Founding a Hackerspace

An Interactive Qualifying Project Report

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Abstract

This report is the written component of our project that explores the hackerspace phenomenon. The report discusses the background and history of hackerspaces along with the social context of the modern hackerspace. Interviews of various hackerspaces were conducted and analyzed in order to gain insight into their operation and management. The research conducted was used to establish a hackerspace as a for-profit business. We describe the process of launching this entity, MakeIt Labs LLC in Lowell, MA. Also included is the business plan created for MakeIt Labs.

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Chapter I: Executive Summary

Creativity and ideas emerge from many places. Bill Gates, the founder of Microsoft, said that his biggest fear of competition is from “someone in a garage who is devising something completely new” (Henderson, 2010). His fears came true in 1992 when two Stanford graduates came up with Google in a California garage.

Sprung from this garage environment, Google is now perhaps the largest competitor to Microsoft in the areas of Internet search, mobile operating systems, and Internet advertisement. Their innovations have expanded from their core search market to now becoming a market leader in everything from email to satellite mapping, news aggregation and mobile computing.

The desire is to live the entrepreneur lifestyle and come up with the ‘next big thing’. Having a space where people can work and share knowledge while making innovations and sharing opportunities with others is the key idea behind a hackerspace. If garages were the entrepreneur domain of the 20th century and hackerspaces are the social evolution of the do-it-yourselfer garage, they are naturally looking to be the innovation hotspots of the future.

The goal of this project was to gather information on hackerspaces and in order to prepare us to open a hackerspace as a profitable business. We researched the historical background of hackerspaces, the evolution of the modern hackerspace and the movements driving the cultural phenomena that are now leading to the rapid expansion of hackerspaces across the US and the world at large.

We have researched extensively online and collected a sizeable sum of relevant information. This research gave us a wide understanding about hackerspaces and their associated terms. Perhaps the most valuable part of our research was the series of interviews that were conducted with leading members various prominent hackerspaces in the US. Using the data we collected, a business plan for establishing a hackerspace was created. Using this plan, we established MakeIt Labs: a hackerspace in Lowell, MA. In line with the open-source nature of hacker culture, we are distributing this business plan to the public free of charge for general use.

The information collected from our research gave us an understanding of the following concepts:

- What is a hackerspace?
- What are hackers?
- What is it mean to be a member of a hackerspace?
- What is the hacker ethic?
- What is the history of hackerspaces?

Our findings can be found in the report that follows.

The purpose of modern hackerspaces has become broader when compared with the original hackerspaces. The modern hackerspace hosts many more activities. The basic purpose of the original hackerspaces was the basic sharing tools and knowledge between members to complete projects. Nowadays, while the mission has remained the same, the methodology has grown significantly more complex. Many hackerspaces also host a wide spread of outreaching workshops, classes, competitions and various social events. During public events, participants are often enticed to join hackerspace communities.

The online hacker community continues to play a vital role in expanding the real-world hackerspace community. They strive to share information through online tutorials, workshops and example projects. Using websites, magazines and television they have managed to bring many enthusiasts into the hackerspace community and inspired many to open their own hackerspace.

Events and competitions give hackers an incentive to participate in the community and developed a Do It Yourself (DIY) mindset. Competitions like Makeshift and the Make Photo Essay Contest challenge hackers to present their projects and be rewarded for their ingenuity. Maker Faire is an annual fair where hackers from different organizations can demonstrate their projects in front of a huge audience of hackers and laypersons alike.

The Evolution of the Modern hackerspace section of this report has more details on the changes in hackerspaces and also profiles some exemplary hackerspaces.

Communication between hackers is one of the keys to innovation within the community. Hackerspaces communicate with each other to get updates on events and news in the community. One of the most popular networking websites is hackerspaces.org. Newcomers can communicate with members of hackerspaces if they need information or wish to open their own hackerspace. Local hackerspaces post contact information for chat, email, micro-blogging and phone, and encourage interested people to get in touch with them. They also offer free software that can be used to schedule meetings, classes and events.

We conducted several interviews with different hackerspace representatives and gathered valuable information. From the interviews we got a broader picture of hackerspaces and how one manages a hackerspace. We came to know how they got involved in hackerspaces, their management structure, liabilities, activities and their relationship with public.

Using the results from the interviews and background research we wrote a business plan. The business report includes the operational strategy, market analysis, competitive edge and risk factor in opening a hackerspace business.

Finally, we have a functioning hackerspace in Lowell, MA. These members contribute by paying monthly fees which help to run and expand the hackerspace. The members also provide many tools that they share with other hackers in the hackerspace.

Chapter II: Introduction

In this report, we delved into the cultural phenomena of hackerspaces, or open access community workshops. The goals of the project for one of the members of the team, Joe Schlesinger, was to start a hackerspace in Lowell, MA and create a business plan detailing a for-profit hackerspace. The goals for the other members of the team, Md Monirul Islam and Kelly MacNeill were:

- Identify the roots of the modern hackerspace by researching the culture and history of hackerspaces.
- Provide background knowledge that may be useful for starting a hackerspace.
- Develop research skills for online sources and interviews.
- Develop cooperative project skills.
- Create a document incorporating the previously listed goals and skills that outlines the social phenomena of hackerspaces to identify of socio-technological systems, subsystems, and the linkages between them.

The objective of our IQP project was to dig out the connection between the technology and the society. In trying to do so, we looked into the hackerspace concept and see how it build/ interact with society through their technological work.

We conducted this project in part because there is little formal research on the topic of hackerspaces. By doing further research on the topic we aimed to be better prepared and more likely to create a successful hackerspace.

This project is suitable for an IQP because hackerspaces are a physical manifestation of hacker culture, a social phenomenon based in a technical society. Using the results of our research to create an open environment for people to create and share ideas about technology marries the ideas of technology and society that exemplifies the ideas guiding the Interactive Qualifying Project.

This report is particularly helpful to people who are hackers, tinkerers, entrepreneurs or anyone who is interested in the hackerspace phenomenon. They should be able to gain knowledge of hackerspace culture and gain awareness and understanding of the Do-It-Yourself philosophy. The business plan section of this report should be useful to anyone trying to start their own hackerspace. They will be able to use the business plan as a guideline for starting their own space modeled after MakeIt Labs. People interested in hackerspace culture will discover the history of the hackerspace phenomena and a view of modern hackerspaces. Current operators of hackerspaces might learn of ways to improve their hackerspace and find several ways of increasing their presence in the DIY community.

We discerned the pertinent topics on hackerspaces and hacker culture through online research and interviews conducted in person.

The following chapters of the report establish the background of the hackerspace phenomena, elaborate on our procedure for research, interview and establishing MakeIt Labs. The next chapters discuss the results of our research and interviews, and analyze the social context of hackerspaces. The report concludes with the appended businesses plan and interviews.

Chapter III: Background

The background chapter of this report is concerned with the origins of the hackerspace phenomenon and introducing hackerspaces and hacker culture to an uninitiated reader. It is divided in into sections based in a FAQ style.

What is a hackerspace?

One definition of a hackerspace is a community workspace which operates on the principles of hacker ethics. Hacker ethics are expanded upon in a later section. Hackerspaces are a large set of differing places, with one ubiquitous feature: a community of enthusiasts. Hackerspaces are so varied that this feature is probably the only element that is shared among every hackerspace. Hackerspaces can be found that are involved with every technical niche you can imagine. However, there are some hackerspace types that are more common than others. Some of the more common hackerspace foci are computer technology, industrial art, robotics, and electronics.

Many hackerspaces are found at www.hackerspaces.org; some of the most well-known older hackerspaces are C-Base, Metalab and L0pht Heavy Industries.

A definition from hackerspaces.org: "Hackerspaces are community-operated physical places, where people can meet and work on their projects. In short, it is a real location (opposed to an online meeting place) to gather with like-minded people and hack" (Hackerspaces.org, 2010).

What does 'hack' mean in that quote? There are many different definitions of 'to hack' or what a hack is, and we explore that later. As used above, it means to undertake a project that involves tinkering, modifying, or creating something.

Jarkko Moilanen, a sociology PhD candidate, who is doing his dissertation on Hacktivism wrote that a hackerspace seems to have the following qualities:

1. Owned and Run by it's [sic] members in a spirit of equality.
2. Is a nonprofit organization, and open to the outside world on a (semi)regular basis.
3. Shares tools, equipment and ideas without discrimination.
4. A strong emphasis on technology and invention.
5. Has shared space (or is working on a space) as a center of the community.
6. A strong spirit of invention and science based on trial, error, and freely sharing information (Moilanen, 2009).

In an interview with Mitch Altman, one of the founding members of Noisebridge, he defined 'hackerspace' this way: "To me, the term denotes a physical location with tools and diverse experts who can help collaborate on projects in a wide range of scales, but it connotes a philosophy of doing things with no particular preference to empirical or theoretical methods" (Altman, 2010).

It is important to note that we are discussing hacking in its original meaning. This is not 'hacking' as portrayed by the popular media. The definition of a hacker is expanded upon in the next section, but it is important to note that it is different from the common usage of the term ‘hacker’, meaning “a malicious computer programmer that reverse engineers computer systems to cause damage or steal

information" (SearchSecurity.com, 2007). These people are known to the legitimate hacker community as computer crackers or black hat hackers.

Hackerspaces are typically very social environments, where information, tools, expertise and ideas are shared freely. Some social activities that occur at hackerspaces are:

- Open houses- Hackerspaces show off what they have been working on to the public.
- Classes/workshops- Members learn skills taught by other members or people brought in.
- Collaborative projects- Members work together to build something.
- Fundraising- Members perform feats of valor to gain financial support.

Open houses are very important because sometimes they are the only window to hackerspace from the outside world. Hackerspaces use open houses to recruit new members and garner interest in the community. Open houses are sometimes accompanied with local media publications.

Classes are either taught by current members or by external people that are brought in. Some examples of skills taught might be welding or carpentry. In more computer-oriented hackerspaces, they might bring in a special type of programmer. A specific example is the learning to program Ruby sessions at Noisebridge (Hackerspaces.org, 2010).

Collaborative projects are the heart of a hackerspace. These are what members come in to work on during normal hours. They might be architectural modifications to the actual space, or a custom built computer, or a robot that serves drinks. The possibilities are extremely wide. Anything that is interesting or creative can be considered for a collaborative project. Some specific examples are the Tesla coils at BUILDS (BUILDS Wiki, 2010) and the Arduino Fire-alarm at NYC Resistor (NYC Resistor Wiki, 2010).

Fundraising is important if not all the costs of running the hackerspace are covered by membership dues, or if the hackerspace is trying to raise money for a piece of equipment or project. Fundraising events are often standard fundraisers but with a technological twist, like a barbeque with a robot serving the burgers, or an all-night computer programming party. A specific example is the Friends of NYCR, who donate to the hackerspace to show their support. (NYC Resistor, 2008)

What is a hacker?

A hacker, in the original sense of the term is a person who takes things apart to learn about them, rebuild them and improve them. The term 'hacker' actually originated at MIT, from the Tech Model Railroad Club, meaning "persons who perform hacks, or pranks on the MIT campus" (TMRC, 2008). The first hacks involved modifying model trains to perform better than their specifications, or do something completely different, such as play a song. (IHTFP Hack Gallery, 2010). 'Hacker' has only become a malevolent term recently, with media's portrayal of black-hat hackers, or more appropriately termed 'crackers'. Crackers do not follow the hacker ethic, and are shunned by the hacker community.

The term *Hacker* evolved into its current usage from the original hackers taking apart and reverse engineering computer systems. Like any other piece of technology, hackers felt that they could learn the most about computers by dismantling them and rebuilding them. They became the first people to show what amazing things computers could do by using them for unintended purposes. Naturally, their knowledge of the intricacies of computer systems and phone infrastructure also granted them the ability to break computer and phone systems (Cabrera, 2009). Some of the less scrupulous hackers then made a name for themselves by using their skills for evil. For example: breaking into bank security systems.

There are many degrees of *computer* hackers, from black-hat to white-hat. Black-hat meaning that the hacker uses their skills for malicious and/or illegal means; grey-hats tending to the morally ambiguous; and white-hat hackers who operate to improve security by finding and announcing flaws in programs (Parker, 2005). There is a large and complex subculture of computer hackers that is beyond the scope of this project.

One of the first mainstream media exposures of hackers occurred when the hacker group L0pht (also founders one of the first hackerspaces, L0pht heavy industries), famously claimed to Congress in 1998 that they could shut down the Internet in 30 minutes. Fortunately, this never came to pass, even though authorities failed to take action regarding the flaws that l0pht were publishing (Senate Governmental Affairs Committee, 1998).

Why do hackerspaces exist?

