

Teaching High School Students to Code: Solving CS4All with Private Organizations

THESIS

Submitted in Partial Fulfillment of

the Requirements for

the Degree of

MASTER OF SCIENCE (Management of Technology)

at the

NEW YORK UNIVERSITY

TANDON SCHOOL OF ENGINEERING

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Approved:

Advisor

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VITA

Tom Bijesse graduated from The State University of New York at Oswego, with a Bachelors of Science in 2012. Tom's major at SUNY Oswego was Technology Education, a degree focused on the education of industrial arts and design skills. Immediately after graduating Tom decided to not pursue a career as an industrial arts teacher and instead went in search of a Computer Science teaching role.

In August of 2012, Tom started working at The Urban Assembly Gateway School of Technology in Manhattan teaching six courses in software engineering. After constant frustration caused by bureaucracies within the Department of Education, Tom decided to pursue a career shift.

In July of 2014 took a position at the small NYC non-profit ScriptEd. When Tom joined ScriptEd he was the third member of the young company with a mission of equipping students from under-resourced schools with the fundamental coding skills and professional experiences to create access to careers in technology. His job provides him with the freedom and flexibility he felt was missing from being an NYCDOE teacher.

In August of 2014, Tom decided to continue his education at the NYU Polytechnic School of Engineering Executive Masters of Science Management of Technology program. His career and academic experience have influenced him to write this thesis. When he graduates he plans to put this work to good use by growing his influence in the learn-to-code industry for high school students.

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Thomas Bijesse**Advisor: Prof. Jill Kickul, Ph.D.****Submitted in Partial Fulfillment of the Requirements for
the Degree of Master of Science (Management of Technology)****May 2016****ABSTRACT**

Politicians the world over like to say they are preparing their students to work in a changing world by teaching them 21st-century skills. Towards the end of the recession, computer science education started to begin a movement in which nations are racing to prepare and train young people to work in the evolving field of technology. In an industry that is projected to grow over 200% between now and the year 2020, it is no wonder that in Barack Obama's final State of the Union address he specified the importance of offering every student the access to learning hands-on computer science skills.

As a reaction to the high need and lack of resources for this education several non-profit and for-profit organizations started teaching students computer science skills after school, on weekends and sometimes during the school day. The excitement over computer science education is still gaining momentum today and shows no sign of slowing down. The only question is when and where will the next learn-to-code organization open their doors.

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INTRODUCTION

Education for 21st Century Learning

On January 30, 2016, Barack Obama announced a new initiative called Computer Science for All (CS4All) to address the state of computer science education in American schools. Currently, only one in every four schools in America teaches some form of computer science (Obama, 2016). The president and other policy makers around the country are doing everything they can to ensure 100% of American schools start preparing students for the changing world of work through rigorous computer science education. This initiative has laid the foundation for making computer science a basic skill that all students must learn. The next step is finding entrepreneurs and teachers who can design a plan to roll out this initiative successfully.

Public and Private Efforts

In just about every part of the world, there is a huge disparity between the need for computer science education and the amount of people capable of actually teaching it. In order for today's kids to be prepared to work in a technology role, they must first be trained by someone who is capable of doing exactly this. The unfortunate truth is there are simply not enough teachers able to teach computer science. Meanwhile, the resource needed to hire new teachers or train current teachers also does not exist, even after the amount of money recently dedicated to CS4All. In response to this lack of resources, private entities are attempting to fill the gap in order to standardize computer science education in a timely manner.

These private efforts have seen huge success in the cities that they are clustered in. Cities like New York and San Francisco have seen the largest influx of organizations partnering with schools to provide quality computer science education to students. Even with a multitude of organizations entering these cities each organization continues to grow and shows no signs of slowing down. Although the markets in San Francisco and New York City are not saturated there is still a huge demand for these services in cities across the country. The purpose of this study will be to find the market with the need, want and resources for the next learn-to-code organization for high school students.

WHAT IS COMPUTER SCIENCE

In order to ensure a successful roll out of the Computer Science for All initiative, one must first understand exactly what is meant by computer science education. For decades universities around the world have been offering degrees in computer science at all levels of higher education. Several definitions for computer science exist and vary quite a bit depending on which source they come from. Perhaps the most appropriate definition comes from Business Dictionary who defines computer science as the study of computing, programming and computation in correspondence with computer systems (Business Dictionary, 2016). Computer science is a field of study and work in which people are creating and manipulating the computer systems that people the world over use.

Coding is the ability to read and write computer programs. It is the central skill in the field of computer science. In order to be able to create or manipulate a computer system one must first learn how to communicate with technology, they must speak a language that the computer also speaks. There are hundreds of programming languages today and new ones are being created every day that allows a coder to communicate with a computer. Those who are trained in the field of computer science can code in one or more of these languages and use the code they write to provide a service for themselves or their customers. The ability to code opens up a new world in which a human and a computer can work together to complete difficult tasks.

Why Computer Science?

This push for universal computer science education has gained a lot of traction in recent years. It is a movement that is supported by politicians on both sides, nearly all educational institutions and 90% of American parents (Obama, 2016). With American education struggling in fields like reading, writing, math and traditional sciences how is it that everyone can agree that schools need to start teaching computer science? The answer is simple, as technology finds its way into nearly every part of our lives we need to train our students to manage and create these new technologies.

Technology is causing several industries to shrink as a result of jobs becoming automated and the need for human interaction with production being minimized. However, as these other industries continue to shrink, the technology industry is growing at an incredible rate. According to a 2010-2012 report by the Bureau of Labor Statistics, there will be one million jobs in computing that will go unfilled by the year 2020 (Bureau of Labor Statistics, 2015). This deficit is a result of the lack of qualified people in the field of computer science to fill these roles. So far the projections made by the Bureau of Labor Statistics have held true and are on a trajectory for remaining true in 2020. The issue is clear. While professionals in many industries are desperate for jobs the technology industry is desperate for qualified professionals. Quality computer science education for all is the solution to the professional inequalities we face.

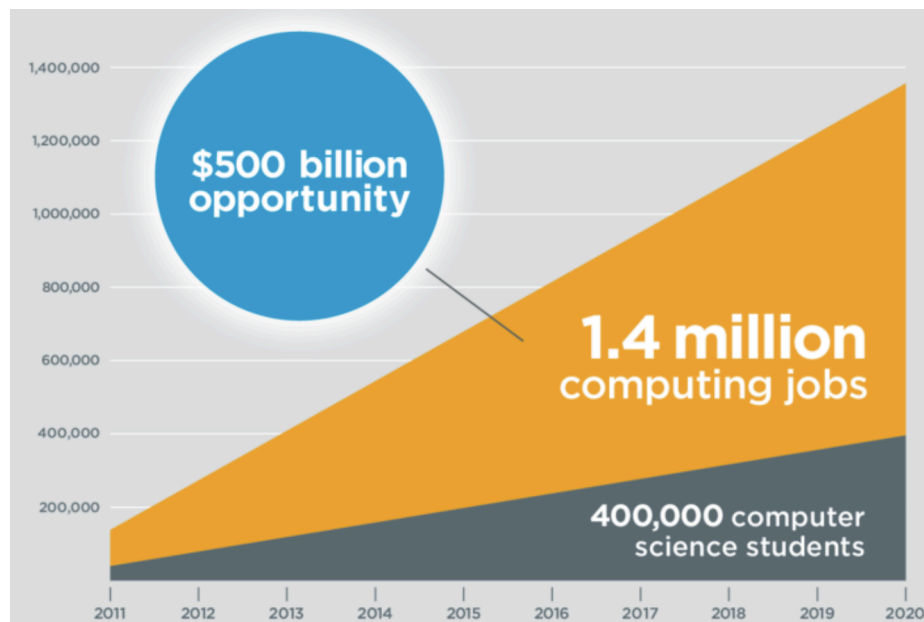


Figure 1: Computing Job Projections for 2020¹ (Stack Exchange , 2015)

History of Computer Science Education in America

To fully understand the importance of everyone receiving an education in computer science one must understand how this field first began. The history of computer science stretches back much further than the education and popularization of the computer as we know it today. In fact, the first computer was built in 1943 and was built by the Allied

powers for the sole purpose of decoding German messages (Hodges, 1997). Computer scientists have been shaping history for over 60 years with their devices but where do they come from and how do they learn these skills?

The first formal education in computer science was created in 1962 at Purdue University in Indiana (Rice & Rosen, 1994). In 1964, more than 20 years after the first computer helped win World War II, three individuals received an accredited Masters of Science degree in computer science. The field then began to grow in popularity through the 1970's and was projected to only grow from there. However, the early 1980's were a time of de-enrollment and hardship for computer science education. For something as trivial as education and training to control an amazingly powerful device there have been many hardships and periods of low enrollment for computer science education.

