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## Writing #1 – Anyshare Proposal Revised

Anyshare is seeking a grant to launch the mobile application and to locate hundreds of lockers in Washington, D.C. with the objective of encouraging people to share items with one another and thus reduce the excessive consumerism in the modern society. By creating a system of sharing any item with people nearby, Anyshare aims to minimize the needs of buying new items and to provide convenient, affordable services to consumers.

Anyshare is a mobile application that provides sharing or renting service of anything that fits into a locker. A list of acceptable items includes a drill, soccer ball, watch, gloves, or any sort of small items that are mostly being unused at homes. Here is how Anyshare works in simple steps: A landlord puts an item in one of Anyshare lockers located all around the city and updates the activity on Anyshare. Renters are then able to find the updated item on the geographical map inside the application. The app provides the location service which enables both landlords and renters to see the list of lockers and desired items closest from their location. Once a renter searches and reserves the item, the renter will receive a QR code to unlock the locker. After receiving the QR code, the renter goes to the designated locker, retrieves the item by using the code, uses it for however many hours one rented for, and returns it back. Renters are asked to add their credit card information to make payments before retrieving the items. The company then processes the payments and distributes the amount to the landlords. Landlords can 1) receive the payments or 2) collect ‘altruism’ points for being a good Samaritan if they decide to donate their items.

Although Anyshare seems to be easily implemented, few technical challenges may arise when implementing the application and there are solutions prepared. The two most frequent issues that can happen are perhaps when renters intentionally do not return the items or switch the items with different products. To ensure that users return the item, users are required to provide valid identification information as well as contact information when creating an account on Anyshare. One can become an active user once his/her identification is approved. Even if one intentionally misplaces an item, it can be tracked down with the information linked to the user’s account. Moreover, to prevent users from switching the items, a camera is installed within every locker to ensure that the returned item is the identical one. Using a complex machine learning algorithm, the camera recognizes the object and verifies its dimensions. If the machine detects any error when processing the recognition, it will send an error message automatically to the support team. Another potential problem that may occur is the malfunctioning of either cameras or locks. To maintain the quality of these technologies, the service team will patrol the lockers and report the qualitative status on a weekly basis. Although Anyshare may be faced with such technical challenges, the company would be ready to provide optimal and client-friendly solutions.

Anyshare promotes sharing within the society to encourage people to get into the habit of spending less and sharing more. As more people find value in material possessions, modern society faces a major issue in excessive consumerism. To meet the needs of consumers, the global production rate has increased over recent years and is now threatening both the global economy and environment. There is no better time to practice sustainability and take care of the planet. Anyshare is a step towards the minimalistic lifestyle for the benefit of each other and of the world. With that said, Anyshare is now seeking to expand the size and to make sharing a new lifestyle for the betterment of planetary health. Please give us a call at 202-898-9096 if you need any further information or have any questions about the proposal. We appreciate your interest and time.

Brian Morgan

10 October 2019

## Revised Writing 1: Anyshare Proposal

Whether it be infrastructure maintenance, EMS support, or Uber, services are essential for daily life. These services have one thing in common: they provide something that is needed by many. Many services today have an Internet connection, allowing unprecedented access. Anyshare aims to capitalize on this untapped potential by providing users with the products they need, with the added benefit of reducing consumerism. Using Anyshare, users can make their seldom-needed items available for rent by others. Similar to a bike-share docking station, Anyshare would be composed of a geographical array of small form factor lockers that house the items to be rented. Using the application, one can rent or make available for rent, an item of their choice. Once an item is selected, a map of available lockers containing the desired item in relatively close proximity will be displayed to the user. After selecting a locker, the user will receive a code to access the item in the locker. After the predetermined rental period, the user will return the item to the locker and be on their way. This process is Anyshare and it aims to upend consumeristic culture.

Even though this seems foolproof, there are some problems that may arise and we have devised remedies to solve them. One of these problems stems from the action of renting and returning. Suppose that upon return of an item, the user attempts to return a different item. Even though the nature of this service is to benefit others, we expect this may still happen. To remedy this, we have installed a camera within the locker, which uses a webcam alongside machine vision algorithms to ensure that the rented item is the item being returned. If an issue is detected, a message will be sent to the owner of the item, and the account of that user will be flagged. It may seem unnecessary to flag a user returning an incorrect item, but the security and confidence of all Anyshare users is of the utmost importance.