Hackerspaces exist because of the need for tools, ideas and knowledge to complete projects. Specifically, hackerspaces are designed to accommodate the following needs:

- Access to a wide variety of tools and technology.
- Group interaction, knowledge and resources sharing
- Floor space for individual project development.
- An open environment for expression of creativity, innovation, inspiration and encouragement.
- Equipment for prototyping project ideas for companies.

Hackerspacesg.pbworks.com describes the social aspects of a hackerspace: "Because us geeks are humans, before Hackers. While working on achieving that perfect LCD (or CRT) tan might be the hottest thing this summer, the keyboard and mice really aren't that cool to hang around with 24/7. They don't talk back, they don't review your code, and they can't catch the latest episode of *The Big Bang Theory* with you. Contact with other Humans in meatspace [real life] is pretty rewarding as well (see: *Fellow Hackers are useful for:*, above). Besides, the only way you're going to Level Up that Geek Cred is by hanging around others like you. Ever played the Game of Life? Stay lonely and die, my friend. The Hackerspace is a place where geeks are free to hack on and experiment with whatever they want. Even if it ends up being completely pointless. Hackerspace.sg is the focus of geek activity, and the heart of the Singaporean Geek Culture. Funds accumulated in the running of the Hackerspace could well be channeled back into the community by acquiring further ~~toys~~ equipment to share and hack on." Likewise different hackerspaces and different members have varying views on why they want a hackerspace, but they all have a core reason – to share tools and complete projects (Turner, 2010).

What is the hacker ethic?

According to Steven Levy, the author of Hackers: Heroes of the Computer Revolution the hacker ethic lies in five principles:

- Sharing
- Openness
- Decentralization
- Free access to computers
- World improvement

The common goal, as phrased by Levy is the Hands-on imperative: "Hackers believe that essential lessons can be learned about the systems—about the world—from taking things apart, seeing how they work, and using this knowledge to create new and more interesting things."

At MIT the hacker ethic actually describes the qualities that a 'hack' (a covert modification to the MIT campus) must have. It must:

- be safe
- not damage anything
- not damage anyone, either physically, mentally or emotionally
- be funny, at least to most of the people who experience it (IHTFP Hack Gallery, 2010).

As indicated earlier, many places calling themselves hackerspaces are in conflict with these principles. So the definition of hackerspace must not be limited to those that abide by the hacker ethic. Perhaps the original hackerspaces were founded on these notions, but then imitators branched off into the plethora of diverse hackerspaces we have today.

What does it mean to be a member of a hackerspace?

Nick Farr of Noisebridge in San Francisco, CA describes what a hackerspace member is:

“Since each hackerspace differs slightly on members and the issue of membership, I choose to define a member as a person directly involved with the upkeep and governance of a hackerspace. Most members pay dues to cover rent and expenses and share the obligations of administration, publicity, documentation and other duties essential to keeping a space open and flourishing. Without these members, the Hackerspace itself would cease to exist” (Farr, 2009).

The privileges and responsibilities granted to a member of a hackerspace obviously vary by the actual space the person is a member of. In a situation where access is not limited, it can simply mean that a 'member' is a person who donates (money or resources) to the community. *Noisebridge*, a more anarchist minded hackerspace, describes their attitude toward members:

"Noisebridge even welcomes non-members to come use the space, and Altman says non-members can do everything that member’s can (except block the consensus process). The community governs itself according to the guiding principle expressed on a large poster of Keanu Reeves hanging from the loft: “Be excellent to each other, dudes”. “ (Tweney, 2009).

At BUILDS, a hackerspace run as a club on the Boston University campus, they do not make a distinction between members and non-members. Anyone who comes and participates in the space is a member. When elections are held, anyone who shows up can vote. This is because it is a school club: there is no overhead to run the space, so there is no need to charge for membership (House, 2010).

In a more restricted hackerspace, only members may be allowed into the building, or may be allowed to use the tools or special equipment in the space. A model for many of these commercial hackerspaces is Techshop, what could be considered the “McDonald’s” of hackerspaces, because they are a franchised for-profit brand. In many of these cases, membership may also confer administrative powers, giving paying members a voice in the overall direction of the hackerspace. The restrictiveness of membership may also be a function of the group's need for anonymity or security. On the opposite side of the spectrum, there are perhaps also those who do not wish to become members for similar reasons. One might not want to be officially associated with an insidious group of miscreants (but still take part in the devious activities).

It is not surprising that there is some contention over these types of hackerspaces. While charging for membership may be necessary, it goes against what some people believe is the very nature of hacking: that information should be free. Due to charging for information, some potential members of hackerspaces might be dissuaded from joining a for-profit organization, when other more hacker-inclined options may be available. This conflict may also spark the creation of additional hackerspaces that suit the needs of those with differing opinions on the hacker ethic.

What is the history of hacking?

The first hackerspace was the Tech Model Railroad Club, founded in 1946, a model train club at MIT. There, the first hackers modified model trains to perform better or do something 'completely different'. Their view on the term hacker is as follows: "We at TMRC use the term "hacker" only in its original meaning, someone who applies ingenuity to create a clever result, called a "hack". The essence of a "hack" is that it is done quickly, and is usually inelegant. It accomplishes the desired goal without changing the design of the system it is embedded in. Despite often being at odds with the design of the larger system, a hack is generally quite clever and effective" (TMRC, 2008). In Steven Levy's book, he describes the TMRC as the source of the hacker culture.

The Homebrew Computer Club, founded in 1975, was not a hackerspace itself. However, they popularized computer usage with their newsletter which gave instructions on how to build a computer. Several of the world's most influential hackers, Steve Wozniak, John Draper (AKA, Captain Crunch), Steve Jobs, and Bill Gates were involved in the club (Lash, 2006). This club spawned many clubs of its own, some of which are hackerspaces such as the Chaos Computer Club.

Founded in 1981, in Berlin, Germany, the Chaos Computer Club partially transcends the idea of hackerspace. They are an activist organization, hacker club, and political movement. They describe themselves as *"a galactic community of life's beings, independent of age, sex, race or societal orientation, which strives across borders for freedom of information…."* Each year they host the Chaos Communication Congress, which is Europe's largest hacker convention, with a record attendance of 4,230 in 2008 (Club, 26C3: Here Be Dragons, 2009).

The Chaos Computer Club is still active, with over 1500 members. They first gained attention when they compromised a German bank's network, causing them to deposit 134,000 DM into the club's account. They had notified the bank of the flaw in their network beforehand, but the bank failed to take any action. The money was returned the next day, however. The CCC is known for publicly demonstrating security risks (Club, CCC Home page, 2010).

Another popular hackerspace in Berlin, c-base, has some affiliation with the CCC. Founded in 1995, they are recognized with being one of the oldest hackerspaces and are responsible for influencing the development of hackerspaces in the western world (Tweney, 2009). The hackerspace is actually rumored to be a downed space station, and has a rich and fantastic background. C-base often hosts musical performances in their space, and has weekly meetings for musicians called the "Cosmic Open Stage".

Chapter IV: Procedure

This chapter discusses the procedure we underwent for doing our research on hackerspaces and for establishing the business of MakeIt labs.

Research Methodology

Researching hackerspaces is unlike researching many other subjects because hackerspaces are a relatively informal topic. There is little written literature on hackerspaces. The majority of the information about hackerspaces we gained was from blogs, new articles and interviews.

The greatest obstacle in our research was the lack of concrete data on hackerspaces. The best thing we found was hackerspaces.org's wiki. However, the problem with the wiki is that it is completely user generated. It contains much obsolete data concerning hackerspaces that no longer exist, or never existed.

Additionally, we would have liked demographic information about the participants and members of hackerspaces. This information is unavailable because there is no association of hackerspaces or similar group where this data can be collected and reported. Again, this is likely due to the informality and local scale of most hackerspaces.

The primary methodology used in the research of this paper was online search. Most of the sources of information on hackerspaces are online. There are some literature sources, such as Stephen Levy's book, Hackers: Heroes of the Computer Revolution. For researching direct questions, usually searching the Internet revealed a blog or a forum with information on the queried subject. The website "Hackerspaces.org" was a very useful source of information for quantitative figures on the number of hackerspaces and the growth of hackerspaces over time. Jarkko Moilanen's blog was also very helpful with many good figures on the growth and demographics hackerspaces. MIT's website on the Tech Model Railroad club was helpful in explaining the original source of the term hacker, additionally, there was information on the hacker ethic from the IHTFP Hack gallery. There are also several good articles from Hack-a-day and MAKE.com describing the hacker community.

Interview Methodology

Our desire to know more about hackerspaces and our general lack of experience with the hackerspace community led us to create a questionnaire which we used to interview several hackerspace members. The goal of our selection of members was to find people from different hackerspaces and different demographics. The surveys are attached as Appendix B. We decided to interview the following hackerspaces to get a broad sample of the different types of spaces:

Boston Area:

- Sprout & Co.
- BUILDS

New York City Area:

- Noisebridge
- NYC Resistor
- AlphaOne Labs

Silicon Valley Area:

- Superconductor
- Hacker Dojo
- Techshop

We conducted an interview with someone from each of the above hackerspaces via email, instant messaging or telephone. Through the interviews we managed to unearth valuable information about hackerspace management and culture. In several cases, some of the hackerspaces we tried to interview were closed or unresponsive to our requests.

Narrative: Building a hackerspace from the perspective of Joseph Schlesinger

I started getting an interest in hackerspaces as I looked to set up a workshop of my own. I was planning on graduating in the upcoming year (May 2010) and looked forward to setting up a place where I could work on projects. I don't remember how I came across the term 'hackerspace', but it particularly appealed to me when I did. I went looking for one in the area, and couldn't find any within reasonable travel time (less than an hour by car). I figured that since I was going to get some space and start a workshop anyway, I might as well make a business out of it and get other people to share it with, so the idea of setting up a hackerspace appealed greatly.

The first part of establishing a hackerspace involved a long research process of one to two months. Anything I could find about hackerspaces I read. Hackerspaces.org was incredibly helpful, as it provided a list of hackerspaces for me to examine. I also set up a customized Google Reader feed that automatically found new results for different search terms (like 'hackerspaces'), and alerted me. Anything new that Google found on hackerspaces, I was made aware of. I've found this a useful tool when trying to corner any subject of interest to me that is fast-developing.

After I was convinced this was something I wanted to do, I went about setting up an LLC under the name MakeIt Labs to organize it. I chose an LLC for its simplicity in tax structure. While many of the hackerspaces I had discovered in the initial research period were created as communal non-profits, I didn't see an easy way for me to establish one by myself in the short term. As I didn't know anyone sincerely interested in helping me set up a hackerspace, I figured the best way to make sure it happened was by doing it myself. Many hackerspaces I had seen took years to coalesce because of the nature of getting enough

people, and then the long decision making process that committees often get themselves embroiled in, and I wasn't interested in waiting that long for this to get started.

Once I had a company set up, I created the website and started advertising the idea to as many people as I could. One of the first places I listed MakeIt was hackerspaces.org, as that was where I found so many places, and where I figured many others who were looking for a space to join would start. I also set up a Facebook page to help keep track of the people interested in the idea.

The first meeting of interested people was at University of Massachusetts Lowell. A number of people that had contacted me out of interest attended there, and they were able to get me a room. The group was comprised primarily of those who had already contacted me out of interest in MakeIt. There were a couple of individuals who attended solely out of it being posted on the online social networking site Facebook. We discussed what the place was to be about, where it was to be located (Lowell), how membership would work, what we would do, and any other talking points people came up with.

This group of people, with some dropping interest and new people joining as time progressed, met regularly to discuss the progress of getting a physical space and to share ideas for how to make further broaden awareness of MakeIt.

With a group of people interested in the project, it came time to search for space. A budget was formed, and what would be desired in a space talked about. I met with a realtor, and visited places on craigslist. Eventually a location was chosen, and a lease was signed under the LLC. Members then got together to paint and decorate the place in the MakeIt color scheme (orange and blue), painted the logo on the wall, and moved in all the equipment. Desks, chairs and similar equipment still needed were acquired for free from craigslist. The members that were still interested at that time have mostly joined as paid members.

The place as it stands now is completed. The next steps will involve growing the memberspace, first in hopes of having MakeIt break even, and then in hopes of expanding to an even better space. All the while, events are being planned with the hope of getting interested people together, encouraging people to collaborate on projects and starting classes both to raise funds and share skills amongst members.

Chapter V: Results

This chapter discusses the results of our research and the state of MakeIt labs.

Interviews

From the interviews, we discovered some valuable pieces of information. As previously stated, we interviewed several members of hackerspaces from all around the country. Some of the interviewees consider themselves part of a hackerspace; others explained that they do not consider their organizations to be hackerspaces, even though they recognized the similarities.