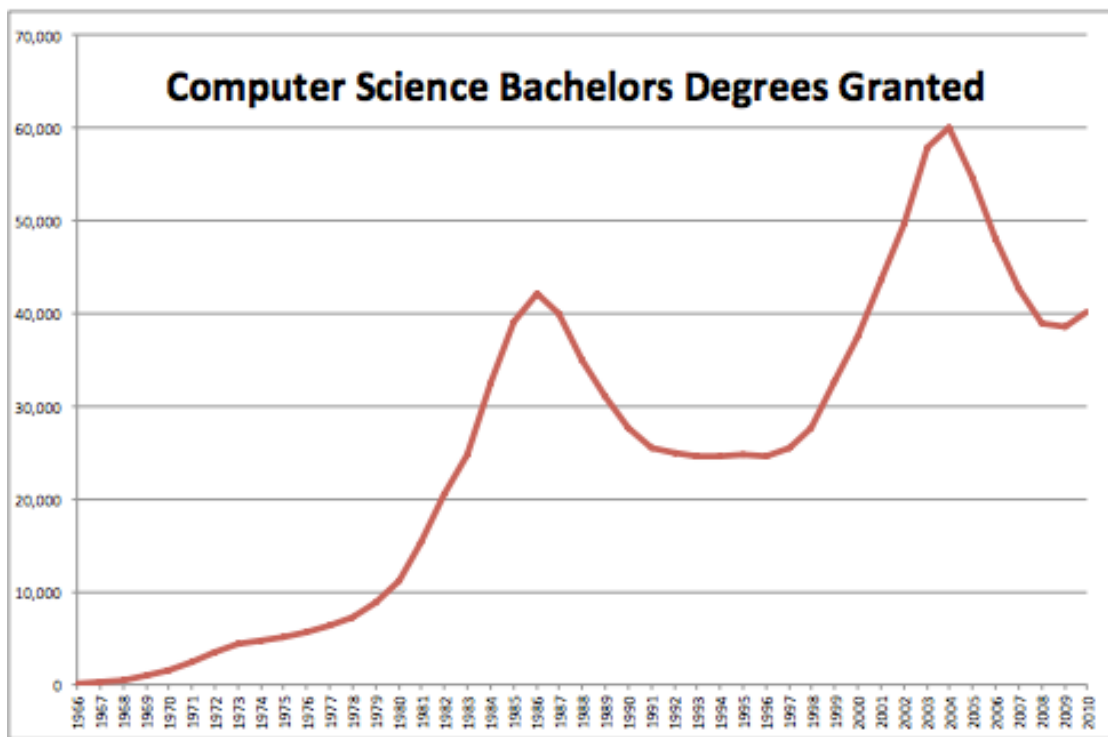


Figure 2: Computer Science Bachelor's Degrees² (Stack Exchange , 2015)

Personal Computers: The First Surge

With the rise of personal computers in the 1980's brought more and more university students to seek a degree in computer science. At this point, the coder is still a figure of

counter culture that few knew much about or would interact with. But with the large boost in computer sales and industry success one would only assume that the education would follow suit. Since the rise of the personal computer in the 1980's this country and the rest of the world has seen a significant disparity between the rise of the technology industry and the education needed to enter it.

Dot-Com: The Second Surge

During the dot-com boom in the late 1990's and early 2000's yet another wave of eager university students joined computer science programs by the masses. This time they were being taught programming languages like the ones we see still in use today which include HTML, JavaScript and Java. But when the dot-com bubble busted so did the number of computer science degrees. But it is crucial to mention here that even after this retreat, the computer was still finding its way into the hands of more and more people.

Standardization: The Third Surge

It is hard to believe that in 2008 there was a retreat of computer science from universities and grade schools. Not only were schools failing to bring in computer science courses, several schools were actually removing these courses from their curriculum. At a time of financial crisis, unemployment and the number of computer devices in the hands of everyday people continuing to grow we decided it was the right time to cut computer science education! Luckily, this deficit was soon realized which brings us to the current state of computer science education.

At the start of this decade the world saw a realization that these technology device are not going anywhere. It is a growing business that requires plenty of training to enter. And those who enter this field are rewarded with a first class salary. However, in this third surge we see a new motivation for computer science education besides money. This time around we interest in the form of excitement and curiosity of doing something powerful. Many say that this third surge of computer science is here to stay. Computer science is finally moving away from counter culture and into standardization.

Implementation

Standardization will be the key for success moving forward with computer science education. In America, the Computer Science for All initiative is seeking to do exactly that. Other countries such as the United Kingdom have gone even a step further than America. In 2013, the United Kingdom made computer science a mandatory part of grade school education (Dredge, 2014). Although these movements are powerful and are supported by an overwhelming amount of groups there has been an incredible amount of controversy linked to the methods of implementation. There are simply not enough teachers in the world capable of teaching computer science in grade schools. In order to create a sustainable system in which computer science education flourishes in grade schools effort must come from a partnership between the private and public sector.

INDEPENDENT LEARN-TO-CODE ORGANIZATIONS FOR KIDS

While many countries, including The United States, would like to see coding become a part of the mandatory requirements for high school graduation it is important to consider how this would be managed and who these courses would be taught by. Those who are able to code are often not pursuing a career in education; they are seeking a career in the booming industry of technology. According to the Bureau of Labor Statistics, the median salary of a software engineer is nearly twice the median salary of a teacher in America (Bureau of Labor Statistics, 2015). It is no wonder that those who code pursue a career in technology and not education. Although engineers, developers and coders are not eager to become teachers they are willing and able to help make the CS4All initiative a reality as soon as possible.

In the past few years, the world has seen several organizations appear with a goal of improving computer science education in grade schools. The United States has seen the largest influx of these organizations, both in the for-profit and non-profit sector. These organizations have access to a very important resource that most schools simply do not. These organizations have access to the brilliant men and women in the technology industry. With this invaluable resource, private organizations are able to create access to a quality computer science education for grade school students.

NON-PROFIT ASSESSMENT

In January 2013, Code.org, one of the most well-known learn-to-code organization, opened its doors with a mission of expanding computer science education. Around the same time, several other non-profit learn-to-code organizations also started appearing. Some of these organizations include ScriptEd, TEALS, Girls Who Code, Yes We Code, C/I and Mission Bit just to name a few. Although these organizations vary a bit in the curriculum they teach or they way they partner with local schools they all have a similar mission of expanding computer science education. Most also strive to bring their education to under represented groups in the technology industry such as women and minorities. With such similar missions and close clustering one might wonder how all these organizations are able to co-exist.

The reason so many organizations are able to not only co-exist in the same city but also expanding rapidly is because the demand for computer science education in schools is so high. In a recent study of American schools conducted by Gallup, nine out of ten parents want their child to study computer science (Gallup, 2015). With only one in every four schools teaching computer science it is even easier to see the demand for computer science education is far greater than the resources available. Non-profit learn-to-code organizations are working closely with schools to provide the resources they cannot acquire alone. With no official computer science teacher training program offered at any university in America right now, it is clear that the need for this partnership will remain strong for many years to come.

Non Profit Major Players

As we consider where the next organization should plant its feet it is important to first understand the major players in the field. In observing these major players it is also important to consider the potential for one of these organizations setting up a branch in a new area. This is an industry in which the threat of existing competition is as strong as the threat of new entrants. Before any organization decides to open it is important to explore the current landscape.

Code.org

Code.org is undeniably the most popular organization in the learn-to-code field right now. Many would attribute their success to incredible marketing and impeccable timing. In 2013, Code.org launched a 5-minute video highlighting the importance of computer science education (Partovi, 2013). The video includes pop-culture icons, tech industry legends and Code.org founder Hadi Partovi that helped

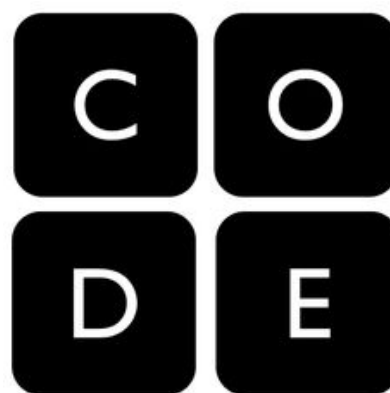


Figure 3: Code.org Logo³ (Code.org, 2015)

bring this issue to life for those who are not already in the industry. The video now holds 13 million views on YouTube and has been the driving force for educating people on the

lack of computer science education today. Code.org has since been featured in several political campaigns including CS4All. Code.org is now a symbol for the learn-to-code movement.

The mission of Code.org is for each student in America to have access to computer science education, an ambitious goal in 2013 when Code.org launched. However, Code.org is moving towards that goal and has even seen its products used around the world. Code.org's annual event, The Hour of Code, served over 2 million students around the globe in 2015 and served as a platform for the first time many students have written a line of code. This organization has mastered the art of introducing computer science education but where does it stand on furthering this education?

The model for Code.org is to offer their curriculum for free to any teacher who would like to use their materials in the classroom. The curriculum is packaged in such a way that even a teacher without any experience writing code can launch it in their classroom. This offers a low barrier to entry and can be attributed to some of Code.org's incredible success. With this model in place, Code.org is not restricted by any geographic barriers. This allows it to exist in various communities around the world for any length of time. This model is also quite different from the other players in the space who believe several touch points and human interactions are needed to ensure effective computer science education is being delivered.