Another problem for the Anyshare application is a potential lack of items made available to rent. After all, a service claiming to rent items can't fulfill its claim if it has no items to rent. In an attempt to prevent this problem, Anyshare implements a system of 'altruism', a leaderboard where those with the most items available to rent are placed. As a result, this system aims to encourage users to rent more of their items by competing in a friendly competition between Anyshare users. Additionally, we found that this 'altruism' leaderboard could increase the number of daily users in tandem with the overall number of users. Having a higher number of active users differentiates Anyshare from other apps that are downloaded once, and then not used for another 6 months, like Uber. With the consideration of potential problems, we intend to portray Anyshare as a serious investment opportunity.

While Anyshare has been designed to cope with its self-made problems, the nature of the application also aims to solve another problem, consumerism. Many developed nations have a fascination with possession of material goods. Many people, typically located above or within middle-class, like to have their own things and never share, even if they don't need them all the time. This is the case with most household appliances, tools, sports equipment, etc. This excess desire for possession drives global production of these items. Manufacturing is a detriment to our environment, regardless of improvements over time. By using Anyshare, we can reduce the amount of production dedicated to these seldom-used products. Anyshare isn't just an application to save money by renting, or facilitate a competition of altruism, it is an application that can, and will, change the world.

Ahmet K. Yilmaz

9/30/2019

## Edit of Writing#1 Anyshare Proposal

Sharing economy is a relatively new concept; individuals easily rent or share their cars, homes, and personal time with other individuals. The hallmark examples of this new industry are Airbnb and Uber. Today's smartphone technology and Internet provide platforms connecting the owners and the seekers sharing/renting potentially anything. TIME Magazine calls the concept as "One of 10 Ideas that will Change the World." Like a lot of startups following this hot new global trend, we propose a startup that provides a platform to share/rent anything a person can possibly own. The shared item can be a hedge trimmer you use only a couple of times a year, or a specialized kitchen gadget you might want to rent out for 3-4 hours at a time. In this platform, the platform owners may receive a small fee for each transaction. While loaners specify the hourly fee for their items, renters may shop around and find the best bargain based on an hourly fee. The app will be called Anyshare.

The main benefit of such a platform is the convenience of the accessibility of a wide range of tools, gadgets, etc. Ownership of such vast resources would not only require a substantial monetary investment, but it will also create an uncomfortable clutter in our living spaces. The Census Bureau reports that in 2013, 28 million Americans moved their homes. With an excessive amount of clutter to carry around, each move becomes harder and more costly. With the help of this app, people's lives will improve as it reduces clutter and financial burden. Sharing not only helps renters save money, but it also creates a platform for loaners to earn money. With these incentives in mind, there are many people who would like to use the app to both loan and rent various tools/gadgets they own or need. Our app will also promote a healthy environment because people will not purchase items that they may need only a few times a year, which will lead to less consumption.

One of the problems with this platform is that it requires lockers for the items to be placed in and secured, which will increase the startup cost. Initially, we will be using our own assets as funding. We plan to start with a small region with only a hundred lockers. The business may grow gradually as we start making profits. Perhaps the biggest challenge will be theft or damage: A renter may get the item but may not return it at all, return it late, or return a different, cheaper item. One of the solutions for these issues is keeping track of each item with a QR tag. With a camera installed inside each locker, it will be possible to read the QR tag to confirm the return of the right item. Late returns or damaged items will result in additional fees associated with the transaction. To prevent the renter's access to the same locker after (s)he checks out the item, a new key sequence will be assigned to the locker after each transaction, preventing thefts to some degree. Since this sharing system can still be abused by loaners or renters, building trust among the participants is important. We will promote trust among the users of the app by allowing them to provide comments and rate their peers after each transaction.

Another problem the company may face is that, at any given time, there is no guarantee that enough items are made available by the loaners. To avoid this issue, we will keep small stock of rentable items of our own, which may grow in time. However, encouraging the loaners to loan their items is important for the company to be successful. Therefore, there will be a reward system in place: the loaner will earn reward points based on the number of items they loaned in a month and the number of transactions they closed. Based on the rewards earned, loaners can pay lower Anyshare commission fees.

With an easy to use app, conveniently placed lockers, and mechanisms put in place to create a trusted environment, this sharing media will improve our lives.

## **Comparison with similar projects**

While sharing of transportation means and real estate properties are prevalent in numerous countries, it is difficult to find an outstanding or distinct business that focuses primarily on sharing of small-sized daily necessities. Companies such as eBay, Amazon, or Craigslist provide reselling and trading services, but their main area is not on the rental service. In a nutshell, there is no easy way for people to freely borrow and lend unused tools/gadgets within the community. With Anyshare, people can now rent and lend various different items for a short period of time with a quick, easy way.

