use of Premises

You will use and occupy the Premises of commercial and industrial use only and for no other purpose such as residency. Such use of the Premises is and will be permitted by the applicable laws, regulations and/or by-laws throughout the term of this agreement.

You agree that when participating in or using the Services, you will not:

- Use the Services in connection with malwares;
- Defame, abuse, harass, stalk, threaten or otherwise violate the legal rights (such as rights of privacy and publicity) of others;
- Publish, post, upload, distribute or disseminate any inappropriate, profane, defamatory, obscene, indecent or unlawful topic, name, material or information on or through HELIOS MAKERSPACE servers.
- Take Helios Makerspace's tools outside of the workshop
- Restrict or inhibit any other user from using and enjoying the Services.
- Violate any code of conduct or other guidelines which may be applicable for any particular Service (including the Building Rules).
- Violate any applicable laws or regulations;

Electricity used in the Premises will be at the sole charge of HELIOS MAKERSPACE; except when electricity is required above and normal usage, such as running of machinery and voltage exceeding 110 volt. An additional rent will apply.

HELIOS MAKERSPACE will supply the Premises with the necessary heating to provide the usual comfort for normal occupancy during business hours

HELIOS MAKERSPACE will not be responsible for the failure to perform any of its obligations pursuant to these presents or for the loss or damage suffered, if the failure, loss or damage is caused by force majeure, by fire or other similar circumstance or cause beyond the reasonable control of HELIOS MAKERSPACE.

Alterations, Repairs, Changes, Additions, Improvements

You may not make any improvements, alterations, additions or repairs to the Premises at any time without having obtained from HELIOS MAKERSPACE.

At the time of expiration of this Agreement for any reason whatsoever, you must, at its cost, restore the Premises to their original condition (except with respect to approved improvements), save and except normal wear and tear.

Without limiting the responsibility, you will be responsible for all damages suffered by HELIOS MAKERSPACE and/or other occupants of the Building.

Renewals and Terminations

This Agreement is renewed at the end of each period with consent of each party.

This Agreement must be adhered to at all times. Failure to follow Agreement can result in non renewal or even early termination of the usage license. HELIOS MAKERSPACE reserves the right to terminate any

Service at any time, immediately and without notice, if you fail to comply with the Agreement. This includes non-payment or violation of the space rules. If this happens, HELIOS MAKERSPACE will refund any amounts paid for unused periods that remain excluding the last month payment after deducting any pending charges, on a prorata basis.

HELIOS MAKERSPACE reserves the right at all times to disclose any information about you if required by law. Your participation in and use of the Services as HELIOS MAKERSPACE deems necessary to satisfy any applicable law, regulation, legal process or governmental request, or to edit, refuse to post or to remove any information or materials, in whole or in part in HELIOS MAKERSPACE sole discretion.

Participation in or Use of Services

You acknowledge that you are participating in or using the Services at your own free will and decision. You acknowledge that HELIOS MAKERSPACE does not have any liability with respect to your access, participation in, use of the Services, or any loss resulting from such participation or use.

Disclaimer of Warranties

To the maximum extent permitted by the applicable law, HELIOS MAKERSPACE provides the Services “as is” and with all faults, and hereby disclaim with respect to the services all warranties and conditions, whether express, implied or statutory, including but not limited to: merchantability, fitness for a particular purpose, accuracy or completeness of responses, results, workmanlike effort and lack of negligence. Also there is no warranty, duty or condition of title, quiet enjoyment, quiet possession, correspondence to description or non-infringement. The entire risk as to the quality, or arising out of participation in or the use of the services, remains with you.

Exclusion of Incidental, Consequential and Certain Other Damages

To the maximum extent permitted by the applicable law, in no event shall HELIOS MAKERSPACE be liable for any direct, special, incidental, indirect, punitive, consequential or other damages whatsoever (including, but not limited to damages for: loss of profits, loss of confidential or other information, business interruption, personal injury, loss of privacy, failure to meet any duty (including of good faith or of reasonable care, negligence, and any other pecuniary or other loss whatsoever) arising out of or in any way related to the participation in or inability to participate in or use of the services, the provision of or failure to provide services, or otherwise under or in connection with any provision of this agreement, even in the event of the fault, tort (including negligence), strict liability, breach of contract or breach of warranty of HELIOS MAKERSPACE, and even if HELIOS MAKERSPACE has been advised of the possibility of such damages.