The largest portion of the hackerspace demographic is people aged 20 - 40 years old. Interestingly, Sprouts (one of the organizations that do not consider their establishment to be a hackerspace) said their members' ages range from 8-65. The younger lower bound is likely due to their hosting of several programs for homeschooled children.

The management structure between hackerspaces varies wildly from one to the other. The management styles run the gamut from anarchist, in which all decisions are made on an individual basis, to top-down where decision making responsibility is distributed vertically with management and executives holding the most power. MakeIt Labs, being a profit oriented enterprise, logically follows the top-down style of management. The most common style was a form of democracy with elected officers.

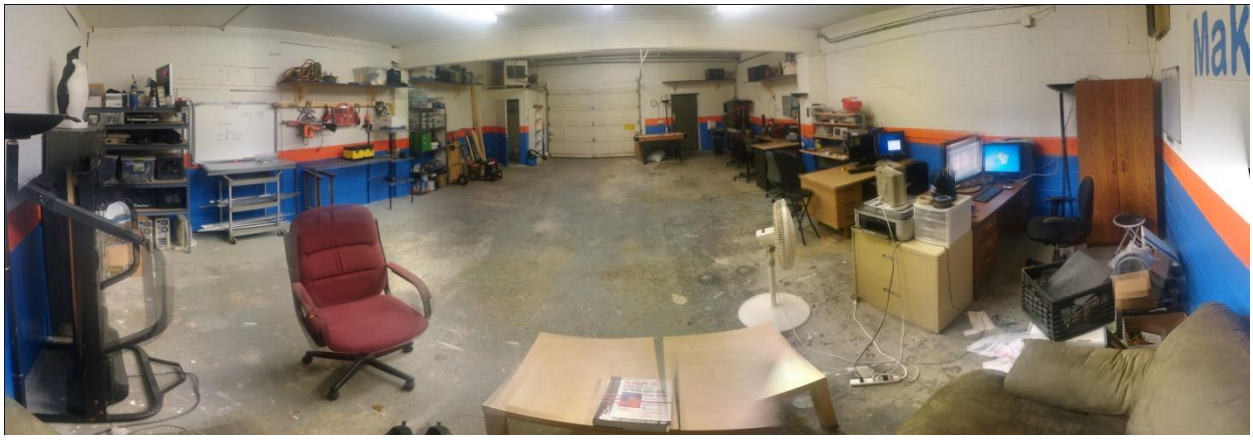
In terms of activities, most hackerspaces were fairly *active* but the purpose of the activities differed by hackerspace. Some activities were hosted as fundraisers, while some of them were purely educational. Additionally, some of the members teach classes to cover their dues. Several also stated that their hackerspaces were profitable businesses.

As for legal problems, there were few that hackerspaces had to face. Many tried to be responsible and avoid any legal or liability issues. Some said that they maintain good relations with their municipalities. Usually, they chose the commercially zoned spaces so they wouldn't run into zoning issues.

MakeIt Labs

This section discusses the current state of MakeIt Labs, the hackerspace started during this project.

MakeIt Labs opened to the public on July 1st, 2010. It was opened following the business plan described in appendix A. As of 10/29/2010, the hackerspace currently has 8 paying members. There are no regular events except for open houses which occur every Thursday between 6 pm and 9 pm. Below are panoramic images of the space:


MaK

Business Plan

Our research impacted the business plan in several ways, detailed below:

The management structure of MakeIt Labs was chosen by the founder, Joe Schlesinger, after careful deliberation and consideration of the standard hackerspace management structures. The flat topology of democratic management, as is the most common hackerspace structure, is not suited to the boot-strapped quick expansion goal of MakeIt Labs. He ultimately settled on sole proprietorship of the business because of his major out-of-pocket investment in the company.

The marketing strategy for MakeIt Labs outlined in the business plan was shaped by the demographic data and communication techniques discovered throughout the research we conducted. From the interviews we discovered that the age range varies greatly for hackerspace membership, disregarding specific hackerspace qualities that might influence age range (such as being part of a college or a homeschooling focus). We found that the membership was not limited to engineers, but included all types of people. We found that there was a great online presence for hackerspace members and that shaped the initial marketing strategy to focus on Facebook advertisements.

Our research on events and activities corroborates the decision to host weekly open house sessions to attract public interest. During open house members get a chance to show their projects to the attendees. These projects give attendees a better idea of what they might be able to do if they become members of MakeIt Labs. As found in the research: classes, workshops and training opportunities bring in more potential members, thus, MakeIt Labs allows non-members to participate in classes for a fee.

The liability and legal issues are some of the most important concerns while opening a business. The information from the interviews on legal problems led to the creation of the rules and regulations in the liability section of the business plan. These rules are imposed on members of MakeIt Labs to ensure maximum safety. Also the information on liability from the interviews along with legal advice helped to find the right insurance plan to cover MakeIt Labs to cover liability issues.

Chapter VI: Analysis of Results

This chapter of the report synthesizes the results of our research into discussion of the social contexts of the phenomenon of hackerspaces.

The Evolution of the Modern Hackerspace

Hackerspaces have become a worldwide phenomenon of community-operated physical places for people to meet and work on their projects. The phenomenon is spreading rapidly and people from many different communities and backgrounds are participating.

The purpose of a hackerspace has become broader as time has elapsed. Hackerspaces have evolved to not only provide a workspace but also provide a place for hackers to create social connections. Having a common space helps these people work on their projects, and gives them access to resources they would not usually have. The sharing of tools and space builds a relationship between these people and creates an open environment for new ideas to flow freely. Events hosted at the hackerspace provide opportunities for the members to create social connections.

The events also serve to entice more people to become part of their hackerspace community. Apart from work and social events, they also host different kinds of workshops to teach basic skills to people who are interested in hacking and want to get started on their projects. This gives newcomers an easy transition to a hackerspace community.

There are currently 29 hackerspaces in the USA and 27 more are in the process of starting up (Hackerspaces.org, 2009). A list of active hackerspaces can be found at hackerspaces.org. This website gives the name of the hackerspace, country of location and relevant contact information of all the hackerspaces on the website.

For example, some of the modern hackerspaces active today are: NYC Resistor in NY, Noisebridge in San Francisco, CA, Metalab in Vienna, Italy, Pumping Station in Chicago, IL. With their workshops, events, and project demonstrations, these hackerspaces have successfully built a community.

These hackerspaces have enough members to pay their rent and bills. NYC Resistor is one of the most popular and has attracted a wide variety of people. They are involved in many projects. NYC Resistor has a section called “Friends of NYCR” where people can give them money to help them run free events for the community and maintain such a large hackerspace (NYC Resistor, 2008). Members of NYC Resistor meet regularly to share knowledge with the community at their space in downtown Brooklyn.

NYCR and the other organizations listed above are examples of hackerspaces and strive to spread the concept to other people and communities. These hackerspaces are well established and have little fear of collapsing. They also act as an example and encouragement for others to open hackerspaces.

Overtime the concept of hackerspaces has expanded to grow alongside web based communities. While these ‘online hackerspaces’ don’t provide a physical place to complete projects; they provide enough information through tutorials to complete them. The mainly online ‘maker’ community present their projects in several ways offline as well: magazines, websites, and television. All of these methods of presenting projects have proven effective in spreading the hacker philosophy.

Some of these publications and activities are listed below:

1. Make – Magazine that publishes projects and workshop on skills. (http://makezine.com/)
2. Make Photo Essay Contest. (http://makezine.com/)
3. Make workshops. (http://www.makeworkshop.com/)
4. Makeshift – Competition to build lifesaving equipment. (http://makezine.com/01/makeshift/)
5. Maker Faire – Annual maker fair. (http://www.makerfaire.com/)
6. Craft - an artistic division of MAKE. (http://craftzine.com/)
7. Make – a television show.(http://makezine.tv/)
8. Hackaday – online community.(http:// hackaday.com/)

A description about these events and communities are given below in detail –

Make- A quarterly magazine named Make publishes projects focused on Do It Yourself (DIY) and Do It With Other (DIWY) projects. Their project ideas cover computers, electronics, robotics, metalworking, woodworking and many other areas. The focus of this magazine is on people with a mindset similar to people of the hackerspace community. They enjoy making complex projects often with household materials. These projects often source ideas for other projects (Doughety, 2005).

Make photo essay contest- The editor of the magazine is Bruce Sterling. Lee D. Zlotoff writes a column in the magazine for the competition and judges them. The magazine has a section for the photo essays contest where readers submit photos of the project(s) they have completed. After evaluation and votes, the best participant is awarded a prize.

Make workshops- In the primary sections of the magazine they write about skills such as welding, electronics and mold making. They write about these skills thoroughly so that anyone lacking previous knowledge on any of these topics can still follow the steps and learn by themselves. These sections are aimed at people who like to create things but don't have the money or knowledge to do so. With the skills gained from these workshops, and household materials, they could make many interesting projects.

Makeshift- Hackerspaces are not always about building fancy things, but also about designing and building lifesaving equipment. Makeshift is another competition that the author of the magazine hosts, where someone would have to safe his/her life with a limited amount of equipment. This kind of competition inspires the hackerspace community to create new MacGyver-esque ideas (not surprising, as Lee D. Zlotoff was one of the creators of the TV show!). In this competition people get to show off their creativity and learn how to act in hazardous conditions.

Maker Faire- Every year Make magazine hosts a public fair to show off all the interesting projects that different hackerspaces have submitted to the events (Doughety, Maker Faire, 2005) The project categories include arts, crafts, and engineering. The fair is a celebration of the DIY philosophy. It started with 5 acres of land on 05/22-23/2006 (Doughety, Maker Faire, 2005). The faire features expositions, workshops, hands-on workshops, demonstrations and DIY competitions.

The Maker Faire this year was most epic. The gathering of the people showed the growing interest in the concept of innovation and building a revolutionary community. Different hackerspaces came up with

projects on a variety of topics. San Francisco based hackerspace Noisebridge presented Anti/Surveillance Fashion Show. The goal was to use wearable technology for surveillance or to avoid surveillance. There are also projects from people who were not from hackerspaces but wanted to be part of this team and show their creativity. Some of the items in the fashion show are face detection make-up, accessories that blind CCTV cameras with IR LEDs and more. They threw this fashion show to expose the relationship between surveillance and culture (Hackerspaces.org, 2010).

Craft- Hackerspaces are not only for people who like to work with technology but also for people who like to be artistic. Craft is a subdivision of Make magazine meant for publishing projects on arts and crafts. They try to encourage artistic people and give them a space to express their creations. Craft was started on October 2006 in print form and, due to lack of interest; on 11 February 2009 the print version was abandoned, leaving only the online version (Doughety, Make (magazine), 2005).

Make TV- Make has also tried to show their enthusiasm and ideas through the eye of television. A show called Make: television was launched in January 2009 on PBS. This show gives detailed information and guides on selected projects and videos submitted online. These projects are step by step processes. This show has helped to create some new fans for the DIY community.

Hackaday, (not a part of Make, as were previous topics) is an online community where members share their projects to help enhance everyday life in a cheap and interesting way. It contains step by step guidelines on how to create some nifty things we might not otherwise be able to afford. One of the projects shows how to create liquid nitrogen at home; this can be used to make an ice cream machine and many other things (Cray-inspired PC case, 2007). There are other projects showing step by step how to create our own laptop, cell phone, laser, iPhone, iPod, portable audio, GPS, G1 and many other things. Hackaday helped to create a virtual industry where readers can learn to cheaply make luxury products.

Communication in hackerspaces

Inter-hackerspace communication

Hackerspaces and their members try to communicate with each other and keep updated on events and news. Hackerspaces.org has been trying to increase the communication and collaboration between hackerspaces for bigger projects like hackerspace festivals or group support for starting hackerspaces.

There are a number of different ways hackerspaces and their members can communicate with each other. The name and a description of them are given below.

Chat

IRC - irc://irc.freenode.net/#hackerspaces

Jabber – This is one of the best ways to get in touch with the members of the hackerspaces around the world. Anyone can create an account at jabber.hackerspaces.org. Once one creates an account he/she gets a list of all the other users. Having the user list is a good way to start your own network and get in touch with people of a similar mindset.

They have also created a chat room for the hackerspace members known as Hackers chartroom. Anyone can join the Hackers chartroom at xmpp:hackers@conference.jabber.hackerspaces.org?join.

Email

Hackerspaces.org provides a mailing list for to enhance the communication between hackerspace members. They have mailing lists for the following purposes:

1. Announce List – For updates and event announcements.
2. Discussion List – To discuss any topic about hackerspaces.
3. Finance List – to discuss fundraising ideas, strategies, member donations, and tax laws.

These mailing lists can offer help to members on topics they are interested in or in which they require help. The mailing list allows problems or solutions from one specific hackerspace to be available to all the other hackerspaces on the mailing list. This also helps to prevent hackerspaces from having problems that other hackerspaces have already faced and solved.