ScriptEd

ScriptEd is a New York City based non-profit with a mission of providing students from under-resourced schools with the



Figure 4: ScriptEd Logo⁴ (ScriptEd, 2013)

fundamental coding skills and professional experiences needed to create access to careers in technology. ScriptEd does this by partnering with under-resourced schools to teach a full year course in front end web development taught by volunteer teachers. In doing so ScriptEd is able to provide students with an industry aligned experience the school would

otherwise be unable to offer (ScriptEd, 2013). Now in its fourth year of operation in New York, ScriptEd has shown success by introducing hundreds of teens from low-income communities to the technology industry through personal connections and summer internships.

The ScriptEd model requires four volunteer teachers to run an effective classroom. This is a large factor to consider for ScriptEd if they plan to expand. The number of developers and engineers living and working in New York City allows ScriptEd to maintain a volunteer force of over 140 individuals, other cities might not. Even though there is a huge demand for computer science to be taught in high school there is simply so few teachers capable of doing so. ScriptEd is fulfilling this need in New York's under-resourced schools by bringing the technology industry to the school.

Although ScriptEd is only located in New York City right now the Executive Director and founder Maurya Couvares claims national expansion likely in the future especially after the president's Computer Science for All announcement (Couvares, 2016). Sites for potential ScriptEd expansion will be limited in considering the need for a large community of technology professionals and companies interested in becoming involved with ScriptEd's mission. However, there are plenty of cities in the United States and beyond that have the need and necessary resources to support a ScriptEd branch. If ScriptEd is going to expand it would be in their best interest to do so while demand is high and supply remains low.

TEALS

TEALS is an organization that began as a philanthropy project by a Microsoft employee in 2009 and is now funded almost entirely by



Figure 5: TEALS Logo⁵ (TEALS, 2015)

Microsoft's YouthSpark initiative which aims to increase access to computer science education for all youth around the world (TEALS, 2015). Like ScriptEd, TEALS partners with schools and industry professionals on a volunteer basis to teach computer science in

schools that lack the resources to do it alone. Although ScriptEd and TEALS are similar in many ways they differ in curriculum and have different goals for their program. While TEALS volunteers are introducing and preparing students for success in computer science advanced placement (AP) tests they are simultaneously preparing classroom teachers to become dependent and one day teach this curriculum on their own.

TEALS has been growing rapidly over the last seven years. There are now TEALS classrooms in cities like New York, Los Angeles, San Francisco, Miami, Austin, Seattle and more. Although TEALS is concentrated in urban areas the organization has been reaching rural and suburban communities through its remote instruction model in which volunteers teach the course material via video conferencing. Nathaniel Granor, TEALS's lead program manager, states that the remote instruction model is not perfect but it does offer a school outside of technology centered cities with the ability to have a strong connection to the industry (Granor, 2014). TEALS has proved its success in both remote and direct instruction classrooms.

Mission Bit

Mission Bit is a non-profit that strives to eliminate the tech divide for youth living in poverty areas across the San Francisco Bay Area by



Figure 6: Mission Bit Logo⁶ (Mission Bit, 2015)

building computer programming and professional opportunity pathways for public school students (Mission Bit, 2015). Mission Bit uses a force of volunteer teachers to from universities and the technology industry to teach curriculums in computer programming and professionalism. Mission Bit shows many similarities to ScriptEd and TEALS in that it relies on professional resources in the form of volunteers from the technology industry to run its program. Mission Bit's connection to industry engagement has proven its success through transformational changes of students that have resulted in them entering the technology industry.

Mission Bit has expanded its reach to several schools in the Bay Area and expanding its volunteer workforce. Although Mission Bit does not show any signs of expanding to other areas there is plenty of room for growth when considering the Bay Area is often seen as the epicenter of the technology industry. In an area known for making a name for itself with technology it certainly lacks the resources to send students in the area from various backgrounds with the ability to join the incredible workforce. Mission Bit is doing a fantastic job at laying the groundwork for reversing this societal issue.

Code Interactive (C/I)

Code Interactive is another New York City based non-profit with a mission to inspire students in underserved schools with the skills in computing, leadership and professionalism needed to thrive in the internet economy and beyond (C/I, 2015). Code Interactive shows similarities to Code.org's model of providing in-service teachers with the resources they need to run their own computer science course. However, Code Interactive has a much more hands-on approach to this method. Code



Figure 7: C/I Logo⁷ (C/I, 2015)

Interactive partners with underserved schools to provide teachers with continuing Professional Development and curriculum to ensure every program they support continues to be successful.

Code Interactive is currently only operational in New York City. However, Tom O'Connell (Program Director at Code interactive) states that Code Interactive is planning to partner with schools in Texas soon to expand Code Interactive's reach (O'Connell, 2016). Although Code Interactive has many volunteers it does not rely on volunteer effort nearly as much as ScriptEd, TEALS or Mission Bit since it is an organization focused on professional development for teachers. This model for Code Interactive's success allows for it to run on few resources while offering the continued support that teachers in underserved schools often require.

Girls Who Code

Girls Who Code is a national organization that targets high school girls to teach them fundamental coding skills in one

of their clubs. The Girls Who Code mission is simple, they

strive to inspire, educate and equip girls with the computing skills to pursue 21st-century opportunities (Saujani, 2016). Girls Who Code acknowledges that the tech industry has a huge gender gap that discourages young women from entering the workforce. According to the National Science Foundation, only 26% of the computer science and mathematical science workforce is female (National Science Foundation, 2012). By creating an organization that welcomes girls from all backgrounds and varying skill levels Girls Who Code is working hard to reverse these tough statistics.



Figure 8: Girls Who Code Logo⁸ (Girls Who Code, 2016)

Girls Who Code offers two types of clubs that are both free for the participants. The first club is held throughout the school year in a 40-hour curriculum. In this program, volunteer teachers are recruited to ensure the participants learn the required materials. The other type of club is a summer intensive program in which the same 40-hour curriculum is taught over the course of seven weeks. These programs are taught by part-time and full-time Girls Who Code staff and even offer some students with financial need a stipend to attend. Girls who code is targeting a minority market in the technology industry, in doing this they are setting themselves apart from the other non-profits in the learn-to-code space.

Non-Profit Summary

Computer Science for All has created a nation-wide spark and awareness for the lack of computer science education in this country. However, organizations like Code.org, ScriptEd, TEALS, Mission Bit, Code Interactive and Girls Who Code are among many in providing resources that those schools cannot do alone in the battle for providing

computer science education to all high school students. With interest for computer science education coming from families from all backgrounds and locations, the non-profit sector will play an important role in ensuring CS4All will reach students from all backgrounds in a timely manner. Perhaps the day will come when teachers in schools will be able to teach computer science without outside resources but until then these non-profits will continue to fill the gap while also providing direct industry engagement.

FOR-PROFIT ASSESSMENT

In the for-profit space there has been a huge influx of small learn-to-code organizations for high school students appearing out of interest from parents to provide their child with a skill that is not being taught in school. Many organizations are appearing seemingly overnight yet they are able to co-exist because demand is still not being met. This mirrors the current status of non-profits in the same space. Families from affluent communities are willing to pay top dollar for their kids to learn a skill that will set them apart from their peers.

As CS4All pushes computer science into more schools these for-profit companies will only grow stronger. Right now parents are willing to pay for their kid to have a skill the most others do not have even a basic understanding. But this demand will only grow when these learn-to-code organizations will soon be offering parents a means in which their kid can stand out from their peers by excelling in a subject in which other kids might be struggling to keep up. CS4All might force these organizations to change the way in which they operate in the future but this act will benefit these organizations to a similar degree in which the non-profits are seeing now.

As we consider where the next learn-to-code organization for high school students should plant its feet it is important to first understand the major players in the for-profit field. Although this sector differs from the non-profits in that many of the organizations are very small operations with few locations there are still larger organizations that are leading the way in forming this industry.

CodeHS

CodeHS is a for-profit learn-to-code organization based in San Francisco.

The product CodeHS sells is a curriculum, platform and professional development, for teachers

to implement a full computer science course in their classroom. With a lack of qualified computer science teachers in the world and a demand for professional development schools see the minimum price tag of \$2500 to be a worthy investment for providing their students with adequate computer science education (CodeHS, 2016). CodeHS is an online platform that allows any school willing to invest the time and money to implement immediately and is leading the way in self-sustaining classroom computer science teaching.



Figure 9: CodeHS Logo⁹ (CodeHS, 2016)

Hundreds of affluent schools around the country are eager to say that their school is a part of the CS4All movement but do not have the resources of their own to begin a program. CodeHS is providing the Learning Management System (LMS) for these schools to reach their goal now. CodeHS advertises itself as “The best way to teach computer science in high schools” and believes that teaching the teacher and the students simultaneously maximizes the learning in the room (CodeHS, 2016). CodeHS is able to prove its success through constant touch points and continued professional development. For schools that can afford the platform, this is seen as a reliable and quick solution to teaching computer science effectively.