Limitation of Liability and Remedies

Notwithstanding any damages that you might incur for any reason whatsoever (including, without limitation, all damages referenced above and all direct or general damages), the entire liability of HELIOS MAKERSPACE under any provision of this Agreement and your exclusive remedy for all of the foregoing shall be limited to actual damages incurred by you based on reasonable reliance up to 100,000\$. The foregoing limitations, exclusions and disclaimers, including the previous sections) shall apply to the maximum extent permitted by applicable law, even if any remedy fails its essential purpose.

Non-Disparagement

You shall, during and after the participation in and use of the Services, refrain from making any statements or comments of a defamatory or disparaging nature to any third party regarding HELIOS MAKERSPACE, or any of HELIOS MAKERSPACE other than to comply with law.

Indemnification

You release, and hereby agree to indemnify, defend and hold harmless HELIOS MAKERSPACE from and against all claims, liabilities, losses, damages, costs, expenses, judgments, fines and penalties based upon or arising out of your negligent actions, errors and omissions, willful misconduct and fraud in connection with the participation in or use of the Services. You further agree in the event that you bring a claim or lawsuit in violation of this agreement, you shall be liable for any attorney fees and costs incurred by HELIOS MAKERSPACE or its respective officers and agents in connection with the defense of such claim or lawsuit.

Severability

In the event that any provision or portion of this Agreement is determined to be invalid, illegal or unenforceable for any reason, in whole or in part, the remaining provisions of this Agreement shall be unaffected thereby and shall remain in full force and effect to the fullest extent permitted by applicable law.

Language

Both parties hereby declare that it is their express wish that the present Agreement be drawn up in the English language. Les deux groupes déclarent par les présentes que cette Entente a été rédigé en langue anglaise conformément à leur volonté expresse.

Company Representative's Name

Company Representative's Signature:

Date

MAKERSNATION RESEARCH ON STATE OF MAKERSPACES ANONYMOUS RESPONSES
 Provided by The Makers Nation - <http://themakersnation.com/>