People who are interested in this community but are not yet sure if they want to join, can subscribe to the Announce List or Discussion List. From these mailings they will get enough information to make the right decision. The mailing list can also help new or old members in this community to understand the financial issues they might face and how to tackle these situations in an efficient and effective manner.

Micro-Blogging is another way members can remain connected to and gain information about the community. Hackerspaces can also be found on:

1. twitter page - http://twitter.com/HackerspacesBot
2. identica.ca page - http://identi.ca/group/hs
3. Hackerspaces.org blog - http://blog.hackerspaces.org/

Various types of information can be found from these different blogs. Information about new projects, new hackerspaces, events, dates and locations on skill workshops, and more can be found. (Doughety, 2005)

Telephone

Hackerspaces.org organizes a monthly hackerspace call-in service where anyone can call for hackerspace information. Details about this event and how to make calls can be found at http://hackerspaces.org/wiki/Call-in.

Planet Feeds

Planet feeds gathers as many blogs as possible and puts them into a feed at http://planet.hackerspaces.org/. Planet feeds is a great source for projects that have been completed. They also collect feeds about social and professional activities/events that hackerspaces have posted in their blogs. It is a great way to find information about the events that are occurring in the hackerspace community. One example of another hacker-centric feed is: “Intro to Reversing”, a class that the hackerspace Hive76 organized to teach reverse engineering. There are many other project feeds, including “A guided Tour to Creating a Commercial Video Game” and “DIY Upcycle Fly Trap.”

With an idea from hackerspaces.org, Metalab started hackerspaces soup, a similar concept to planet feeds, at the following link -http://hackerspaces.soup.io/. The web site collects feeds from different hackerspaces, providing another way to discover upcoming events, workshops, social activities and news.

Webinar

Dimdim offers free webinar software that can used to schedule meetings, classes, and events. It can be used to hold classes in which other hackerspaces can participate. Anyone can create an account for free and start using it at this link - http://www.dimdim.com.

These methods and tools for communication have created an environment of open communication between hackerspaces and their members. Information regarding the establishment of hackerspaces, managing a hackerspace, benefits of hackerspaces, risks in hackerspaces and many other queries can be found using the tools that hackerspaces.org and other hackerspaces have provided. These tools help new members join the DIY community easily.

The Commercialization of Hackerspaces

This section discusses the existence of hackerspaces as profitable businesses.

Techshop, founded in 2006, showed that a hackerspace could be a successful business. Techshop is one of the more advanced hackerspaces, with access to many resources one would not have normally. They have laser cutters, 3D printers, and welding equipment. They also offer training and safety courses for all the equipment they use. The original location was in Menlo Park, CA (also the location of the Homebrew computer club), they franchised two additional locations: one in Raleigh-Durham, North Carolina and one in Portland, Oregon. Recently the Portland branch filed for bankruptcy, and plans to reopen later in 2011. (Rogoway, 2010) There are plans for additional franchises in San Jose, CA and San Francisco, CA.

It will be interesting to see the interplay between Noisebridge and Techshop in San Francisco, because of their opposing ideologies. In regards to Techshop, Mitch Altman of Noisebridge stated: "Many if not most people who do things at Noisebridge subscribe to the Burning Man idea that life is better in a gift society free of commercial interests, and they have varying degrees of tolerance for Techshop ... we're probably never going to have certain classes of equipment like really nice CNC gear or laser cutters due to the commercial relationships required." (Altman, 2010)

Chapter VII: Conclusion

Throughout this project we successfully established a hackerspace in Lowell, MA. We also researched the social impact of the hackerspace phenomena and the hacker community and culture.

We interviewed several hackerspace members, and proprietors of hackerspaces. From these interviews we gathered information about their management structure, demographics and liabilities. We gained a great amount of real world information on operating a hackerspace.

We collected much information the hackerspace movement from Internet sources and literature on hackers. Hackerspaces have helped not only hackers, but also other people in their local communities through their free events, workshops and training courses.

Using all of the information we gathered from different sources we wrote a business plan. The business plan outlines the operation of the hackerspace we established in Lowell, MA. The plan is located in Appendix A of this paper.

We hope that the business plan and the information we gathered will help other people who wish to start their own hackerspace or enrich their knowledge of the hackerpsace phenomenon.

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Appendix A

Business Report

Appendix B

This appendix contains all the interviews that we had with different hackerspaces to gather information about different thing

Noisebridge - Hackerspace Questionnaires

Interview with one of the founding members of Noisebridge, Mitch Altman. Mitch is widely considered one of if not the leading hacker evangelist in the US.

1. Q: Do you call it a hackerspace? Do you use the term hackerspace? If so, what do you feel that term means?

A: Yes, we do call it a hacker space. To me, the term denotes a physical location with tools and diverse experts who can help collaborate on projects in a wide range of scales, but it connotes a philosophy of doing things with no particular preference to empirical or theoretical methods

2. **Q:** What are the demographics of your hackerspace (age, professional/ education background, etc.)?

A: I don't have any numbers but we have people of all ages and many people who show up have at least some college. Many of us do engineering of various sorts, but there is also a fraction that is focused on art and is employed in that field. I think a disproportionate number of people are self-taught with regard to their programming skills

3. **Q:** How did the hackerspace start?

A: 5 people ponied up some cash and leased a place. That's pretty much it.

4. **Q:** What is the management structure like?

A: There isn't any. The official line is that we're an anarchist collective but the reality is that it's more of a web of trust model, with the usual elements of feudalism that crystallize out of any anarchic group. There's a board that appoints officers who technically have executive authority with regards to the space, but the reality is that if any of them actually exercised power they'd get thrown out. For certain things, like insurance, taxes, and our nonprofit filings, they have duties but those are invisible to the day-to-day operations.

5. **Q:** Are you a formal business entity? If so, what kind? (LLC, Corp, non-profit status, etc)

A: California educational nonprofit corporation with federal 501(c)(3) status+

Q: Reasoning for that structure?

A: A California nonprofit corporation is required for 501(c)(3) status and federal nonprofit status is required for free stuff

6. **Q:** How do you deal with liability? What kind of insurance do you have? How much of your operating do you spend on insurance %-wide?

A: There is D&O E&O insurance, plus a general liability policy for the space. We have a mid-5 digit operating budget, and iirc insurance is less than 10% of that but more than 1%. There's a vote to add an officer to the D&O policy tonight, actually

7. Q: What are legal problems you've faced, if any?

A: There was a takedown notice wrt our 5mof event. Some of the cryptoanarchists constantly do illegal things and often get yelled at for it.

Q: For what kind of stuff? ITAR-related?

Jake Applebaum, our ex-director, has non-mainstream views on how society should interact with communications technology. He recently went to Seattle, but some of his friends are still members and they share his views. They used Noisebridge resources to do things like hack parking meters, crack SSL certificates, that kind of thing. There is a project which has successfully constructed a GPS which can't be exported; it's in violation of both the EAR and ITAR regulations. Well, it would be if it was exported. The two space programs are also borderline compliant. The directed energy weapons are certainly not compliant. But so far they're only used to make popcorn. I think it's a felony to point them out the window.

8: **A:** Drink sales and memberships. Some members pay half price because they feel like it. Membership doesn't really get you anything besides a director votes every year and the ability to block group implementation of a suggestion.

9. **Q:** What are some regular activities if you have any? Do you charge?

We ask for donations but I don't think any of them have an admission fee. There are too many activities to list, see the wiki.

10: **Q:** Do you hold regular classes? Do you charge?

No charge, but yes. There's a variety of programming language classes, a knot tying workshop, probably some other things I don't know about.

11. **Q:** What is your relationship with the public?

We are the public. As long as you don't look like a crackhead we're open to the public, and a significant chunk of people at the space on any given day are not members.

Q: The public at large, then. Like media, outreach, etc.

A: The "your" in that question is a misnomer because there isn't anyone who can have a relationship with the public. No one is in charge. There's a group of people with experience talking to press that can answer questions, but the majority of them are answered in the press kit on the wiki. Thinking about it

some more, the relationship is really between individual projects and the public. Every once in a while someone does something awesome and it shows up in the press with Noisebridge mentioned in the article somewhere. As far as outreach goes, some members fly around for their work and hand out stickers and sell tshirts but I think that's it. Some of us are starting a new hackerspace to serve the east bay.

12. **Q:** What is your relationship with other local hackerspaces?

A: Some of us are starting a new hackerspace to serve the east bay. Almost nobody is involved with hacker dojo in any way. Some members have a good relationship with some local places that sort of fit the definition of a hackerspace, but those places don't call themselves that

Q: What places are you thinking about, and why do you feel that way?

A: NIMBY, the vulcan, the bike kitchen, langtonlabs ...Well, hackerspaces.org says Hackerspaces are community-operated physical places, where people can meet and work on their projects. By that definition, all of the above spaces meet that definition. Oh, cellspace is in that category too. However, none of the above call themselves hackerspaces, probably because they are primarily focused on specific kinds of projects. All of the above spaces predate the term hackerspace, I think.

Q: Where/when do you think that term [hackerspace] originated?

A: I never heard of it before 2008. The Wikipedia page was only created in July 2008. It may have originated in Europe, Noisebridge deferred to prior work done by some spaces over there in the beginning.

----Free-form Questions----------

Q: Okay, this is all stepping outside the questionnaire and more into my own personal interests now, but will probably make its way into the report anyway.

Q: How do you feel about Techshop?

A: Noisebridge by its nature can't have certain kinds of equipment because it would either walk off or maim someone. Techshop provides an environment where that kind of equipment can be housed, and used for an appropriate fee. Many if not most people who do things at Noisebridge subscribe to the Burning Man idea that life is better in a gift society free of commercial interests, and they have varying degrees of tolerance for techshop. I personally don't have any opinions on the matter. If you ask other people who hang out at Noisebridge you're sure to get a wide variety of responses to that question. The reason why I point out the commercial interest angle is that it's been a source of conflict in the past between the two factions who subscribe and do not subscribe to that idea. On the one hand, we're probably never going to have certain classes of equipment like really nice CNC gear or laser cutters due to the commercial relationships required. On the other hand, I've seen people work around the lack of that gear in pretty amazing ways. The faction that doesn't have problem thinking in terms of dollars is somewhat involved in the SF techshop expansion on many levels

Q: How do you feel about hackerspaces that have more of an authoritative structure? You guys being as much on the anarchist side as you are. While I'm recognizing that this is your opinion, and you don't speak for the group.

A: I don't know because I've never been to any other hackerspace besides Noisebridge. I'm on the board for the new one in the east bay and that is going to be a lot more like techshop than noisebridge. That's due to necessity: we have pending donations of some extremely expensive and dangerous equipment, so adult supervision with consequences is necessary to keep everyone safe and productive. There have been times that Noisebridge's social structure has been really annoying, and other times that it's been a major boon to doing awesome things. I think the key property that determines whether a group of arbitrary but particular individuals is going to benefit from a lack of structure is whether they're honest, hardworking, ethical, tough, and competent individuals. Hackerspaces seem to attract a particular kind of individual that will sometimes enjoy the social aspects so much that they never get anything done because they talk all the time. That behavior is a monkeywrench in the self-organizing property I observe in the first class of people. There's an event called foo camp here in the SFBA which is predicated upon that property functioning correctly in a group of people in the first category.

So the short version of my answer is that with the right people anarchy is swiftly subsumed by the minimum degree of organization required for the task at hand, and with the wrong people you just get a lot of yelling instead

Q: How do you feel about groups that try and limit the amount of people they have, like NYC Resistor? Their argument being that they need to limit their internal membership to maintain a sense of community.

A: No idea. I don't know, I'd have to think about that a lot more

Q: What do you do for a living? Any projects you're working on at the moment?

A: I'm one of those new breed of engineers that was trained not to specialize, so I do hardware, software, and ops. I also run a blog, Chipopolis, and have two very small smartups that do niche work. The main project I'm working on right now is a cookbook for making SDR modules out of ambient technology, like broken cell phones and CFLs. I have a bunch of other things I'm working on at any given moment, like another nonprofit that does shell hosting for kids who want to learn how computers work, hosting Noisebridge's cloud servers, the GCC build farm, reverse engineering Intersil firmware, constantly defibrillating the northern California ham radio packet community, doing ops and video work for a bar in the financial district, constructing safe RF detonators for small scale explosive charges, and probably a dozen other things I'm forgetting

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Hacker Dojo - Hackerspace Questionnaires

Interview with Katy Levinson - One of the five Directors of Hacker Dojo
With Parts filled by Kitt, also a Director (filling the roll of Treasurer)

1. **Q:** Do you call it a hackerspace? Do you use the term hackerspace? If so, what do you feel that term means?