ID Tech

ID Tech is the largest summer technology camp in the world. It currently boasts over 150 locations across America for kids age 6-18 (ID Tech, 2015). In 1999 ID Tech started

with a simple idea, take the same summer camp that most kids are used to and add a technology component to it. The model has been duplicated by small organizations



Figure 10: ID Tech Logo¹⁰ (ID Tech, 2016)

several times but ID Tech has seen the largest and most rapid growth for being first to the market. As schools are failing to teach computer science parents are welcoming the idea of peaking their child's interest through an innovative type of summer camp experience.

With two-week coding camps priced up to over \$4,000 the price tag for ID tech seems too expensive for many. But for those who are already in search of a sleep away camp for their child they find the prices ID Tech charges to be reasonable and an incredible learning experience. ID Tech is able to see amazing success in the amount of material the students are able to learn in a short period of time due to the 24 hour model of the program. ID Tech is offering an innovative solution for providing meaningful computer science education for thousands of kids.

Globaloria

Globaloria bears a resemblance to CodeHS in that it sells a full-fledged Learning Management System (LMS) to schools that would like to



Figure 11: Globaloria Logo¹¹ (Globaloria, 2015)

start teaching Computer Science but do not have the resources to do so alone. Globaloria offers a complete set of student materials, professional development, and resources to ensure success in any school that can fund the program. Globaloria claims that most schools are able to find funding for their program and offers personalized help to ensure your school can afford the platform (Globaloria, 2015). Although Globaloria and CodeHS offer similar products both are able to coexist and expand rapidly by varying in curricula to match the needs of the schools they partner with.

Small Learn-to-Code Organizations

More so in the for-profit space than in the non-profit one can find a seemingly endless supply of small learn-to-code organizations for high school students. Some of these organizations strive to become a major player while others pride themselves in their small size and tout their ability to adjust curriculum based on industry changes while also providing a more personalized experience for each student. These organizations are

targeting wealthy families who either feel their child's school is failing to teach the necessary skill of computer coding or they feel their child needs to spend more time learning to code so that they can excel in their computer science courses in school.

These smaller organizations tend to cluster in large metropolitan areas with affluent communities. New York City and San Francisco see more of these organizations than any other place in the world. As more and more seem to be opening each year in these two areas it leaves one to question when will the supply catch up with the demand? Although that time does not seem to be coming anytime soon it does open the opportunity for an entrepreneur to set up one of these organizations in another metropolitan area with less competition.

For-Profit Summary

Learn-to-code organizations are extremely dynamic in the for-profit space. Organizations like CodeHS and Globaloria have found success in targeting teachers and schools with a simple Learning Management System (LMS) that can be adapted by teachers who do not know how to code. While other organizations have found success in targeting the parents by offering pricey coding experiences in which their child learns from industry professionals in a non-traditional manner. In either case, this industry is continuing to grow and shows no sign of slowing down. In considering the next city that a learn-to-code organization should target one must consider the competition in regards to both in person and online education.

LOCATION ASSESSMENT

In the industry of teaching high schools students how to code one thing is clear whether you are a for-profit or a non-profit, there is a lot of competition. Even though demand for these organizations is still far larger than the supply careful consideration must be made in regards to finding an area that will show the greatest chance of success. If an organization is to set up a new branch or an entrepreneur is going to begin his or her own venture it is likely that a metropolitan area will be targeted. However, finding the right metropolitan area will require a proper feasibility assessment.

Finding the Right Market to Enter

Organizations that work in-person with students require ample resources to ensure success. Before conducting a feasibility assessment on the best metropolitan market to enter countless things must be considered. However, we can categorize these considerations into four main categories to allow for fair comparison from one area to the next. The four main considerations are as follows:

- Size of Technology Community
- Potential Funding Partners
- School Partner Model
- The Competitive Landscape

Size of Technology Community

According to Mark Schill, a researcher at Praxis Strategy Group, between 2004 and 2014 the number of tech-related jobs in The U.S. grew 31% faster than other high-growth industries like health care and business services (Schill & Kotkin, 2015). This growth has benefitted many areas of the country. However, even with such huge growth of this industry, there are clusters in which this growth is targeted. In considering the best place for teaching high-school students how to code the existing tech community will play a vital role in ensuring success.

Organizations that work in-person require a significant tech community for several reasons. A prevalent tech community will be the source of employees, volunteers, site

visits and will be the largest proponent in supporting a new organization like this in the area. Areas with little to no tech companies often do not understand the need for teaching how to code at such a young age. The last thing a learn-to-code organization would want to encounter in a new city would be push back from the citizens making claims that would undermine the organization's presence.

Potential Funding Partners

Whether you plan to open a non-profit or a for-profit you will likely need funders who support your cause. Start-up costs for the first-year operation on a for-profit organization can be about \$80,000 (Fenjves, 2016). These costs are often even higher for a non-profit when considering employee salary. The cost of running a non-profit in its first year of operation can be roughly \$150,000 (Couvares, 2016). One of the first steps one must make when deciding a new city is to meet with venture capitalists, philanthropists and large tech companies in the area to inquire their interest in funding a learn-to-code organization.

Funders will obviously vary depending on whether you intend to have a non-profit or for-profit organization. In either case, you will not get far at all unless you plan to have backing from a member of the local community. In several cases, organizations were able to find the funding they needed from large corporations who believe in this new industry. Finding funding for your organization and evaluating the size of the tech community will work hand and hand through the process of establishing a new market.

School Partners Model

Learn-to-code organizations that teach in person require a relationship with local schools no matter what their model is. Schools provide a gathering of the entire market in which any organization will be able to pull students from. Several organizations rely on schools for space and in some cases even break into the school day and teach alongside a licensed teacher in their classroom. Lastly, a school will be a main source of marketing towards potential students and parents.

Finding a school to partner with is easy. Most schools in America will even pay for the opportunity to say that they bring in outside resources to ensure adequate computer science education is being taught within their walls. However, finding the right school to partner with can pose a challenge. Some schools lack the infrastructure to support a learn-to-code program (reliable internet, devices, etc.) while other schools lack the flexibility or space to bring in a learn-to-code organization.

The Competitive Landscape

It is clear that at this point there are many capitalizing on this new demand parents and governments have for teaching kids how to code. After the recent CS4All announcement you can be assured that in garages around the country there are people making plans to open a new organization every day. Even though the general public is beginning to buy into this idea that every student needs to learn how to code it would certainly make success easier if there was not considerable competition when beginning a new venture.

It may sound logical to simply open a new learn-to-code organization in an area that doesn't already have one. However, without considering the other three pieces of this feasibility assessment any organization would surely fail. There is a reason these learn-to-code organizations are concentrated in the areas they are in. These are the places where the demand exists. These are the areas that should still be considered and in many cases, these are the areas where demand is not being met. Finding the proper metropolitan area to set up shop will inherently follow a Goldilocks metaphor of discovering the area that is just right!

Location Assessment Summary

Finding the right metropolitan area for a learn-to-code organization will rely on the four factors above. The right technology community will ensure the organization is welcomed and supported financially. Adequate funding will build any organization's foundation and will set it up for later success. While partnering with the right schools who do not already have organizations offering this product will help build a wealth of customers and infrastructure needed to sustain this project.

LOCATION STRATEGY

When asked where is the most logical place to set up a new tech company more than likely the answer will be Silicon Valley and the greater San Francisco area. Indeed, Silicon Valley is an area that must be included in studying where to open the next learn-to-code organization but it is not the only place to consider. Choosing the right areas to investigate will rely on the aforementioned factors from the previous section that will ensure quality and success.

CS4All and the exponentially growing technology industry has brought computer science education out of Silicon Valley and into minds of city centers the world over.

In conducting this feasibility assessment five American cities have been chosen for their potential in providing adequate resources and interest in supporting a learn-to-code organization for high school students. These five cities are as follows:

- New York City, New York
- San Francisco, California
- Austin, Texas
- Washington D.C.
- Raleigh, North Carolina

Any one of these metropolitan areas could support an array of learn-to-code organizations and many of them already support several. In order to find the right choice for the current market these areas will be investigated thoroughly.

The charts below compare each of these five areas on a statistical analysis of information relevant to this study. It is important to note that the information below is considered when deciding which area can ensure success but is not the final decision-making tool.

Table 1: GDP by Area (millions of Dollars) (Bureau of Economic Analysis, 2015)

	New York	San Francisco	Austin	Washington D.C.	Raleigh
GDP	1,558,518	411,969	115,262	471,584	71,574

Table 2: School Quality Ranking by State (Bernardo, 2016)

	New York	California	Texas	Washington D.C.	North Carolina
School Ranking	33	43	27	50	24

Table 3: Tech Jobs Per Capita (per 10,000 people) (Bort, 2013)

	New York	San Francisco	Austin	Washington D.C.	Raleigh
Tech Jobs per 10,000 people	50	500	150	150	500

The chart below provides a brief overview of how each of the proposed areas compares in regards to the four factors to consider for successful entry and sustainability. In the chart, each category has been color coded to indicate potential issues that may occur if creating an organization in the area. This chart will also serve as a quick indicator of which area has the resources that ensure success. Rankings in each area of interest are based on relevant factors that include but are not limited to GDP, concentrations of tech companies, growth and school ratings.