Country	What year did you open?	How many members do you have?	Which initiative contributes the most to your bottom line?	How are your membership fees structured?	What is the price range of the workshops you host at your space?	What is the number of participants in the workshops you host?	Are you profitable?	Are you non-profit or for-profit?	How many staff members do you employ?	What percentage of the organization are volunteers?	What is the most popular piece of equipment used in your space?	What are the operating hours of your space?
USA	2012	0-50	Membership Fees	\$50	Free	12	Yes	Non-profit	1-5	100	3D Printer	24/7
USA	2009	200-300	Membership Fees	\$40-\$70	Free, \$20-\$20, \$40-\$40,		Yes	Non-profit	0	100	Laser engraver, by far	24/7
USA	2010	400-500	Membership Fees	\$35-\$50	Free, \$20-\$40, \$80-\$100	5	Yes	Non-profit	0	100	Laser cutter and 3d printers	24/7
USA	2013	0-50	Workshops, Government Subsidies	\$100	Free	6	Yes	Non-profit	1-5	2	Laser Cutter	Staffed Tue - Sat 10am-8pm
USA	2013	50-100	Events, Government Subsidies	0	Free	20	Yes	For-profit	1-5	40	Welders, miter saw, sewing machines	Office closed on Monday
USA	2013	50-100	Membership Fees	\$75-\$100, \$200	\$20-\$40	4	No	For-profit	1-5	5	Knowledge, Meetups	24/7
USA	2013	0-50	Workshops, Membership Fees	\$25-\$50, \$99	Free, \$0-\$20, \$20-\$40, \$40-\$80	6	No	Non-profit	0	100	3d printers	24/7
USA	2013	Public	Government Subsidies, Grants and sponsorships, our Friends group	0	Free, \$0-\$20	15	No	both	1-5	20	3D printer	Appointments
Canada	2010	50-100	Membership Fees, Sponsorships	\$50	\$0-\$20	15	Yes	Non-profit	0	30	Laser cutter	24/7
USA	2008	100-200	Membership Fees, Studio Rental	\$35	\$60-\$80	15	Yes	For-profit	1-5	10	laser cutter	24/7
USA	2009	50-100	Workshops, Membership Fees	\$30	\$20-\$40	12	Yes	Non-profit	0	100	Makerbot Replicator	24/7
USA	2014	0-50	Workshops, Membership Fees	\$50	\$20-\$40, \$40-\$60, \$80-\$100	8	No	Non-profit	0	25	3D Printers	Mon - Fri 6pm - 10pm
USA	2013	0-50	Membership Fees	\$80	\$0-\$20	10	No	Non-profit	0	80	Laser Cutter	24/7
USA	2013	0-50	Membership Fees	\$10	\$0-\$20	10	No	Non-profit	0	100	Most used: table saw	24/7
USA	2013	30-100	Membership Fees	\$75-\$225	\$0-\$20, \$80-\$100	5	Yes	For-profit	0	2	3D printer	3:37
USA	2011	100-200	Membership Fees	\$50, \$125, \$175	\$100-\$150, \$150+	4	No	For-profit	5-10	60	SawStop table saw	M-F 9am-2am
USA	2006	50-100	Membership Fees	Project	Free, \$0-\$20	10	No	Non-profit	0	15	40W CNC Laser cutter	Non-Sunday 9am-10pm
USA	2013	100-200	Workshops, Membership Fees, classes	\$99	\$20-\$40, \$80-\$100,	9	Yes	For-profit	10-20	30	laser cutter, then 3D printers, then woodshop, then welding.	24/7
USA	2009	100-200	Membership Fees	\$40	\$0-\$20	5	Yes	Non-profit	0	30	Laser cutters	M-F 11am to 11pm
USA	2014	0-50	Membership Fees, Government Subsidies	\$50-\$100	\$0-\$20, \$20-\$40	5	Yes	Non-profit	0	100	3d Printers	24/7
Norway	2013	0-50	Membership Fees, Government Subsidies	\$80	Free	10	No	For-profit	1-5	0	Laser cutter	24/7
USA	2011	Public	our bottom line is knowledge sharing and content creation	0	Free, \$0-\$20	5	No	Non-profit	20-50	30	3D printers, sewing machines, laser and vinyl cutters, STEM kits	68 hours per week
USA	2009	90-100	Membership Fees	\$25, \$50, \$100	Free, \$0-\$20, \$20-\$40, \$40-\$60	5	Yes	Non-profit	0	10	Laser cutter	24/7, Saturday 10-2 Sunday noon-5
USA	2014	0-50	sponsors	\$50	\$60-\$80	5	No	Non-profit	0	50	TBD	open Monday and Thursday nights 5-9
USA	2013	0-50	Workshops, Membership Fees, Events	\$60	\$20-\$40	3	No	Non-profit	1-5	75	3D Printers and the Nerf's Derby	12:00-10:00pm