A: Sometimes. Dojo members just call it The Dojo normally. We call it a lot of things when trying to explain the concept to new members and sponsors, and that's definitely on the list. Really though the movement is young enough that explaining that "The Hacker Dojo is a Hacker Space" doesn't actually clarify anything for anybody who doesn't already know who we are. Or what we are, more accurately.

I personally think a Hackerspace is a place where people collaborate on new ideas, make things, learn things, and hang out.

2. **Q:** What are the demographics of your hackerspace (age, professional/ education background, etc)

A: We have almost no members under 20. Beyond that varies by hour. We have a coworking population which nearly dominates the area from 9-5 weekdays, and they tend to be anywhere from late 20's to early 40's. It is the oldest population.

We have a social crowd which spends a lot of evening time, most of them are in their 20's with some in their early 30's. The startup crowd is always there and is between 20 and 40, most of them in their late 20's, and many outside events which bring their own demographics of participants, which vary wildly.

Educational background wise, most of them went to college, but a fair chunk never did. A slim few have master's degrees, and a very small number either dropped out of high school or have a PhD.

About 15% of the members are female that was calculated once

I think a few more people have master's degrees than I think they do, it isn't discussed a lot. We also have a small collection of college students; the startup people often tutor them. Most popular major was probably computer science, very heavy emphasis on web development and web technologies, which is just probably part of being in Silicon Valley. Also people study math, statistics, machine learning, hardware, and we also have some random art/philosophy/whatever else people. You find a lot of the "weird majors" in the non-technical groups like slackrope walking, juggling, rocketry, and whatever else. Oh there is also a big focus on mobile development among the people who do professional work here. Not as big as web, but probably the second biggest. Third biggest would probably be distributed computing systems, or "cloud" as I'm told the buzzword of the day is.

3. **Q:** How did the hackerspace start?

A: Depends on what portion. The name comes from a communal apartment David lived in many years ago. The core group of founding members grew out of a recurring event called SuperHappyDevHouse (SHDH). David and Jeff (directors of the dojo) were very involved with that, as well as Joel Franusic, Mike Lundy (WPI '06?), Tom Harrison, and many others. A more full list of everybody SHDH owes to its existence is probably on its website.

(David = David Weekly, Jeff = Jeff Lindsay, but it turns out there are many Jeff Lindays so it gets complicated)

If you want more information on how the space started in detail, you should probably talk to a founding member. There were 60 of them, but I joined too late to be one of them. Discussions of the space started in January 09, I believe the directors were selected in May, the lease was signed in August, and the place opened in September 09.

4. **Q**: What is the management structure like?

A: There are five directors. The founding members voted that David should be a director and that he should pick the other four. He did, and then one of them resigned a few months later. Her replacement was voted in by a direct majority election and took office in May

Up until last week, we had a staff group of about 40 people. They were responsible for keeping the place open, and they were the only ones who could have keys. Last week staff voted to disband itself and give keys to all the members.

We also have four departments who take care of more or less recurring things (events, memberships (that's a lot of recruiting), operations (overseeing the cleaning crew, restocking the toilet paper, etc.) and finances (though the treasurer is a director position)). We also have staff volunteers who hold single-person jobs like media/marketing work, construction/repairs, etc.

The majority of work is currently done by calling "Fix-Its" where we have giant lists of things we need to do, then everybody shows up, drinks beer, eats pizza, and does all the work. They're not bad events; lots of people bring their girlfriends/boyfriends because it is kinda a fun time, even though they're not dojo members.

5. **Q:** Are you a formal business entity? If so, what kind? (LLC, Corp, non-profit status, etc.)

A: Mutual Benefit Corporation, seeking 501c6 status.

Q: Reasoning for that structure?

A: Kitt is the treasurer and the expert in that. She will have more information.

Kitt: non-profit for both tax reasons and for vision fulfillment (wanting to help the community, vs. make a profit off of them). Incorporation because with LLC someone owns the company. We want it community owned, not under one person or a small groups control. Makes it easier to separate out vision from management somewhat with a board of directors. Made easier by our lawyer who was working pro-bono.

we are, however, considering a different structure , but haven't settled completely.

6. **Q:** How do you deal with liability? What kind of insurance do you have? How much of your operating do you spend on insurance %-wide?

A: Ask Kitt

Kitt: we have insurance. Covers the community spaces. We have no employees, which drops the price down. Let's see, how much % wise ...maybe 3%? I'd have to look at the numbers, but it's around there. No more than 5% to be sure, could be as low as 1%
Is it because you don't do a lot of dangerous things? I ask because a fair share of places has plenty of dangerous stuff with fairly lax access policies. This makes insurance a rather large issue with them.
I'm not 100% sure. We don't have dangerous things, no, the worst being an electronics lab, but that doesn't mean that someone can't come in and start doing crazy things.

7. **Q:** What are legal problems you've faced, if any?

A: We have not had any legal problems. We do put a serious amount of time, money, and effort into working with the zoning board. Our space is zoned light industrial, but that isn't strictly our use, so we do a lot of work with the city in making that work for everybody.

8. **Q:** What are your sources of income?
    1. If you charge members, how much?
    2. Are there special discounts for poorer members?

A: 1. All members contribute $100 a month
2. We give a family discount of, after your first $100 membership, each additional membership is $50 for adults and $25 for people under 18. Family is defined to be people who live in the same house and consider each other family. We have an unemployed/hardship rate of $40/month, and some people are on work-trade where they just volunteer a lot of hours and we understand

9. **Q:** What are some regular activities if you have any? Do you charge?

A: Dojo rules say that you can't prevent any member from being in any event, though you can charge them materials costs if they want to participate. You don't need to prepare for their attendance if there was an RSVP and they missed it or something materials-wise. Events can charge outside people as the event holder wishes.

10: **Q:** Do you hold regular classes? Do you charge?

A: we just lump classes and activities together as "events", we have tech talks, we have juggling class, lots of programming class, some people slackrope walk, we had a group go the whole way through the machine learning coursework from Stanford's grad course. LAN parties, once we had a pancake breakfast, lots of parties, some people make rockets. Android and iPhone classes (development).

11. **Q:** What is your relationship with the public?

A: we have a DC650 group. We welcome the public to the majority of our events, and we don't really check carefully who is a member who is using the space and who is not. Strangers can't schedule events or use any of the automated systems because they don't have a login, and they can't have keys. We also run some events specifically for the public, like the hacker fair.

12. **Q:** What is your relationship with other local hackerspaces?

A: here are strong membership overlaps between us and Noisebridge and Tech Shop, but not many active participants in all three. We have discussed doing more formal things with noisebridge, but nothing has come of the discussions yet.

BUILDS - Hackerspace Questionnaires

Interview with David House- an officer at BUILDS

1. **Q:** Do you call it a hackerspace? Do you use the term hackerspace? If so, what do you feel that term means?

A: Hackerspace, or makerspace

2. **Q:** What are the demographics of your hackerspace (age, professional/ education background, etc.)?

A: Undergrads and grads mostly, hard to know, open environment, very communal fashioned board of students who advise and make decisions. Regular members are 80% undergrad, 20% graduate, 60% male, 40% female, MIT students are frequent, 30%, and Tufts and UMass Amherst, Wellesley, BU are 50%-60%, including community members

3. **Q:** How did the hackerspace start?

A: Last October, opened in January.
It started out of ACM at BU. They were meeting out of classrooms and they were the only computer club at BU. They petitioned to use a space, and they were given a room. Did a lot of advertising and branding, talked to people in the area. A unique culture.
The space is given to them by the BU computer science dept. Uninhabitable as an academic space. No fees, students fixed up the space. Free for students to use. No membership fees. Donations are asked for, sells shirts and stickers.

4. **Q**: What is the management structure like?

A: Board of students, 4 or 5 students, they are chosen by the collected members of builds, chosen in September for the students next year. Interim positions are filled on a case by case basis. Anyone who shows up to the elections can vote.

There is no distinction between members and non-members. Surveillance is used, and it's inside an academic building. We rely on the trust of every user of the space.

At this point, David House ended the interview because he had to leave.

Sprouts - Hackerspace Questionnaires

Interview with Alec Resnic (one of the founders of Sprouts)

1. **Q:**Do you call it a hackerspace? Do you use the term hackerspace?

A:The space is considered a studio or office that is open to the public. It is the offices of the nonprofit, where the al the stuff is around to do the work they need. When they're using, people are welcome to come by and use it. It's a studio space or co-working space, or a workshop open to the community, but not a community workshop. Less like a YMCA, and more like a pool they don't use all the time.

2. **Q:** What are the demographics of your hackerspace (age, professional/education background, etc.)?

A:Broad range, 8-65 years old. But the big peak is around 40-55 and 20-35. Most everyone uses 2/3rds are white or Asian, 1/4 African American, smattering of other ethnicities. Prof/educations 3/5 to 3/4 are college educated or beyond. 1/4th are high school, or are younger than college age.
Employment: many who have been engineers many work as scientists or grad students, handful of teachers, handful of students. A lot of local people who feel they are handy use the space regularly, a big spike around home school with parents.
Ratio: 50/50 male/female at public events. Project nights are 3/5th favoring male. The disparity goes away when looking at younger people.

About homeschooling:
There are maybe 2 big uses from homeschooling. One group home schools for religious regions, none like that go there. Other group is the ones that are dissatisfied with educational opportunities. They want to get their kids out into the real world. But there are not a lot of public's spaces that offer things to for their kids to do. They offer kids access to a lot of cool things they wouldn't be able to get their kids to. Having a space to bring your kid to work on electronics is unusual and valuable. They provide access to a lot of technical tools and people with technical backgrounds or expertise.

3. **Q:** How did the hackerspace start?

A:3 of us worked full time while in school. Out of collective dissatisfaction for post college education. They thought "oh we should work on something together" one was coming out of summer camp that they were running for a few years. Started getting together every day to figure out what they wanted to do in November 2008. Spent a month setting up a bunch of projects they wanted to do. 3 or 4 months after they starting working with a group called green city growers to design instruments to help with their gardens. Then they shifted directions maybe 8 months in, about a year ago. they found a space and spent a few months renovating and shifted toward committee education brought in equipment and just

finished their first season of programs are starting to put stuff together for the fall. They needed the space about a year ago, because up until then they didn't a space, they were just working out of their backpacks before. Then they felt the need for a personal or private workspace. They were more interested in building a community workshop. They found a good space that works well for them.

4. **Q:**What is the management structure like?

A:flat management, 3 of them share responsibility across all lines. Three and half dozen volunteers that works in different capacities. Running stuff, graphic design, and clerical stuff. 150 who just use the space. All volunteers are set up in a one off way. Informal work. 3 that work full time, there is no real hierarchy, but they do delegate areas of responsibility fairly clearly. Finances, coordinating, studio stuff.Mostly managerial.

5. **Q:**Are you a formal business entity? If so, what kind? (LLC, Corp, non-profit status, etc)

A:501c3 nonprofit.

6. **Q:** How do you deal with liability? What kind of insurance do you have? How much of your operating do you spend on insurance %-wide?

A:They do have insurance; they are considered a private space. Not a public space, so it is much easier. For more dangerous equipment, people have to go through a process to prove they are competent. Operating expenses (not counting salary) - 2500/month, so 10% is insurance. No formal safety course for dangerous equipment. Informal making sure that they use the thing safely. After that point, they are brought into the community more formally. They don't take membership fees so they don't set expectations that they can use anything they want. People are considered welcome guests.

7.**Q:** What are legal problems you've faced, if any?

A: Nobody has sued us. Closest thing to a legal problem. Nonprofits can do fiscal sponsorship. No problems with the authorities. They are in a residential area, but they are zoned commercially. They have a good relationship with neighbors. Brass band at spaghetti dinner, someone called the police for having a live band. It was over by the time the police got there, it was over. There was no problem.

8.**Q:**What are your sources of income?

A:Programs are volunteer operated, so proceeds go toward operating expenses. Ask for donations for people interested in using the space as a venue. They charge to make sure they can buy garbage bag. Dollars per person for half day event is charged. 20 dollars is charged per person for whole day event. Some people just donate because they are excited about the space. They do odd technical and education jobs. Like tutoring, or working with my kid. It's a small amount of money. Very recently some people volunteered to write grant trusts, so they are applying for grants.

9. **Q:**What are some regular activities if you have any? Do you charge?

A:programs that happen every seasons, 1 day workshops to 13 week seminars. There dinners, music. Every Tuesday and Thursday, they have open houses. Occasionally host work parties or BBQs where people work on the studio. Community or neighborhood potlucks, a social event. Occasionally people

use the space as venue for meetings or conferences or movie showings. a lot of the work they do is not in the space. Like churches or schools or restaurants.