Table 4: Location Comparison by Feasibility Factors

	Tech Community	Funding Partners	School Partners	Competition
New York	Yellow	Green	Yellow	Red
San Francisco	Green	Green	Red	Red
Austin	Green	Yellow	Green	Green
Washington D.C.	Red	Yellow	Red	Green
Raleigh	Green	Yellow	Yellow	Green

New York City

Known to many as the city that never sleeps, New York has become synonymous with hard-working entrepreneurs working long hours to create products the world has never seen before. New York City is known world wide for its financial institutions. Wall Street in Downtown Manhattan is host to some of the world's largest banks such as Goldman Sachs, American Express and J.P. Morgan. It is no wonder that New York has is the holder of the largest GDP in the country with a staggering \$1.56 trillion (Bureau of Economic Analysis, 2015). It is important to consider that these financial institutions do not center on their engineering department but they do employ a large number of STEM careers.

At a first glance, it seems that New York City would not be the best place to consider in regards to establishing a learn-to-code organization for high school students since the per capita rating of technology jobs is so low. However, in a city of over 9 million people, New York has an estimated 265,000 jobs in the tech industry to choose from (Schill & Kotkin, 2015). New York has also been given the nickname "Silicon Alley" in recent years. This media-friendly name is referring to the large number of technology start-ups that have opened their doors in New York. Some of these companies include familiar brands such as Etsy, Tumblr, Foursquare, Gilt and KickStarter just to name a few.

The New York City school system is one that varies significantly in quality from school to school. New York's reputation as a financial powerhouse unfortunately does not apply to all of its citizens. New York is home to some of the best and the worst schools at times sharing the same building! However, even with all this disparity Bill DeBlasio, the mayor of New York City, has on several occasions publically announced his administration's support for bringing computer science education to every student.

New York City is home to a seemingly countless number of learn-to-code organizations in the for-profit and non-profit sector. Non-profits such as ScriptEd, TEALS, Camp Interactive are rapidly expanding in New York while small-scale for-profits are offering exclusive education access to New York's affluent community. New York City provides

all the right resources for a learn-to-code organization. However, with all the organizations already flourishing in the area it leaves one to question if now is the best time to introduce another competitor.

San Francisco

At the start of the century the technology industry was centered in the same place it has been since its birth in the 1950's. Silicon Valley also known as The Bay Area and home to the city of San Francisco has been deemed by many as the tech capital of the world. Until recently, if an entrepreneur intended to start their own tech company it would have been foolish to attempt starting it anywhere else except silicon valley. Even today there are many who might believe that this statement is still true. After all, the area is home to tech giants such as Apple, Google, Microsoft and Intel.

On the other hand, many would argue that there are plenty of places to establish a new technology company in America, just look at the growth the industry has seen nationwide. In either case, finding a funding source in San Francisco would cause fewer issues than in other metropolitan areas since the economy and history is almost completely centered in the tech industry. Non-profits will find that the large corporations can be seen as a source of funding and a source of volunteers to stay strong. While for-profits will find a plethora of venture capitalists in search of the next big investment. San Francisco has been seen as the center of the tech world for quite some time and will likely continue to attract young entrepreneurs for years to come.

The school system in California has been rated one of the worst in the country for several years (Bernardo, 2016). For years politicians have attempted radical new strategies for change such as implementing new charter schools, closing failing schools, linking teacher pay to student performance but those efforts have seen huge failures over the years. This failing school system has seen many struggles with poverty that other metropolitan areas like New York have seen in the past but where California differs is the lack of resources the state municipalities are willing to allocate towards education.

This lack of education could however create an opening for a learn-to-code organization. The disparity between large technology companies with deep pockets and school districts in need sounds like a combination that could be useful for a non-profit. However, the reputation of being the center of technology has already attracted organizations like Mission Bit, TEALS, Girls Who Code and much more. The competition and poor school infrastructure must not be overlooked when considering San Francisco as a place for a learn-to-code organization to establish themselves.

Austin

Austin, Texas has earned popularity in the technology industry as the home of the South-by-Southwest (SXSW) festival every March. The festival, which began in 1986 as a gathering for entertainment and media professionals has exploded into one of the largest gatherings of technology enthusiasts in the world. They have even expanded to hold an entire week focused on education. Many attribute SXSW as the sole contributor to the incredible tech industry growth in recent years. Whether SXSW caused the growth or simply feeds into it is unconfirmed but it has certainly played a significant role in placing Austin on the map.

The technology industry growth in Austin is astonishing when put to raw data. From 2004 to 2014 the industry grew 73.9% in Austin. It now sits in first place of the Metropolitan Tech-STEM Growth Index created by Praxis Strategy Group (Schill & Kotkin, 2015). With such a large level of growth, the government and the private industry in Austin consider computer science education to be in their best interest as they begin to consider a future workforce. In 2013, Texas became the first state to allow a programming language to take the place of a foreign language in a high school student's schedule (Adam & Mowers, 2013). This is an indicator of the commitment to computer science education in the area.

Even more surprising when taking all of this information into consideration is that Austin only has a small spotting of competition to speak of. TEALS and Girls Who Code have established partnerships with a total of six schools in the city, leaving another 124

schools in The Austin Independent School District without private Computer Science partnerships (Austin Independent School District, 2015). Austin's newly found identity and love for technology have taken off rapidly but the education has not yet caught up. (Austin Independent School District, 2015). Austin's newly found identity and love for technology has taken off rapidly but the education has not yet caught up.

Washington D.C.

As the nation's capital, Washington D.C. has not been known as an area synonymous with the private technology industry. Instead, it is home to politicians and government workers. However, in recent years, the area has somewhat become a niche market for entrepreneurs with ties to the federal government. The United States government is flawed and many young people are seeing this as a market for serious improvement. In a 2013 article from Entrepreneur magazine the author states "There are at least three accelerators within walking distance" emphasizing the several potential private funders that include iStrategyLabs, Opower and CoFoundersLab (Max, 2013). Washington D.C.'s highly educated population certainly allows for no shortage of private funding for new organizations.

If the plethora of private funding is not enough to start a new learn-to-code organization for high school kids then there is plenty of public money one could apply for. Birthplace of The CS4All act, there is no doubt that the Obama administration has set aside some of that \$4 billion for children for its own backyard. The governmental factor for change in Washington D.C. is an enormous opportunity waiting to be taken by someone.

In 2015, President Obama recruited countless young individuals from the tech industry in a plea for help to remove the notion of governmental work constantly being years behind the technology of the private industry (Gertner, 2015). In an inspirational victory, the white house and the many government agencies surrounding it are now home to talented software engineers working for the government. This administration has proven its consistent dedication to creating access to careers in technology. If a learn-to-code

organization acts quickly it might just be able to ride this hype cycle and find some quick funding.

Unfortunately, while Washington D.C. thrives in potential for funding and publicity it scores extremely poor in education and growth. Although it is true that certain hype has been built around being a software engineering for the federal government it is only fitting a niche market for engineers. Washington D.C. has seen over a 2% growth in the number of tech-related careers from 2012-2014 but will the momentum continue to build or will it fizzle out in the new administration (Schill & Kotkin, 2015)? Although this coupled with one of the worst school ratings in the country several years in a row might be enough to scare someone away perhaps Washington D.C. a blue ocean of uncharted waters for someone to service this newly discovered niche market.

Raleigh

Home of incredible tech related job growth(62.3%) and an integral part of The Research Triangle Raleigh, North Carolina shows promise as a launch site (Schill & Kotkin, 2015). With a population growth of 111% since 1990, the city takes pride in attracting people every day with countless job vacancies in tech positions with companies like IBM, Cisco, RedHat, and much more (City of Raleigh, 2015). Raleigh and the greater Research Triangle has proven its own dedication by ensuring technology has a home there for many years to come.

With a school system quality ranking of 24 out of 51 from WalletHub Raleigh finds itself to be the highest rated schooling system compared to all other cities in this study (Bernardo, 2016). This could mean success for a for-profit learn-to-code organization but it could make opening a non-profit problematic as most philanthropists are not as interested in donating to schools that are already seeing success. In either case, Raleigh scores fairly low on the ranking of national GDPs by city with \$71,574 million (Bureau of Economic Analysis, 2015). This could make finding funding for your organization a challenge in Raleigh.

As far as competition is concerned there are small coding summer camps that are few and far between which do not seem to offer much competition for for-profits and there does not seem to be any competition in the non-profit space anywhere in The Research Triangle. The Department of Education and Raleigh does not specifically require any technical course to its students for graduation but claims they are highly recommended for students (North Carolina DOE, 2015). Perhaps with the new CS4All act lawmakers in the state will start to realize the value in a sound computer science education and turn technical courses into a requirement for any high school student to graduate.