USA	2013	50-100	Membership Fees	\$40-\$90, \$199	\$0-\$100	5	Yes	For-profit	1-5	100	Laser cutter	Generally open M-F 9-5, many members have 24/7 access.
USA	2010	0-50	Workshops, Membership Fees	\$50, \$25	Free, \$0-\$20, \$20-\$40, \$40-\$60, \$60-\$80	4	No	For-profit	0	200	Other people's knowledge and skill sets	3:37
Colombia	2013	0-50	Membership Fees	\$50	Free, \$0-\$20, \$20-\$40, \$40-\$60, \$60-\$80, \$80-\$100	12	Yes	Non-profit	1-5	20	Laser cutter, 3d printers	24/7
Spain	2013	0-50	Membership Fees	\$35	Free, \$0-\$20, \$20-\$40, \$40-\$60, \$60-\$80, \$80-\$100, \$100-\$150, \$150+	10	No	Non-profit	0, 5-10	100	Laser cutter, 3d printers	3:37
USA	2010	300-400	Membership Fees	\$150, \$100, \$60	Free, \$20-\$40, \$40-\$60, \$60-\$80, \$80-\$100, \$100-\$150, \$150+	5	Yes	Non-profit	1-5	30	Unknown	24/7
USA	2013	1000+	Membership Fees, Government Subsidies	\$19	\$20-\$40	12	Yes	Non-profit	5+	30	Woodworking equipment	7 days a week, 10am-5pm
Colombia	2013	0-50	Workshops, Membership Fees, Events	\$150, \$30	Free, \$0-\$20	15	Yes	Non-profit	1-5	0	Woodworking equipment	24/7
Austria	2013	0-50	Workshops, Membership Fees	\$25	\$20-\$40, \$60-\$80, \$100-\$150, \$150+	3	No	For-profit	0	0	Fastlane, CAPEX	Wed / thu / fr : 1PM - 8PM
USA	2009	0-50	Membership Fees	\$50	\$0-\$20, \$40-\$60, \$80-\$100, \$100-\$150	6	Yes	Non-profit	0	100	3D Printer	24/7
USA	2014	0-50	Membership Fees	\$150	\$20-\$40, \$40-\$60, \$80-\$100, \$100-\$150	10	No	Both	1-5	95	Woodworking tools.	9 to 9
USA	2014	0-50	Membership Fees	\$50, \$75, \$12, \$175	Variable depending on workshop	7	Yes	Non-profit	1-5	75	3D printing and laser cutter	8am until 10 pm
USA	2011	300-400	Membership Fees	\$10	Free	7	Yes	Non-profit	1-5	0	Laser Cutter	T-S 10-8
Norway	2012	0-50	Government Subsidies	Project	\$50-\$100	5	No	Non-profit	1-5	50	Sliding table saw	08-17:00 (hoping to expand soon)
New Zealand	2012	Community - 2000	Workshops, Membership Fees, Government Subsidies	Project	\$20-\$40	12	Yes	Both	1-5	0	Laser cutter	10-8 mon, No weekends
Summe	2013	0-50	Government Subsidies	0	Free	10	No	Non-profit	1-5	80	Lee Bennett consultant	Monday to Friday from 8 to 17:00
France	2014	50-100	Workshops, Membership Fees, Events	0	\$0-\$20	6	Yes	Non-profit	0	100	3d print	from 3pm to 8pm, Friday
USA	2013	0-50	Workshops, Grants	Project	\$0-\$20, \$20-\$40	6	No	Non-profit	1-5	25	We only have 3D printing	11-4 on Saturdays.
France	2012	100-200	Events	\$10	\$20-\$40	10	Yes	Non-profit	1-5	100	The laser cutter!	Wednesday, 2pm - 9pm
Japan	2010	0-50	Membership Fees	\$30	Free	5	No	Non-profit	1-5	1000	Laser cutter	Saturday and Sunday 12:00-19:00
Austria	2010	1000+	Membership Fees	\$30	Free, \$40-\$60, \$150+	16	Yes	For-profit	1-5	10	Laser cutter	24/7
France	2013	100-200	Government Subsidies	\$30	\$0-\$20	15	No	Non-profit	5-10	20	Laser cutter, 3d printers	5 days a week
Italy	2012	100-200	Events, we are the Arduino's Fablab, the enterprise supports economically the fablab	\$70	\$20-\$40, \$80-\$100	12	No	Non-profit	1-5	95	laser cut	from tue to fri from 16:00 to 00:00
France	2013	0-50	Workshops, Membership Fees, Government Subsidies	\$10	\$150+	12	No	Non-profit	1-5	50	CNC Milling Machine to create molds for glass slumping and blow glass	Generally open from 8am to 17pm + till 19pm on tuesday
France	2011	50-100	Government Subsidies	\$5	Free	6	No	Non-profit	1-5	99	CNC mill.	24/7
The Netherlands	2014	Public	Workshops, Contracts with Corporations	0	\$60-\$90	5	Yes	For-profit	1-5	0	Laser cutter	9.00-17.00