10. Q:Do you hold regular classes? Do you charge?

A: Pretty wide selection of different content. These past seasons.Simulating natural phenomena for designers.Processing and how to simulate them to create forms that were interesting. We have 13 week seminar and one for differential geometry one for educators, one for youth, one for adults. Programmable power strip to dim outlets with sensors. Played around with it to do an energy audit of their homes. Bring your grandpa to math day, a math puzzle festivalish get together for 150 people. People teaches how locks work, lock picking. Theme is some sort of investigation or science. Ran another workshop to build moisture sensors.A wide range of stuff.Investigate something they can do, even if they don't apply "science." Listing of stuff on their website sprouts.org/programs.

NYC Resistor

Interviews with ERIC – Treasurer and Co-Founder of NYC Resistor

1. **Q:** Do you call it a hackerspace? Do you use the term hackerspace? If so, what do you feel that term means?

A:We definitely call ourselves a hackerspace. For us, the term embodies the values that the word "hacker" originally represented - we are people who are eager to understand how things work so we can find interesting new ways to put them together. Our motto is: "We learn, share, and make things"

2.**Q:** What are the demographics of your hackerspace (age, professional/education background, etc)

A:Our demographic is largely young people 20-40, skewing towards men, but with a healthy female population (20-30%)

3.**Q:** How did the hackerspace start?

A: George Shammas and Bre Pettis went on the "hackers on a plane" trip to visit European hacker spaces. After realizing they both lived in Brooklyn, they decided to start NYCR. They began by inviting a few people they respected to "microcontroller study group" evenings, and the initial group began forming, meeting at a friendly space (Lemurplex)

After 9 months or so, we decided we needed our own space, and 9 of us each threw in $1000 for initial rent and seed money for the space. We also set dues at $42 monthly per member. Dues were quickly increased to $75 to cover costs, and finally settled at $75 for members who teach classes and $115 for members who do not wish to teach.

4. **Q:** What is the management structure like?

A:We a do-ocracy! (The do-er is right) All members who show up at a Tuesday meeting have an equal vote. If you want to affect the future of NYCR, you'vegotta show up! Membership is invite-only, and can be vetoed by a single "0" (aka no) vote. This helps us keep the space friendly to all, and avoid bringing on members that don't consider/respect others. To get an invite, just show up to our public events, show interest, and get to know us!

5. **Q:** Are you a formal business entity? If so, what kind? (LLC, Corp, non-profit status, etc.)

A:Yes, we are registered as an LLC in Delaware, doing business in NYC (and paying NY sales tax on our member dues. Ug...)

6. **Q:** How do you deal with liability? What kind of insurance do you have? How much of your operating do you spend on insurance %-wide?

A:We agreed early that we wanted to take NO risks regarding insurance. We have an incredible policy from state farm that covers up for 2 incidents in a calendar year for up to 6 million liabilities per incident, including all lawyers' fees. We pay roughly $130 a month for that insurance, and it's worth every cent to know that none of us can lose our houses because of an accident at NYCR. Our total operating expenses range from $2700 to $3200

7. **Q:** What are legal problems you've faced, if any?
A:None yet, thankfully.

8. **Q:** What are your sources of income:
A:Member dues, class income, and some additional small income from t-shirt sales, kickstarter pledges from friendly outsiders, etc. We are currently bringing on $500-$1500 a month above our expenses, depending on how classes go that month, and whether we need to run the heat.

a. if you charge members, how much?
$75 if you want to teach a few classes a year, $115 if you'd rather not.

b. are there special discounts for poorer members?
We consider $75 low enough to be affordable for anyone serious about joining, especially since you can easily earn that back by teaching the occasional class. Class fees are split %50/%50 between the space and the teacher.

9.**Q:** What are some regular activities if you have any? Do you charge?

A:We hold regular free craft nights from 6-9 Thursday, where the public is invited in to hack on any project they bring.

10. **Q:**Do you hold regular classes? Do you charge?

A:We have frequent classes, and generally charge $25 per student per hour, plus materials

11. **Q:**What is your relationship with the public?
A:awesome :)
In all seriousness, we have been very well supported by the community, and try to give back as much as possible with open public events, classes, information published on our blog, etc. We have also been blessed with some very favorable press in notable publications (NYT, WSJ, etc)

12. **Q:** What is your relationship with other local hackerspaces?

A:We do our best to extend friendly gestures and support other local and budding hackerspaces. Some have taught classes at NYCR and utilize our public email list to advertise their events and space (with our blessing). We also sent out holiday cards and ornaments to every hackerspace we could find an address for this past season :)

Please feel free to get in touch with any follow questions, and good luck with your project!

MakeIt Labs: A For-Profit Hackerspace

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Executive Summary

MakeIt Labs LLC. is an open-access workshop that will serve people in the North Boston/Merrimack Valley area. We will provide the equipment, classes and personal help to a membership community that allows them to prototype and develop any idea they can imagine. We are targeting people who have an interest in hands-on skills in a variety of design and manufacturing areas.

We focus on developing and fostering a creative community of hands-on individuals, and providing them with the tools they need to succeed. The location will have equipment for welding, metalworking, woodworking, plastic-working, electronics, programming and many other skill sets. There will be regular classes over these areas that will train people to safely work with this equipment and how it can be used to realize their ideas.

Owner Joseph Schlesinger is a Systems and Electrical Engineer with a long history of invention and self-started entrepreneurship. He has personal skills in machining, welding, electronics design and programming which he has used to complete numerous cross-disciplinary projects. He has started and run a Convenience store, businesses in Web Design, Defense/Aerospace Communications and Online Alternative Currency Trading. Invention, prototyping and teaching has been a life-long passion of the owner, and this business will allow him to utilize his skill set and passions into a successful venture.

There will be a heavy focus on community. It is the belief and experience of the owner that a strong, active community fosters excitement, passion and innovation that drives members to both stay with the business and come out satisfied with continual completion of projects.

Funding will come primarily from membership fees collected by those interested, and from classes held on various topics. Continual investment from the owner to make up initial revenue shortfalls. The business will eventually seek non-profit status and then donations from area business and equipment comes largely from the existing stock of the owner and initial generous members.

MakeIt Labs: A For-Profit Hackerspace

Company Summary

MakeIt Labs is an Open-Access workshop opening in Lowell, MA. MakeIt Labs is founded on the idea that designing and building your own ideas provides a level of satisfaction unmatched by many consumer activities. MakeIt Labs seeks to capitalize upon this by offering its members the equipment, facilities and knowledge necessary to build their ideas and projects of interest.

Keys to Success:

1.1 Competitive Advantage

The lack of similar locations in an area of the country known for its creative and inventive spirit offers a large, pent up demand for this service. Centralized control offers key competitive advantages over other similar spaces.

Almost all similar businesses in this field are structured through a communal, non-profit structure. While the idea is to keep the space as free and creativity-fostering as possible, this structure slows capital acquisition, misallocates resources, breeds political infighting and leads to long reaction times to problems that arise.

Because MakeIt Labs is structured as a business, and not a communally-organized space, there will be a greater emphasis on increasing revenue. Where research shows that many locations with a similar purpose shy away from increasing revenue for ideological reasons, and to avoid the political infighting that comes with money, the business-organized ownership of MakeIt Labs uses this to its advantage. This income can be effectively re-invested into the kinds of higher-cost, high-value equipment that attracts users.

Our main keys to success include:

- Creation and maintenance of a strong, vibrant community
- Utilize existing online communities for marketing
- Variety of high-value tools otherwise inaccessible to customers
- Availability of proper training
- Flexible access and use of facilities
- Providing a work area free from intellectual property demands

1.2 Mission

MakeIt Labs offers a productive environment that nurtures innovation. MakeIt Labs will provide the equipment, space and knowledge to attract the area's leading inventors, citizen scientists and general innovators. We offer classes and events that entice new members, while expanding into new areas to keep experienced members coming back, all while fostering a community that cements members into long-term bonds centered on MakeIt Labs.

1.3 Objectives

The objectives of MakeIt Labs are the following:

- Achieve self-sustaining status within the first 6 months
- Provide a rich community of innovation
- Encourage collaboration among local innovators

Operational Strategy

2.1 Company Ownership

MakeIt Labs is a privately owned limited liability corporation operated by and under the sole ownership of Joseph Schlesinger.

2.2 Management Team

MakeIt Labs is run solely by Joseph Schlesinger, its founder. Joseph is a life-long hobbyist and maker who has long identified strongly with the culture to which MakeIt Labs will be targeting. The creation of MakeIt Labs comes after Joseph searched for a similar space in the area, asking many of the people that would be interested in such a space, and found no such thing. Also being a life-long entrepreneur with several ventures under his belt, he decided to start MakeIt Labs to satisfy both his own personal need for a workshop, and to provide a way to share his passion for creation. His C.V is listed in the appendix.

2.3 Services and Activities

MakeIt Labs will offer services to entice both existing and potential area innovators. MakeIt Labs will provide design, engineering and fabrication instruction in addition to the use of its facilities.

2.3.1 Membership

Membership offers people the chance to have 24/7 access to the MakeIt Labs facilities. Members will receive discounts on all classes, have the ability to store their projects in on-site lockers and be allowed to come relax with other members at MakeIt Labs. Membership allows people who do not have the tools, space or support to come anytime and be involved in an active community of innovators. No formal qualifications are necessary, beyond a mandatory liability waiver and payment of membership. There will be two tiers of membership: regular and student/out-of-work. The idea is that students and those who are currently out of work, while able to contribute a great deal of enthusiasm and time to the MakeIt community, aren't able to provide the financial contributions that full members would be, and should be given lenience, as well as the fact that a reduced membership provides more income than no membership whatsoever.

2.3.2 Classes

MakeIt Labs will offer classes in large number of areas. Classes will be offered to both members (at a discount) and non-members (to draw interested people into membership). Instructors will be chosen on a class-by-class basis both from the member pool and the surrounding area based on their knowledge of the subject matter, experience in the field and ability to effectively teach. MakeIt Labs will focus on teaching the needed information in a casual, hands-on environment that adheres to its culture of strict safety. Classes will be offered both on a regularly scheduled group basis and special individual cases. These classes may or may not require material use charges.

Fees for the classes will be based on a combination space usage, instructor, and material fees. Base cost of a class is $20 per session per person. This serves as a base level of income for MakeIt, to recuperate costs for running the event in the facility. This cost will be waived for members, as an incentive for membership. The rest of a cost of a class goes towards covering paying an instructor and/or any consumables used in the process of a class. Classes will be chosen based on the expected level of interest.

The courses taught can be broken down into three basic types:

2.3.2.1 Design/Engineering

Design and engineering courses will focus on the planning and theoretical aspect of making things. These courses will provide the overarching concepts that will aid the attendees in analyzing how best to realize their projects, while practicing these skills with free-form hands-on exercises. They may either be short one-session classes, or multiple-session, multi-week courses depending on the complexity of the material. An example of this type of class would be *Introduction to Micro-controllers*

2.3.2.2 Safety

Because of the inherently dangerous nature of some of equipment at MakeIt Labs, some will require mandatory safety courses before use is allowed. These courses will be short, one-session introductory courses that focus on proper operation, cleaning and maintenance on either individual pieces or groups of equipment. They will require people knowledgeable in the field. Those who take these courses should at their end feel confident that they can safely begin to use the equipment for their projects. An example of this type of class would be *Basics of Arc Welding*. While no safety ‘course’ will be required for general membership, a brief overview of the safety policy of the lab will be given upon attaining membership.

2.3.2.3 Fabrication

Fabrication courses will offer advanced hands-on techniques and skills that go beyond the minimal level of operation taught by safety courses. These will require a master of the field to teach. They will allow members to begin to fully realize the potential that the area of the course offers. These courses will usually run multiple sessions over the span of several weeks. Students should feel increased confidence

at the end of the course that they can use their new skills to tackle a wider variety of projects. An example of this type of class would be *TIG Welding for Bicycles*.

Market Analysis Summary

MakeIt Labs provides a service that is critically lacking in an area with large, pent-up demand. An initial small advertising campaign attracted dozens of potential customers in days. Completing projects is a satisfying experience, as any do-it-yourselfer can attest. Today's typical consumer lifestyle leaves many without much realization of this joy. Local innovators with projects that lack the proper equipment or space are often forced to either make due, leading to lack-luster results, or put off projects till 'some day'. The most many people can do is dream. There is no doubt that innovative types would flock at the chance to work on interesting projects, learn valuable new skills and collaborate with like-minded people.

3.1 Market Segmentation

MakeIt Labs has determined that a large portion of potential members will come within a one hour travel time, estimating that 80% will come from within a 30- minutes travel time. The majority of interested people are expected to be people in the engineering profession.

We will target engineers, students, artists and people in hands-on fields within 30-minutes of travel. We do not expect people to travel more than an hour to work on projects or take classes. Research into other hackerspaces shows that these are the most prevalent audiences. Age and gender vary wildly, with most coming from an engineering or artistic background.