Location Strategy Summary

The five American cities above have been selected for their potential in providing adequate resources and interest as the site of the next learn-to-code organization. They each have a population, GDP, and community large enough to support an in-person model while also have shown interest in either becoming a part this movement or expanding their role. In Austin, one could see potential in the 73% growth of their tech industry in the last ten years. Or perhaps the fact that one in every twenty workers in Raleigh and San Francisco are in the tech industry entices an entrepreneur. Lastly, perhaps the wealth of investors in New York or Washington D.C. makes a good argument for entry. No matter which reason is considered during the launch of a new learn-code industry for high school students, each city provides its own enticing factors that hold promises of ensuring success.

However, after close observation and careful consideration, this thesis suggests that Austin Texas is capable of offering more options for success in both the non-profit and the for-profit space when compared to any other metropolitan area in the United States. Austin's impressive technology growth is tightly wound into the economy of the area. This is in turn creating a lot of interest in computer science education in grade schools in order to hold onto talent that is made right in Austin. There is no better place in America hungry for a learn-to-code organization than Austin, Texas.

Any concerns over the potential to struggle to find funding can be alleviated by general interest from the community. The decision by The Texas Department of Education to allow computer science to take the place of a foreign language in a student's schedule shows the interest from government officials (Adam & Mowers, 2013). Many of the Austin start-ups are growing into maturity which could allow a non-profit to seek to fund through corporate philanthropy. In the for-profit space, venture capitalists have been flocking to Austin for decades and anticipate the next big launch to come from SXSW every year. Austin, Texas is going to be home to the next learn-to-code organization for high school students. The only question is when will this launch occur?

ENTRY STRATEGY

No matter what industry you are in it is always important to create an in-depth plan of entry. Even after the decision to enter has been made careful steps must be taken to ensure a plan is in place that will create success for years to come. When is the right time to launch? How large should the organization be at launch? How should my product be marketed before, during and after launch? These questions and more must all be answered before any entrepreneur plans to launch a venture in a new market.

Timeframe For Entry

In order to enter the Austin market successfully, one must know the right time for entry. Enter too early and you might struggle with growing pains that will tarnish your brand's name. Enter too late and you might find someone else has beaten you to the market and is already talking to the customers or schools you would like to target. The learn-to-code industry is the new gold rush! There a plenty of places to look for opportunity while more and more competition is being added on every day. In order to see success in this gold rush, you must find yourself in a place with more than just opportunity around you. You must also have the right tools on hand.

When planning to begin any organization with children the first logical point to start is the school year. All of your students attend school from 8am-3pm from September to June and are for the most part seeking opportunities in the summer months. We all know this and because we all know this it seems logical to launch a summer camp in July or a school year program in September. Although the school year will have a huge influence on when one should launch an entrepreneur's first reaction can't be as simple as this.

In an interview with ScriptEd executive director Maurya Couvares in New York, she revealed that even though ScriptEd is a school year program this does not mean a September launch is a good plan, in fact it could mean a quick death for any organization (Couvares, 2016). ScriptEd's launch started with one class as a pilot site in December of 2012. The class consisted of less than 20 students and at the time, Ms. Couvares, her co-founder and the two ScriptEd volunteers were not receiving any compensation for their

time. Ms. Couvares was still working full-time as a pro-bono coordinator for a major law firm in New York, a role she held until the end of that school year. This pilot school site allowed for ScriptEd to build out its curriculum while discovering exactly where they want to fit in this industry. All of this learning could not have been conducted if financial risk were to be involved in the equation.

This example of ScriptEd shows a glimpse into potential struggles that could arise from starting any non-profit venture. As The National Council of Non-Profits details in a report, this initial start-up phase seems to be a commonality amongst countless social entrepreneurs who have embarked on their own successful adventure (National Council of Non-Profits, 2016). The start-up phase for any non-profit is likely to incur a large learning curve for legal, organizational and financial reasons. Therefore, it is important to not rely on financial reimbursement for your time at first. Non-profit entrepreneurs cannot be determined by financials; they must instead show interest in creating an organization that they feel passionate about.

On the for-profit side of entrepreneurialism, there is a large motivation to establish a summer camp model. A summer camp makes sense when creating a space for kids to learn and play. Parents are looking for an opportunity that not only provides their child with a safe space while they are at work they are also looking for a space in which their child will learn and grow in a model that is different from a traditional school. This is why so many for-profits in the industry find success as a summer camp; it provides a clear timeline and model for success.

When launching a summer camp a natural instinct is to launch your first cohort at the start of July. Although this thought would make logical sense when considering your business model one must also consider building proper infrastructure. The for-profit entrepreneur runs into the same issues the non-profit entrepreneur runs into when launching their organization. Before expecting to earn a profit you must be able to prove your model is successful.

Steve Krouse, co-founder of The Coding Space in New York City details the launch of his organization in a 2015 interview (Krouse, 2015). Krouse and his co-founder decided to launch in the middle of the school year with a small cohort of 12 students. Launching this cohort was not a get-rich-quick scheme for Krouse. This first cohort was to pilot materials put together by the organization in order to ensure they had a successful product for success. “We did not charge much for this first cohort, some students weren’t even charged at all” says Krouse, “This first cohort is what we used for marketing and selling our official launch in the summer of 2015.” The Coding Space provides an example of the success that could be followed for a for-profit searching to open its doors in Austin.

In considering the appropriate time to enter the Austin market one must act quickly. TEALS and Girls Who Code have a small presence currently but will undoubtedly grow in a short period of time. All the while adult learn-to-code boot camps like The Flatiron School and General Assembly entered Austin in the past couple of years. It is only a matter of time until the for-profits targeted for high school students start opening their doors and begin to attract the affluent technology enthusiasts in Austin. After taking these factors into consideration a timeline of entry for a non-profit and a for-profit learn-to-code organization in Austin are proposed.

Non-Profit Entry Timeline

In order to start a non-profit organization, significant work must be completed before convincing anyone that this is a serious venture. All new entrepreneurs of non-profits must apply for 501c3 status. A recent Huffington Post Business article claims that this is the first step in launching any non-profit since you cannot officially call yourself an organization without it (Pimentel, 2016). 501c3 status is not the only way a non-profit can establish its stake in the industry but it is however the same status most other organizations in the learn-to-code space hold. For these reasons and more applying for 501c3 status must be completed immediately.

While simultaneously filling out the forms needed for 501c3 status one must also be making a name for themselves. Introductions to schools will be important for any non-

profit starting off. It is important to start these introductions before the school year ends and contact is held at a stand still all summer. Schools must be sold on this concept even if they are not being asked for any financial contribution, which is another component that must be decided. These school introductions should be completed with at least three times as many schools than what is planned for the initial launch because partnering with a school that does not show significant interest will end in disaster. Building a school's excitement is important during this stage at all levels from principal to students.

After the initial groundwork has been laid it is time to start designing the tools for success for any organization. A powerful curriculum with content that is age and skill appropriate will be necessary. This curriculum must be designed with an eye for pedagogical teaching practices along with industry relevant technical skills. If the entrepreneur is not able to efficiently conduct both of these practices outside help will need to be brought in. This outside help could come in many forms. One may consider bringing a partner on board or perhaps a contractor. It is also likely that a community of volunteers will be a great resource for this process. The curriculum is the driving force behind any program. Without it there is no plan for teaching and students will not see success.

The volunteer effort is a cornerstone behind any non-profit. Volunteers can help design curriculum, make industry connections, teach a class and much more. Luckily in Austin, there are plenty of mediums in which volunteer recruitment can be conducted. Most notably being meet-up groups. Austin is host to countless technology oriented meet-ups every night that provides a grouping of professionals potentially in search of a great volunteering opportunity in the city they love. Pitching at meet-ups will be just one way in which this new organization will acquire volunteers.

The last step in this timeline for a non-profit is the official launch. In order to launch however, you will need funding. Funding is a process that takes place after one can ensure funders they are serious and have a plan for success. After a curriculum has been built, schools have been identified and volunteers have been recruited. The first plan for launch will be four schools. This will require one full-time staff member in order to

efficiently manage all sites. Funders will be pleased with the impact a launch with four schools will have.

Table 5 details the proposed launch in a monthly breakdown for an October 2016 launch. A timeline Gant chart for this launch can also be found in appendix 1.1 at the end of this thesis.

Table 5: Entry Timeline for Non-Profit Organization

Timeline	Action
May 2016	<ul style="list-style-type: none"> • Apply for 501c3 status • Introductions with potential school partners
June 2016 – August 2016	Curriculum development
August 2016	Pilot projects with small cohort
August 2016 – October 2016	Introductions with potential funders
September 2016	Volunteer recruitment
September 2016 – October 2016	Identify School Partners
October 2016	Launch program in four schools

For-Profit Entry Timeline

When considering how to enter the market as a for-profit organization there is not quite as much that needs to be done in the setup phase. Luckily establishing an LLC is often less time consuming and can be completed later in the start-up phase than gaining 501c3 status. The first stage for getting a new learn-to-code for-profit organization started is establishing a name and letting the world know whom you are.

Marketing in the early stages of a for-profit does not require a complete toolbox it only requires a plan. Initially, it is important to find a way to get parents to get to know you. This can be done through a partnership with schools that will let you pitch, word of mouth marketing and through digital means. Parents begin thinking about summer camps for their children as early as October. Finding your way into these early conversations

will be important to ensuring success. The promise of being considered for an early pilot group at a discounted rate can be even more enticing for eager parents.