Country	What year did you start?	How many members do you have?	Which initiative contributes the most to your bottom line?	How are your membership fees structured?	What is the price range of the workshops you host at your shop?	Average number of participants in the workshops	Are you profitable?	Are you non-profit or for-profit?	How many staff members do you employ?	What percentage of the people in your organization use the equipment?	What is the most popular piece of equipment used in your shop?	What are the operating hours of your shop?
Germany	2011	0-50	Government Subsidies, Site of Materials and Machine	0	\$0-20, \$20-40	8	No	Non-profit	0	100	The LaserCutter	9am to 9pm with evening hours available. Mon-tue-thur-fr: 8:00-18:00 Wed 8:00-18:00 Fablab is open for the public on Wednesdays.
USA	2013	Public	Workshops, Government Subsidies	Project	\$100-150	25	No	Non-profit	1-5	25	EpiLog Laser	24/7
Denmark	2012	3000+ students	Government Subsidies	0	Free	30	No	Non-profit	1-5	0	LaserCutter	9am to 9:30pm M-Th, Saturdays. Sun 11AM-6PM EST
Germany	2012	0-50	Membership Fees	\$40-\$15	Free, \$30-20	12	Yes	Non-profit	0	100	CNC Portal Mill	Tues BY APPOINTMENT ONLY
USA	2008	400-500	Classes	Project	\$59-\$1200	7	Yes	Non-profit	1-5	10	3D-Printer	Thurs 11AM-6PM EST
USA	2012	400-500	Workshops	Project	\$40-80, \$60-80	6	No	For-profit	0	100	Cutting tables, Then sergers.	Monday to Friday 9 to 9.
Australia	2012	1000+	Workshops, Government Subsidies	Project	\$20-40, \$40-60, \$150+	25	No	Non-profit	1-5	50	3D Printer only because we don't have a laser cutter yet.	Special events on weekends sometime
Canada	2012	0-50	Contracts with Corporations	0	\$20-40	9	No	both	1-5	50	Laser cutter	10:00pm or less as an event on Sunday to Thursday
Egypt	2012	1000+	Contracts with Corporations	\$10	Free, \$20-20, \$150+	7	Yes	Non-profit	1-5	10	Laser cutter	9-12 / 13-30 - 17:30 week days, 14:00 - 18:00 weekends
France	2011	200-300	Government Subsidies	\$10	\$0-20	10	No	Non-profit	1-5	0	lasercutter	14:00 - 18:00 weekdays, till 22:00
Colombia	2012	0-50	Workshops	0	Free	20	No	Non-profit	5-10	10	Laser Cutter	8:00-12:00
Latvia	2013	0-50	Tutorial Workshops	Project	\$20-40	4	No	Non-profit	1-5	0	3D printer	14:00-17:00
USA	2010	50-100	Workshops, Government Subsidies	\$25, \$365	\$0-20, \$20-40, \$40-60, \$60-80, \$150+	15	Yes	Non-profit	0	100	3D printers	10:00 - 18:00, everyday except Sunday.
USA	2009	0-50	Workshops, Government Subsidies	0	\$60-80, \$150+	10	No	Non-profit	5-10	30	laser engraver, 3D printers a	24/7
Canada	2013	0-50	Membership Fees	\$25	\$0-20	8	Yes	Non-profit	0	100	Wood working tools	24/7 for key holders
United Kingdom	2012	200-300	Government Subsidies	\$295	Free, \$20-20, \$20-40, \$100-150	12	Yes	Non-profit	1-5	20	Laser Engraver / Cutters	Monday 9am - 5pm
Canada	2011	100-200	Membership Fees	\$150	Free, \$20-40	6	Yes	Non-profit	0	7	Laser cutters	Wednesday 9am - 12pm
USA	2009	100-200	Membership Fees	\$50	\$0-20, \$20-40, \$40-60, \$150+	8	Yes	Non-profit	0	100	Laser cutters	Thursday 9am - 8pm
USA	2012	Public	Workshops	0	\$20-40, \$40-60, \$150+	10	Yes	For-profit	1-5	5	The big bed (60x120cm)	Friday 9am - 9pm