The area is host to an enormous engineering base. Major engineering employers within a 30 minute radius include, but not limited to: IBM, iRobot, Sun, Cisco, Intel, Adobe, Oracle, MIT Lincoln Labs and MITRE. Any one of these is filled with engineers without the multi-disciplinary facilities or freedom to create. Lowell is also home to a major engineering college, UMass Lowell. Lowell is also the center of a thriving art community that would enjoy exploring and creating with the equipment and skills that MakeIt Labs offers.

Querying online social networking websites for users with related interests within this travel distance reveals 70,000+ people in the target market.

3.2 Service Business Analysis

MakeIt Labs was started because the founder attempted to find something similar and couldn't find anything like it. There is no business in the area that offers a wide variety of hands-on classes in a casual environment, or offers the space and/or equipment to work on projects, let alone on a 24/7 basis. While there are clubs for specific interests (Ham Radio, RC models), there is no place in the area for general inventors and innovators to collaborate and create together.

3.3 Competition

Little competition exists for this market in the target area. Vocational schools in the area serve at the secondary-education level and don't offer full use of their facilities. Colleges are limited to a narrow band of students, and don't make their equipment or facilities available. While local technical colleges offer the classes for the skills some may require, they are often targeted at employment. With this, the focus is on teaching certification rather than necessarily then focusing on practical skills. Those purely interested in the creative process are often dissuaded by the high cost and certification-focus of these classes. Employers often discourage working on personal projects at work in order to avoid liability issues. Even when employers allow this kind of activity, employees will often avoid using their facilities to avoid potential intellectual property issues down the line.

Within our target market area of 30-minutes of travel time, no other direct competitors exist. The nearest competition is located in Boston, MA, nearly an hour away. For an active hobbyist, it is expected that this travel time is considered too much for a membership.

The largest threat would result from a competing hackerspace opening in the nearby area. Because of the potency of bandwagon effect when it comes to hackerspace communities, the strategy is to firmly cement a strong MakeIt Labs-centric community.

3.4 Marketing Strategy

We will use established networks and organizations to spread the word, including but not limited to professional engineering organizations such as IEEE and ASME, hobbyist clubs such as RC and Ham radio clubs, online inventors, 'Maker', 'DIY' and 'hackerspace' communities, both online and offline. The use of the label ‘hackerspace’ however, should be handled with care. While there is a strong community built up around the use of the term, the prefix of ‘hacker’ can give negative connotations to those who aren’t aware of its meaning. Therefore, the term should be used thoughtfully and selectively when advertising the purpose of the space.

3.4.1 Online Social Networks

Marketing will focus on targeting these communities as tightly as possible. Online advertising will be a key component. Using online social networks, advertisements can be delivered directly to people who already express interest in these types of activities.

A brief, tightly-budgeted, limited-focus 3-day ad campaign on the social networking site Facebook.com attracted over two dozen interested people, 2 of which signed up almost immediately. It is believed that with a mildly expanded budget, better chosen interests, and a longer-running campaign, as well as advertising on a number of other targeted platforms, the results could be drastically improved. Initial results show that an effective initial campaign can be run on the order of $100/month. This can be achieved by focusing on only the most likely potential members, those with highly-aligned interests such as ‘hacking’ or ‘making’. As this pool becomes saturated, and revenue increases, the advertising target can be widened to less-aligned targets such as ‘welding’ or ‘programming’.

Potential customers can also be advertised to via the websites they visit. Several online websites are particularly popular with people with the perquisite interests, including makezine.com, instructables.com and hackaday.com. However, these websites target a very large market

geographically, unsuitable to a location-driven business. Their most effective use would be to create projects that would get posted on these sites, getting MakeIt free advertising.

3.4.2 Affiliate Program

Once sufficient interest has been generated from online advertising, and a broad enough network of customers has been established, affiliate programs can be started to recruit members. Members will be encouraged to recruit their friends by means of cash handouts upon recruitment (and payment of membership by) people they bring in. Payment will be proportional to the level of membership recruited. i.e. more paid for full members than student members.

3.4.3 Media Publicity

The idea of garage-style innovation easily captures media attention, especially when combined with demonstrable projects/inventions. Members will be actively encouraged to post the progress of their work online via the MakeIt Labs website (http://makeitlabs.com). Particularly interesting projects, especially those of media interest (green energy, etc) will have MakeIt Labs help in disseminating to the local press, whether it be newspapers, tv news, bloggers, special interest sites, etc.

3.4.4 Open Houses

MakeIt Labs will hold monthly open-house sessions where potential members will be encouraged to visit. While potential members will be encouraged to visit anytime, providing a set date for visits provides a no-stress atmosphere for people that would just want to “stop by” without having to announce beforehand. These open houses will be of a casual nature, and not require extensive planning, preparation or cost. They merely serve as an opportunity for people interested to satisfy their curiosity. These open houses will also provide a platform for members to show off their latest projects, providing the deadline that some members will need to motivate themselves.

3.5 Location

The location of the facility was chosen based on access to necessary services and economy.

A loading bay door was considered essential for means of carrying in/out heavy equipment and supplies. A door which could have an electronic access lock attached was also considered mandatory. While the preferred layout would have had two separate locations, one for office/electronics/computer work and another for dirtier metal/carpentry/plastics work, for reasons of economy this was not possible in the first location. It was considered more important to have a location that could accommodate the ‘dirtier’ activities, as this is what most people lack in their own condos, apartment, etc.

As far as nearby services, it was essential that the location be located nearby to hardware, general and food stores. The current location is down the street from a Target, less than a mile from a Lowes and has a 24/7 Walgreens and a dozen or so restaurants in the area, many open late at night for those night-owl

inventors. It is also a quarter mile from the Route 3 Lowell Connector, the major thoroughfare in and out of the city.

The street is in the industrial heart of Lowell, and boasts a steel foundry, rapid prototyping business, scrap yard, sheet metal fabrication show, and several automotive and welding businesses, opening up potential teaching and partnership opportunities.

3.6 Competitive Edge

Targeted customers currently spend their time in their making-centric hobbies and projects. What MakeIt Labs provides them, beyond equipment and a knowledge base, is the ability to hang out and interact with other people with similar interests. The key to locking in a customer base will be focusing on establishing a strong MakeIt Labs-centric community. Bandwagon effect applies strongly to hackerspaces. Interesting people producing interesting projects attracts more people of the same type. Being the first open-access workshop in the area provides a firm foundation that potential competition will find hard to overcome.

MakeIt Labs will achieve this by focusing on providing the infrastructure for projects and collaboration. Research of other similar 'hackerspaces' reveals that projects are largely self-formed by the members. Therefore, MakeIt Labs will focus on providing the proper environment. Collaboration area will set up with a couch, whiteboards, computers, projector, snacks and drinks and high-speed wireless internet access. The goal will be to make MakeIt Labs centric part of the creation experience to its members. All of these items are already owned by the owner, and will be transferred to MakeIt as part of the setup process, minimizing startup cost. Additional equipment, along with replacements for broken or damaged equipment,

3.7 Risk Factors

This business poses certain risk factors:

- Sole Ownership
- Liability and Safety Issues
- Membership collection hassles

We can minimize certain risk factors by:

- Delegating tasks to the established community
- Fostering a culture of safety
- Authoritative control of facilities
- Carrying adequate insurance
- Minimize collection costs through automated membership system

3.7.1 Sole ownership

The fact that MakeIt Labs is run by a single individual is both a key strength and a weakness. The singular point of contact and decision making leads to quick decision uniform to the overall strategy of MakeIt Labs, but leaves the business vulnerable if for some reason the owner is unavailable.

Security and financial transactions are largely automated through the use of online billing and bill payment tools. This is to ensure that in the event of absence of the owner for a period of time, the space can continue to run smoothly with minimal intervention.

As time progresses with MakeIt Labs, responsibilities for day-to-day operation will be delegated out amongst the more active members of the established community, either through direct election of positions by the owner, or by a more democratic process if deemed appropriate. This will help to further the sense of community within MakeIt Labs. Sole ownership will still be retained for the sake of being able to have swift, final decision making should the need arise, and to address liability/business concerns.

3.7.2 Liability and Safety Issues

MakeIt Labs possesses equipment that makes safety a key concern. Among the collection of equipment in the facility, there will be dangerous equipment that could pose a safety risk to people without the knowledge of how to use them properly.

A focus will be on embedding the need for safety in the community. There will be constant reminders in all events/activities that safety is a top priority at MakeIt Labs. It will be made clear to members at multiple levels that this equipment will be off limits to those who cannot demonstrate the required safety knowledge. Safety courses will be provided by knowledgeable professionals to allow members to access this equipment.

As part of the MakeIt Labs security system, multiple cameras will be in place, and gone over from time to time. It will be known to the membership that MakeIt Labs policy that anyone caught using equipment in an unauthorized or unsafe manner will be ejected from the premises and not allowed to return. This practice will be enforced by the owner. The membership will be made aware of the transgression, and new codes can be changed as soon as an issue occurs so the member will not be permitted access. These systems are part of the initial setup cost, and require no further purchases beyond routine repair and replacement

The aspect that will most influence safety at MakeIt will be establishing a culture of safety. Members will be reminded from the beginning that safety takes priority over everything at MakeIt. Warnings will be posted around dangerous equipment reminded members of their needs for proper knowledge and caution before and during operation.

Beyond this, liability waivers and insurance will be a key component to protecting MakeIt Labs from litigation should an accident occur. All members will be required to sign a statement understanding the MakeIt Labs safety policy, and disavowing MakeIt Labs of any and all liability from any harm to one’s self or property while performing MakeIt-related actions.

3.7.3 Membership Dues Collection

One of the issues with running a membership-based income model is the time-consuming process of collecting membership fees. Once membership is initially approved, the system will be entirely automated. Membership fees will be collected by a 3rd party online payment collection and the results transmitted to the MakeIt Labs security computer system. Access to the building is controlled by an electronic lock, also controlled by the same computer system. When membership expires, the code used by the member will cease working, requiring them to pay to re-activate it.

Financial Plan

4.1 Start-up Funding

The start-up expenses for MakeIt Labs are minimal. A number of tools are already largely owned by the founder, and tools from interested parties have been offered for use free of cost to MakeIt Labs. Both initial capital expenses and monthly deficits will be covered by the founder until break-even has been achieved.

4.2 Important Assumptions

An important aspect of the operating model is that costs are highly scaled to membership levels. The two largest cost factors, leasing and energy consumption, are directly proportional to membership levels. Long-term capital investment is almost non-dependent on the membership size targeted for the initial growth period. This flexibility allows the business to scale its costs dynamically as membership revenue fluctuates, providing a resilient business model.

As the shop and its use is the primary interest of the owner, funds will be directed towards growth and expansion of the shop. After the initial break-even period, there is no foreseeable need for outside funding. Additionally, while it is believed that the business is ripe for franchising opportunities, this is not part of the initial business plan. Effort will be instead be focused on creating a successful enterprise and lab space for the founder. The reasoning for having it remain for profit is two-fold: control and options. The eventual goal of is for it to later service as an incubation chamber for later business ideas and projects of the founder, as well as any that may crop up as a result of the community established.

4.3 Accounting, Legal and other services

To keep operating costs low, accounting will be handled largely by the owner. This is also another reason why an LLC was chosen. Its simplified tax structure makes it easy for the owner to do his own accounting, keeping the costs of outside accounting minimal.

Little to no legal expenses are anticipated beyond the initial setup fees. Because of this, the monthly budget for legal and accounting fees will be carried from month-to-month creating a slush fund for unforeseen needs, and will accumulate for a time when it is needed.

Given the size of the facility, the need for other 3rd party services such as janitorial are eliminated.

4.4 Breakdown of Monthly Expenses

Rent – Covers the cost of leasing the facilities. Includes 'triple net' real estate costs such as grounds maintenance, essential repairs to the building, plowing, etc. Does not cover infrastructure improvements.

Internet – Cover the cost of internet service. Does not cover phone or television (not needed).

Utilities – Covers the cost of electricity (including that involved in cooling) and heating. Costs are projected based on talks with other tenants in nearby units.

Equipment Purchase – Covers the cost of both purchasing new equipment and replacing or repairing damaged equipment and infrastructure upgrades.

Insurance – Covers the cost of insuring the business from property lost due to theft, and liability coverage against members.

Legal/Accounting/Etc – Covers the needed end-of-year accounting assistance, Also covers unforeseen legal needs. Monthly budget for legal and accounting fees will be carried from month-to-month creating a slush fund for unforeseen needs, and larger expenses like the end-of-year tax preparation.

Maintenance – Covers miscellaneous unforeseen expenses related to keeping the place running.

Advertising – Covers the cost of advertising the business. Funds will initially mostly be consumed by online advertising, but maybe later include publicity stunts, contests and travel to relevant events/conferences.