Next, in the process will be creating a powerful curriculum. This may again require outside resources if the entrepreneur does not hold the technical and pedagogical skills necessary for meaningful coding experience. This can be very costly, especially when considering this organization is far from turning a profit at this point. Careful planning must be done to ensure a curriculum is created using the best resources possible and as the right price. When it comes time to start collecting money for the experience parents will want to make sure the curriculum taught will be of value to their child.

When the organization is officially launched in time for summer a cohort of 50 students can be brought on along with three teachers hired for the length of the summer camp. After considering the cost of space, laptops, salaries and food the margins are not high enough for a significant profit for the founder. During the pilot program, the founder will want to seek funding from investors who believe this company will grow for years. A small initial investment is all this organization will need but without it one will find themselves with an organization that might seem successful but is not enough to live on.

Starting a learn-to-code organization is no easy challenge. Even though Austin has very little competition the company will still be compared to larger organizations in different cities. For the price, one must pay to enter a camp like this they will expect the highly quality experience possible for their child. On page 36, table 6 details this proposed launch in a monthly breakdown for an official launch in June 2017. A timeline Gant chart for this launch can also be found in appendix 1.2 at the end of this thesis.

Table 6: Entry Timeline for For-Profit Organization

Timeline	Action
October 2016	Begin marketing for summer camp and pilot group
October 2016 – December 2016	Curriculum development
December 2016	Apply for LLC status
January 2017	Launch pilot program with 10-20 students
February 2017	Seek funding
May 2017	Hire three instructors
June 2017- August 2017	Launch program

Establishing Relationships

For any organization to become successful they must first establish a number of strong relationships within the community. Relationship building has already been noted in the form of school partners for non-profits but there is much more to relationship building than this. In order to win over the community in the city of Austin, an organization must first have an endorsement from a local figure. The product being sold in a learn-to-code organization is a learning experience. In order for someone to invest time and possibly money into an untested provider there must be some level of trust established first.

Influential figures within the city of Austin can have the power to make or break a new learn-to-code organization. If a new organization can receive the endorsement of a respected city official, educational icon or successful technology entrepreneur the opportunities for success can increase exponentially. This is an important early stage of development that cannot be ignored. Knowing that your organization is endorsed by a respected figure can be all some people need in order to sign on their child or institution.

Introductions

Acceptance from an influential figure can almost be a key to the City of Austin. The challenge is to be introduced to someone who would like to have a stake in the organization. Many non-profit organizations have successful technology entrepreneurs on

their board of directors that not only help find funding but also provide introductions to corporations and school leaders in the area. If a for-profit organization is in search of seeking investors they should begin by reaching out to influential members of the community who do not just offer financial support but also effective word of mouth. Positive word of mouth is key to this process.

An influential figure can also be brought in with less impact to the organization. This person does not need to be wealthy. They can be a well-respected teacher, engineer or parent. This person needs only to be someone who believes strongly in your mission and would be willing to spread the word about your arrival.

In Austin, a number of valuable relationships to make are endless. The opportunity to meet these influential individuals is equally as abundant. Any entrepreneur establishing a learn-to-code organization in Austin must share their plans with eager participants as often as they can. This is an organization that will be welcomed by the city. But one must not underestimate the amount of instant buy-in if the organization is backed by someone the citizens already knows and respects.

COST ANALYSIS

Now that a formal timeline has been created the final piece of the puzzle is creating a budget for launch that you and your funders are happy with. The cost of living is climbing higher every year in Austin, which leaves this organization needing plenty of start-up capital, or else it will surely fail. Once a budget is created the organization may then approach funders with their plan so they can conceptualize the impact of their donation or the quality of their investment. Finding the appropriate amount of funding can be time-consuming but it is the only way to get this venture kicked off the ground.

Non-Profit Start Up Costs

Luckily when considering the cost of starting a non-profit several resources are going to be provided or donated to the organization. For example, the school partners will provide all of the equipment and space needed to run the course. Public schools in Austin already carry the computers needed for adequate performance to run coding environments and since the students attending will be enrolled in the school it makes the most sense to host it there. The final and possibly most valuable resource given to a non-profit is labor. Volunteer time is valuable and will be treated as so.

This leaves the only costs left over to be hosting events, curriculum contracting (if necessary), marketing and operational expenses. Which leaves the largest expense in any new organization, salary. As it stands currently the plan is to launch four initial sites for this organization. This will allow for the only employee on staff to be the founder. If keeping to this model the total cost of launch for this organization will be \$82,000.

Now that a final price has been created for this organization funders can be approached that can come from private foundations, corporations or individual contributions. On page 39, table 7 highlights the cost breakdown of this program.

Table 7: Cost of Launch for Non-Profit Organization

Resource	Estimate cost
Computers	\$0
Space	\$0
Curriculum development	\$3,000
Marketing materials	\$1,500
Event cost	\$1,000
Misc. operational costs	\$1,500
Salary	\$75,000
Total Cost	\$82,000

For-Profit Start Up Costs

In considering the cost of launching a new for-profit organization it can be more complicated than a non-profit. Most notably, funding for this organization will come entirely out-of-pocket or from funders seeking a return on their investment. Resources like space and equipment that may have otherwise have been provided for free in a non-profit will create significant cost when considering an initial cohort of 50 students.

Two major costs that would be provided in the case of a non-profit but not in considering the start up of a for-profit are space and materials. If this organization will be required to purchase laptops for each student at a cost of \$200 per Chromebook this will set the organization back \$10,000. These devices will presumably last four years however. The organization may also decide students will have to bring their own devices. A quality that is not uncommon in the for-profit space. While there are a variety of places this organization can meet the YMCA in Austin can provide sufficient space with appropriate wifi capabilities for an hourly rate of \$40.00. Assuming an eight-week program this total cost will come to \$12,800 (TMCA of Austin, 2016).

The final two costs involved with launching this company will be daily lunch for the 50 students and salaries for employees. Assuming \$10 per student per day, food is the second largest cost to this organization. Hiring instructors to work only during summer

months can be accomplished without exerting many resources if recruiting college students from local Computer Science programs for roughly \$3,000 each instructor. Lastly, there is the final cost for a founder salary. Table 8 highlights the cost breakdown of this program.

Table 8: Cost of Launch for For-Profit Organization

Resource	Estimate cost
Computers	\$10,000
Space	\$12,800
Curriculum development	\$3,000
Marketing materials	\$2,500
Food	\$20,000
Misc. operational costs	\$2,000
Employee Salary	\$10,000
Founder Salary	\$75,000
Total Cost	\$135,300

For-Profit Returns

After considering the cost of launching a for-profit we must then consider what the expected return on investment will be. For a learn-to-code organization, there is only one simple formula that will attribute to returns during a launch and that is the cost of your program multiplied by the number of students served. The only matter left to solve is what should the initial cost of this program be?

In considering a reasonable cost of attendance for the first year of this program one must consider the cost of living in Austin along with the competitive rates of the other major players. As mentioned earlier, even though other major players are not present here and the new organization will be compared to organizations elsewhere in the country. With this taken into consideration, a reasonable cost of tuition for this program is to be set at \$2,500 per student.

The first cohort for the proposed organization will be 50 students. This results in total sales during the first year at \$125,000. When considering the cost to run this program is only about \$10,000 more than the expected returns during the first year it is easy to project growth and profits for the second year of this organization. This fact also opens the door for the potential for an entrepreneur to launch this organization without any outside funding. That is of course if they are able to accept a reduced salary in the early days of the organization. Opening a learn-to-code organization is unlike opening a new tech start up. Learn-to-code organizations follow a profitable model path that assumes much less risk than the average start-up.

Cost Analysis Summary

In mapping out the cost of launching a learn-to-code organization for high school students, it is clear that a small amount of capital must be raised when comparing to the start up cost of most new technology firms that often require millions of dollars. If the founder is pinching every penny possible by working from home and stretching resources to the best of their ability funding can come from very few resources which would allow for more time to complete work related organizational success and not fundraising. The founder cannot expect to live too comfortably in the first year of operation and will have to budget an appropriate salary for him/herself. Even though this needed capital sounds small to many it is still a six-figure number and cannot be ignored.

CONCLUSION

The research and findings in this thesis present an opportunity for fulfilling a need in an evolving industry. Computer science education in America is in its infancy, especially at the high school level. With only one in every four schools in America teaching computer science right now much must be done in order to make sure the United States does not fall behind the rest of the world. As the president admits himself “Large changes to our school system must be made” (Obama, 2016). The truth of the matter is without outside help from industry professionals the American education system will fall behind. It is the responsibility of entrepreneurs in the space to work with America’s youth to fill in the gap until the school system can catch up.

If followed properly and with clear intent one could use the findings in this thesis to open the next organization to address the lack of computer science being taught in American schools. This thesis addressed fundamental issues and provided conclusive evidence that one must consider before opening a non-profit or a for-profit in this space. This thesis provided next steps on the following points:

- How to assess and work with the current competition in the field.
- The metropolitan area in which an organization such as this would be ensured the most success possible
- Creating a budget that can provide an outline for the resources needed for a launch.