USA	2009	100-200	Workshops, Membership Fees	\$55, \$75, \$30	Free, \$20-20, \$20-40, \$40-60, \$60-80, \$80-100, \$100-150, \$150+	10	Yes	Non-profit	0	100	Solder irons and 3D Printers	Saturday 11am - 4pm
Canada	2010	50-100	Workshops, Membership Fees, Events	\$115, \$40	Free, \$20-20, \$20-40, \$40-60, \$60-80, \$80-100, \$100-150, \$150+	5	Yes	Non-profit	0	100	The 90W laser etcher.	24/7 for members.
Canada	2014	0-50	Workshops	\$95	\$20-40, \$40-60, \$60-80, \$80-100, \$100-150	8	No	For-profit	1-5	0	lith	Wednesday 9am - 12pm
Canada	2014	0-50, 100-200	Contracts with Corporations	0	Free	15	No	Non-profit	1-5	40	Desktop CNC - 4 axis	Thursday 9am - 9pm
Denmark	2013	Public	Government Subsidies, and funding	0	Free	30	No	Non-profit	1-5	0	LaserCutter	Friday 11am - 4pm
Spain	2014	0-50	Workshops	Project	\$20-40	5	No	For-profit	1-5	50	3D printer	24/7 for members
Denmark	2013	Public	Government Subsidies	0	Free	15	No	Non-profit	1-5	10	LaserCutter	Members have 24/7 access to the shop type 10-7pm weekdays by appointment
Germany	2014	100-200	Government Subsidies	0	Free	5	No	Non-profit	1-5	0	lith	Operating hours are dependent on the workshop type
Germany	2013	50-100	Contracts with Corporations, Events	\$70	\$80-100	5	Yes	For-profit	1-5	10	LaserCutter	10-7pm weekdays by appointment
USA	2012	50-100	Workshops, Membership Fees, soda and materials sales	\$40	\$0-20, \$20-40	8	No	Non-profit	0	100	3D printers, laser cutter	8-5 Tuesday and Wednesday @9am - 4pm
USA	2013	1000+	Government Subsidies	0	Free	15	No	Non-profit	1-5	10	Computers, 3D printer	Wednesday day off
Italy	2013	0-50, 50-100	Membership Fees, Contracts with Corporations	Project	\$20-40	10	Yes	For-profit	1-5	0	Laser cut - 3D printer	08:00 to 20:00, 7 days a week
Saudi Arabia	2010	100-200	Workshops, Contracts with Corporations	\$10	\$40-60, \$60-100, \$150+	8	No	Both	1-5	20	Laser cutter, Never stops!	08:00 to 20:00, 7 days a week
Germany	2011	100-200	Workshops, Membership Fees	\$40	Free, \$20-20, \$20-40, \$40-60, \$60-80, \$80-100, \$100-150, \$150+	7	Yes	Non-profit	0	40	LaserCutter	Monday to Friday 10am - 8 pm
Spain	2007	0-50	Government Subsidies	Project	\$80-100	5	Yes	Non-profit	5-10	30	laser cutter	Saturday 12 - 6 pm
Luxembourg	2011	0-50	Workshops	Project	Free, \$20-20, \$20-40, \$40-60	20	Yes	For-profit	1-5	20	laser cutter	24/7 for members, and Saturdays for the public.
USA	2013	0-50	Membership Fees	\$20	\$20-40, \$150+	8	Yes	Non-profit	0	100	Soldering irons	M-Th 8am-9am
Portugal	2013	400-500	Equipment rental	Project	Free, \$20-20, \$20-40	12	No	Non-profit	1/5/14	50	Laser cutter	9am-5pm
USA	2011	0-50	Membership Fees	\$110	\$20-40	5	Yes	For-profit	1/5/14	99	Band saw	Su 1-5pm
JAPAN	2012	100-200	Workshops, Contracts with Corporations.	Project	Free, \$20-40	5	No	Non-profit	1/5/14	0	Laser Cutter	24/7
USA	2013	0-50	Workshops, Membership Fees	\$20, \$80	\$40-60	5	Yes	Non-profit	1/3/14	15	Table Saw	5 days a week 9 am - 6 pm.
Italy	2012	100-200	Events, we are the Arduino's Fablab, the enterprise supports economically the Fablab	\$70	\$20-40, \$60-100	12	No	Non-profit	1-5	95	laser cut, CNC mill.	10-19h Monday to Friday
France	2011	50-100	Government Subsidies	\$5	Free	6	No	Non-profit	1-5	99	3D printers are pretty popular too.	Really 9am to past midnight, 2am closing