Appendix A. – Startup Costs

Provided by Owner	Value	Cost
Couch	400	0
Drill Press	200	0
Desks	300	0
Oscilloscope	300	0
Function Generator	200	0
Power supply	200	0
Mini-Fridge	150	0
Computers	500	0
Monitors	500	0
Shelving	160	0
Workbench	100	0
Chairs	50	0
Small Tables	20	0
Printer	100	0
Total	3180	0

Acquired for Free	Value	Cost
Welder	200	0
Drill Press	300	0
Microwaves	200	0
Workbenches	300	0
Chairs	150	0
Air Conditioner	250	0
Stereo	50	0
Total	1450	0

Purchased	Value	Cost
Shelving	300	300
Paint	100	100
Painting supplies	75	75
Toiletries	20	20
Cleaning supplies	30	30
Metal lockers	20	20
Air Conditioner Installation	250	250
Safety/Surveillance	300	300
Legal Setup	800	800
Total	1895	1895

Grand Total	Value	Cost
	6525	1895

Appendix B. – Cash Flow Analysis

Rates (monthly)	Jul '10	Aug '10	Sep '10	Oct '10	Nov '10	Dec '10	Jan '11	Feb '11	Mar '11	Apr '11	May '11	Jun '11
# of Memberships - Full	1	1	2	3	3	3	4	4	4	5	5	5
# of Memberships - Reduced	3	3	4	4	4	4	6	6	6	8	8	8
# of Memberships - Emergency	1	1	1	2	2	2	3	3	3	4	4	4
# of Class Sessions	0	0	5	10	10	10	15	15	15	20	20	20
Income ($/monthly)												
Membership - Full - $150/mo	150	150	300	450	450	450	600	600	600	750	750	750
Membership - Reduced - $50/mo	150	150	200	200	200	200	300	300	300	400	400	400
Membership - Emergency - $30/mo	30	30	30	60	60	60	90	90	90	120	120	120
Classes - $20 net/person/session	0	0	100	200	200	200	300	300	300	400	400	400
Gross Revenue/mo	**330**	**330**	**630**	**910**	**910**	**910**	**1290**	**1290**	**1290**	**1670**	**1670**	**1670**
Expenditures (monthly)												
Rent	700	700	700	700	700	700	700	700	700	700	700	700
Internet	60	60	60	60	60	60	60	60	60	60	60	60
Utilities	200	200	200	200	300	400	500	400	300	300	200	200
equipment purchase	300	300	300	300	300	300	300	300	300	300	300	300
Insurance	250	250	250	250	250	250	250	250	250	250	250	250
legal/accounting/etc	100	100	100	100	100	100	100	100	100	100	100	100
Maintenance	50	50	50	50	50	50	50	50	100	100	100	100
Advertising	100	100	100	100	100	100	100	100	100	100	100	100
Gross Expense/month	**1760**	**1760**	**1760**	**1760**	**1860**	**1960**	**2060**	**1960**	**1910**	**1910**	**1810**	**1810**
Net Income/ month	**-1430**	**-1430**	**-1130**	**-850**	**-950**	**-1050**	**-770**	**-670**	**-620**	**-240**	**-140**	**-140**
cash balance	**-1430**	**-2860**	**-3990**	**-4840**	**-5790**	**-6840**	**-7610**	**-8280**	**-8900**	**-9140**	**-9280**	**-9420**

Appendix C. - Projected Operational Earnings

	2010		2011				2012				2013			
Rates (monthly)	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
# of Memberships – Full	2	5	10	15	20	25	30	35	40	45	50	55	60	65
# of Memberships – Reduced	4	8	12	18	22	25	27	29	31	33	35	37	39	41
# of Memberships - Emergency	1	2	3	4	5	6	7	8	9	10	11	12	13	14
# of Class Sessions	10	20	40	60	100	140	180	220	260	300	340	380	420	460
Income ($/monthly)														
Membership - Full - $150/mo	900	2250	4500	6750	9000	11250	13500	15750	18000	20250	22500	24750	27000	29250
Membership - Reduced - $50/mo	600	1200	1800	2700	3300	3750	4050	4350	4650	4950	5250	5550	5850	6150
Membership - Emergency - $30/mo	90	180	270	360	450	540	630	720	810	900	990	1080	1170	1260
Classes - $20 net/person/session	600	1200	2400	3600	6000	8400	10800	13200	15600	18000	20400	22800	25200	27600
Gross Revenue/mo	**730**	**1610**	**2990**	**4470**	**6250**	**7980**	**9660**	**11340**	**13020**	**14700**	**16380**	**18060**	**19740**	**21420**
Expenditures (monthly)														
Rent	2100	2100	4200	4200	6000	6000	6000	6000	6000	6000	6000	6000	7500	7500
Internet	180	180	180	180	300	300	300	300	300	300	300	300	300	300
Utilities	600	1200	1500	1200	2400	4500	4500	2400	2400	4500	4500	2400	2400	4500
equipment purchase	900	3000	3000	4500	4500	4500	6000	9000	12000	15000	15000	15000	15000	15000
Insurance	750	750	750	750	1500	1500	1500	1500	2250	2250	2250	2250	3000	3000
legal/accounting/etc	300	300	600	600	900	900	900	900	900	900	1500	1500	1500	1500
Maintenance	150	150	300	300	1500	1500	1500	1500	1500	1500	1500	1500	2250	2250
Advertising	300	300	600	600	600	600	900	900	900	900	1500	1500	1500	1500
Gross Expense/month	**1760**	**2660**	**3710**	**4110**	**5900**	**6600**	**7200**	**7500**	**8750**	**10450**	**10850**	**10150**	**11150**	**11850**
Net/Quarter	**-4120**	**-4200**	**-2880**	**1440**	**1400**	**5520**	**9840**	**15360**	**17080**	**17000**	**22120**	**31640**	**34360**	**38280**
cash balance	**-4120**	**-8320**	**-11200**	**-9760**	**-8360**	**-2840**	**7000**	**22360**	**39440**	**56440**	**78560**	**110200**	**144560**	**182840**

Appendix D. – Sensitivity Analysis - Projected Worst-Case Operational Earnings

	2010		2011				2012				2013			
Rates (monthly)	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
# of Memberships – Full	2	3	4	5	6	7	8	9	10	11	12	13	14	15
# of Memberships - Reduced	2	4	6	8	10	12	14	16	18	20	22	24	26	28
# of Memberships - Emergency	1	2	3	4	5	6	7	8	9	10	11	12	13	14
# of Class Sessions	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Income ($/Quarter)														
Membership - Full - $150/mo	900	1350	1800	2250	2700	3150	3600	4050	4500	4950	5400	5850	6300	6750
Membership - Reduced - $50/mo	300	600	900	1200	1500	1800	2100	2400	2700	3000	3300	3600	3900	4200
Membership - Emergency - $30/mo	90	180	270	360	450	540	630	720	810	900	990	1080	1170	1260
Classes - $20 net/person/session	300	600	900	1200	1500	1800	2100	2400	2700	3000	3300	3600	3900	4200
Gross Revenue ($/Quarter)	**1590**	**2730**	**3870**	**5010**	**6150**	**7290**	**8430**	**9570**	**10710**	**11850**	**12990**	**14130**	**15270**	**16410**
Expenditures ($/Quarter)														
Rent	2100	2100	2100	2100	2100	2100	2100	2100	2100	4500	4500	4500	4500	4500
Internet	180	180	180	180	180	180	180	180	180	180	180	180	180	180
Utilities	600	1500	1500	600	600	1500	1500	1500	1500	2400	2400	1200	1200	2400
equipment purchase	900	900	900	900	900	900	900	1500	1500	3000	3000	3000	3000	3000
insurance	750	750	750	750	750	750	750	750	750	1500	1500	1500	1500	1500
legal/accounting/etc	300	300	300	300	300	300	300	300	300	300	300	300	300	300
maintenance	150	150	150	150	150	150	150	150	150	300	300	300	300	300
advertising	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Gross Expense ($/Quarter)	**5280**	**6180**	**6180**	**5280**	**5280**	**6180**	**6180**	**6780**	**6780**	**12480**	**12480**	**11280**	**11280**	**12480**
Net Income ($/Quarter)	**-3690**	**-3450**	**-2310**	**-270**	**870**	**1110**	**2250**	**2790**	**3930**	**-630**	**510**	**2850**	**3990**	**3930**
cash balance (end of quarter)	**-3690**	**-7140**	**-9450**	**-9720**	**-8850**	**-7740**	**-5490**	**-2700**	**1230**	**600**	**1110**	**3960**	**7950**	**11880**

Build Cool Stuff

MakeIt Labs

DreamIt. LearnIt. MakeIt.

Maker, Artist, Hacker, Creator, Inventor, Engineer, Tinkerer.
We go by lots of names.
Now we've got a space.

Contact us or come visit us an Open House:
Mondays and Thursdays 6-9pm

Phone:	(603) 722-0006	Website:	makeitlabs.com
Address:	111 Tanner St. Lowell, MA 01852	Email:	joe@makeitlabs.com

MakeIt Labs – MakeItLabs.com
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Joseph M. Schlesinger

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EDUCATION:

Worcester Polytechnic Institute (WPI), Worcester, MA **-** May 2010
Bachelor of Science in Electrical & Computer Engineering (ECE)

Related Coursework:

Microelectronic Circuits I&II	Embedded Computer Systems
Advanced Digital Logic Design	Verilog Synthesis And Design (Grad)
Continuous & Discrete Signal Analysis	Digital Signal Processing (Grad)
Basic and Advanced Cryptography (Grad)	Embedded Linux* (IEEE)

SKILLS:

Computer: MATLAB, SIMULINK, C/C++, Python, OpenCV, Verilog, VHDL, MultiSim, Simulink, Ultiboard, LabView, Linux, Embedded Linux, Maple, Solidworks, Xilinx, Quartus, Bash shell scripting, Apache, Java, E-SPRIT, MySQL, Oracle
Lab: Oscilloscopes, Spectrum Analyzers, FPGAs, MSP 430, Extensive Operational Amplifier experience, DSP, Digital Multi-Meters, Function generators, Component-level hands-on (MOSFET, BJT, CMOS gates, etc), SMT soldering
Language: Basic Mandarin Chinese and Spanish, with extensive Chinese historical and cultural background

EXPERIENCE:

WPI Electrical and Computer Engineering Department, *Senior Tutor*
August 2009 – Present
Assist with lab work, reviewing and grading lab reports, teaching help sessions

Jobotics Technologies, *Founder, Chief Engineer*
April 2008 - Present
Design, manufacture and marketing of rugged, 'just-works' communications equipment designed for high-noise environments for demanding military and civilian markets.

WPI Metal Processing Institute*, Information Technologies Director*
January - August 2008
Managed department IT assets, made final purchasing decisions, managed department inventory, worked with department members on IT-related issues, managed department website, Mac OSX, Windows and Linux Administration

Trenergi Corp, *Systems Engineer*
November 2009 –May 2010
Developed Electrical, Mechanical and Labview-based mechanisms for hyper-efficient fuel cell heat-electricity co-generation for homes.

MakeIt Labs LLC. *Founder*
January 2010 - Present
Founder of an Open-Access Workshop for engineers, inventors and hobbyists. Providing education for and access to electrical test, metalwork, welding and carpentry equipment.

MITRE Corp. *Systems Engineer*
May 2010 - Present
Penetration testing and selection of WIFI and GSM/CDMA networking equipment for use with USAF Airborne Network onboard VIP planes.

ACADEMIC PROJECTS:

Major Qualifying Project (WPI), *Humanoid Soccer Robotics*
Wuhan, China June 2009 - August 2009
Worked extensively with OpenCV, MATLAB and DSPs and developed a robust, optimized and portable machine vision software program and the hardware platform it ran on for robotics systems from scratch in 7 weeks. Worked in a mixed team of 10 Chinese and WPI students, and organized task and labor division.

Joseph M. Schlesinger

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INDEPENDENT PROJECT EXPERIENCE:

UAV Development , Sensor data fusion, Extensive Battery Chemistry, SMPS, DC-DC Conversion, Motor Control, PCB Layout and Design, Distributed Computing, Data Mining, Concept-to-Finished Product engineering experience, CNC Machining, Welding, SMT soldering,

ACADEMIC HONORS:

- *Recipient of WPI's University and Edward C. Perry, Jr. Scholarships.*
- *Recipient of IEEE Academic and Service Scholarship*
- *Recipient of IEEE Best Graduating Senior 2010*

EXTRACURRICULAR ACTIVITES:

- Chair – WPI IEEE Chapter
  Leading the largest, most active student branch in the US, 40+ events/year
- Team Leader - NASA Lunar Excavation Challenge
- Member (KB1QLF) - WPI Wireless Association