After completion of this thesis it has been proven that it would be in the best interest of an entrepreneur to open the next learn-to-code organization in Austin, Texas within a year from the time this report is published. Beginning any new venture is sure to endure many struggles. This thesis will serve as a guide that will ensure any issue along the way will be only a speed bump on the way to success.

BIBLIOGRAPHY

Adam, A., & Mowers, H. (2013, October 30). Should Coding be the "New Foreign Language" Requirement? *edutopia* .

Austin Independent School District. (2015, December 4). *AISD Fact Sheet*. Retrieved March 31, 2016, from Austin Independent School District: www.austinisd.org

Bernardo, R. (2016). *2015's States with the Best and Worst School Systems*. WalletHub.

Bort, J. (2013, June 16). These US Cities Can't Hire Tech Workers Fast Enough. *Business Insider* .

Bureau of Economic Analysis. (2015). *ECONOMIC GROWTH WIDESPREAD ACROSS METROPOLITAN AREAS IN 2014*. Washington D.C.: U.S. Department of Commerce.

Bureau of Labor Statistics. (2015, December 17). *Occupational Data*. Retrieved February 4, 2016, from Bureau of Labor Statistics: <http://www.bls.gov/ooh/computer-and-information-technology/home.htm>

Business Dictionary. (2016, February 4). Computer Science.

C/I. (2015). *About C/I*. Retrieved February 29, 2016, from C/I: weare.ci/about-ci/

City of Raleigh. (2015). *Raleigh Community Profile*. Raleigh: City of Raleigh Planning & Development, Long Range Planning Division. .

Code.org. (2015). *About Us*. Retrieved February 29, 2016, from Code.org: code.org/about

CodeHS. (2016). *Plans*. Retrieved March 2, 2016, from CodeHS:

<https://codehs.com/info/plans>

CodeHS. (2016). *Press Kit*. Retrieved April 6, 2016, from CodeHS:

<https://codehs.com/presskit>

Couvares, M. (2016, February 5). State of ScirptEd. (T. Bijesse, Interviewer)

Dredge, S. (2014, September 4). Coding at school: a parent's guide to England's new computing curriculum. *The guardian* .

Fenjves, D. (2016, February 1). Upperline Code . (T. Bijesse, Interviewer) New York, NY.

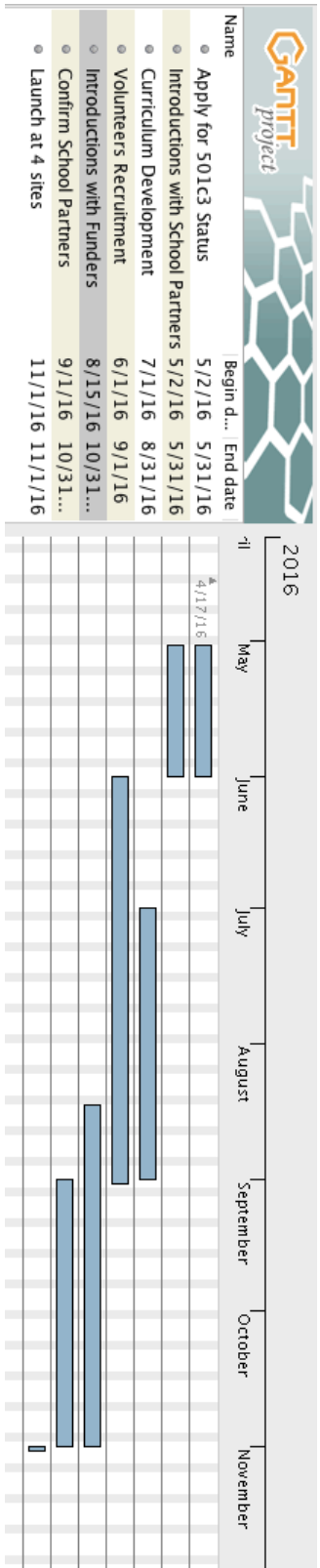
Gallup. (2015). *Images of Computer Science: Perceptions Among Students, Parents and Educators in the U.S.* Gallup.

Gertner, J. (2015, June 15). Inside Obama's Stealth Startup. *Fast Company* .

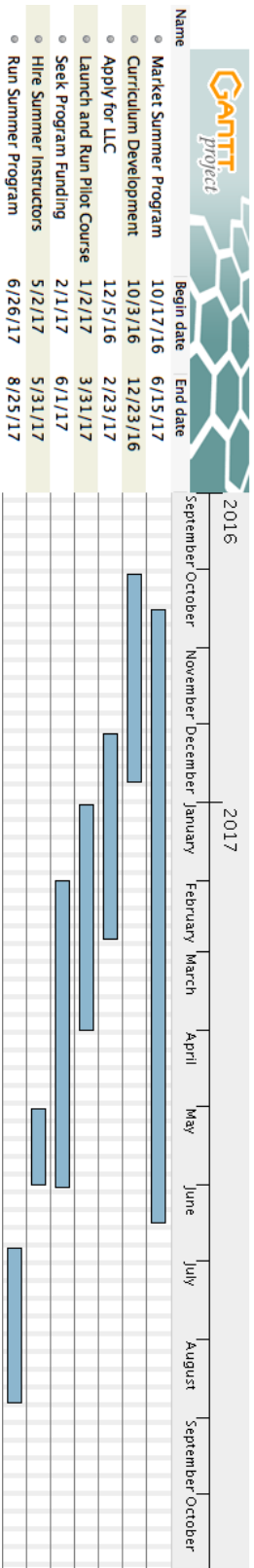
- Girls Who Code. (2016). *Home*. Retrieved March 2, 2016, from Girls Who Code: <http://girlswhocode.com>
- Globaloria. (2015). *Funding*. Retrieved March 2, 2016, from Globaloria: <http://globaloria.com/get-started/funding/>
- Granor, N. (2014, June 20). TEALS Overview. (B. Thomas, Interviewer)
- Hodges, A. (1997, January 1). *Who Invented the Computer*. Retrieved February 5, 2015, from Alan Turing, The Enigma: <http://www.turing.org.uk/scrapbook/computer.html>
- ID Tech. (2016). *ID Tech Next Steps*. Retrieved April 6, 2016, from ID Tech: <https://www.idtech.com/next/>
- ID Tech. (2015). *ID Tech: Camps, Academies & Online*. Retrieved March 2, 2016, from ID Tech: <http://www.idtech.com/>
- Krouse, S. (2015, December 3). Launching The Coding Space. (B. Thomas, Interviewer)
- Max, S. (2013, February 25). A Powerful City Finds Its Entrepreneurial Groove. *Entrepreneur* .
- Mission Bit. (2015). *Who We Are*. Retrieved February 29, 2016, from Mission Bit: <https://www.missionbit.com/about-us/>
- National Council of Non-Profits. (2016). *How to Start a Non-Profit*. Retrieved March 31, 2016, from The Council of Non-Profits: www.councilofnonprofits.org
- National Science Foundation . (2012). *Science and Engineering Indicators 2012*. Arlington, VA: National Center for Science and Engineering Statistics (NCSES) .
- North Carolina DOE. (2015). *Department Shools of North Carolina*. Raleigh: NC Department of Public Instruction.
- Obama, B. (2016). Giving Every Student an Opportunity to Learn Through Computer Science For All. *Weekly Address*. Washington D.C.: Office of the Press Secretary.
- O'Connell, T. (2016, February 23). C/I Expansion. (T. Bijesse, Interviewer)
- Partovi, H. (Writer), & Code.org (Director). (2013). *What Most Schools Don't Teach* [Motion Picture]. www.youtube.com/watch?v=nKIu9yen5nc.
- Pimentel, B. (2016, March 18). How to Start Your Own Nonprofit. *Huffington Post Business* .
- Rice, J., & Rosen, S. (1994). The Origins of Computing at Purdue University. West Lafayette, Indiana, United States of America.

- Saujani, R. (2016). *About*. Retrieved March 2, 2016, from Girls Who Code:
<http://girlswhocode.com/about-us/>
- Schill, M., & Kotkin, J. (2015, April 15). THE VALLEY AND THE UPSTARTS: THE CITIES CREATING THE MOST TECH JOBS. *New Geography* .
- Couvares, M. (Director). (2013). *ScriptEd Summer Internship Program* [Motion Picture].
- Stack Exchange . (2015, May 16). *Are there more open jobs than available developers?*
Retrieved February 4, 2016, from Stack Exchange Skeptics:
<http://skeptics.stackexchange.com/questions/27590/are-there-more-open-jobs-than-available-developers>
- TEALS. (2015). *About TEALS*. Retrieved February 29, 2016, from TEALSk12:
<https://www.tealsk12.org/about/>
- TMCA of Austin. (2016). *Room Rental Information*. Retrieved March 31, 2016, from Austin YMCA: austinyymca.org

Appendix 1.1: Entry Timeframe for a Non-Profit Organization



Appendix 1.2: Entry Timeframe for a For-Profit Organization



APPENDIX