First and foremost, the biggest advantage that Anyshare owns over other sharing economy firms is the diversity of categories of shared products. Uber shares transits including cars and scooters. Airbnb shares real estate properties like houses, apartments, or pensions. Likewise, all other companies have their primary products or properties and each of them are restricted to a single category. Anyshare, on the other hand, allows users to share any product as long as the product is small enough to be stored in a locker. It can be a sporting good or a household good or a stationery good. Customers then do not have to look elsewhere to lend their items or find items they need. By offering a variety of categories of tools/gadgets to customers, Anyshare has greater impact on encouraging people to share goods on a daily basis than other firms with a single category of products have.

Another benefit of using Anyshare is that short-term rentals are available. Even though Amazon provides some rental service, textbook is their only predominant product and is only available to rent for relatively long terms like three months or six months terms. Receiving an item from a landlord can take about three days to a week depending on the shipping address. When returning the item, the renter needs to visit the post office to package the item nicely and ship it to the owner's address. Not only is the returning process at the post office is time consuming, but it can be highly costly depending on the shipping address. Contrarily, with Anyshare, customers can rent an item for a few hours or even less than an hour. After done using it, they simply need to walk to the closest locker and place it back to the locker. Users do not have to wait to obtain items or to return them. Anyshare is both time-effective and cost-effective compared to Amazon, one of the largest firms in the world.

Anyshare is an extraordinary firm that meets the consumers' needs by providing diverse categories of products and saving their time and money. The sharing economy is growing every year and is significantly impacting how people live in various ways. Just as Uber and AirBnb have suggested completely new ways of lifestyle in terms of transporting and staying, Anyshare will offer a whole new way of obtaining necessary tools in people's daily lives. With its diverse categories of products, its accessibility, and its option of renting for a short period of time, Anyshare will open up a bigger market for people to share items more actively, freely, and easily than ever before.

## **Target Audience**

People will use Anyshare app to share a tool/gadget on our platform either to loan or to rent. Loaners are the users who would like to make money by renting the tools/gadgets they own. Renters are the users who would like to save money by renting tools/gadgets they need rather than purchasing. As minimalism is becoming more important in our lives, due to the high cost of living and high rate of relocation, anyone who does not want to make a permanent commitment to a tool/gadget that will be used only a few times a year will find our app appealing. Some users will want to be both renters and loaners at the same time to make money with the tools/gadgets that they already have but they do not use often, and to save money on the tools/gadgets that they need. Our app will also be attractive to renters who would like to try out a product that they have never used before. As our app promotes utilization efficiency of the existing products and dampens consumerism, people who are concerned about environmental issues will want to use our app too.

The app will also fill a gap as an alternative to online shopping. When a person is in urgent need of a tool/gadget which is not available in a local store, ordering online will not be a viable option due to the time limitation. In some other cases, if the tool is too heavy and the seller does not cover the shipping cost, then the cost of the online purchase will increase dramatically. In such cases, Anyshare will look attractive to anyone as it is fast, convenient, and cheap.

Anyshare will be affordable to anyone who has a smartphone. The app itself will be free; users will not have to pay any fee to download it. However, for each transaction, loaners will have to pay a small commission fee, 2.5%, per transaction. The renters will use the app freely for their transactions. The Anyshare company will own the lockers. Therefore, the users will not have to pay any fee to access the lockers. As part of the reward system we will put in place, the Anyshare commission fee, which is a burden on the loaners, will reduce if (s)he completes more than a certain number of transactions per month or puts up more than a certain number of items for rent. The app will also utilize advertisements to increase its revenue, which will help further improve the affordability of our product as well as keep the fees lower. The price of the item will be set by the loaner when (s)he lists the item for rent. The app will not enforce an upper limit on the price. However, as the rental prices are expected to be less than the sale prices and our app will practice the free market economy, the competition among the loaners will help keep the prices lower than the sale prices.

15 years ago, nobody could have guessed that Uber or Airbnb would become essential parts of our daily lives. Today's smartphone technology and Internet provide platforms connecting the owners and the seekers sharing/renting potentially anything. As Anyshare is a smartphone app, it is very feasible to use. Our app will create a platform where renters and loaners who live in a reasonable proximity from each other can engage in a business transaction that is mutually beneficial to both parties. Because our app requires a locker to keep the product safe while it is waiting to be rented, and to be returned to after the rental period has expired, the physical location of the lockers will greatly affect the feasibility of our project. Therefore, we will place the lockers strategically so that people who live in the service area can easily access them. Like Amazon lockers at Whole Foods stores, we may place our lockers close to the big stores such as Walmart or Giant.

Another feasibility issue is a potential lack of items made available to rent. If there is nobody willing to loan anything, people who would like to rent will not be able to use the app. As a solution, the company will keep its own stock of rentable items, which may grow gradually. However, encouraging the loaners to loan their items is important for the company to be successful. Therefore, there will be a reward system in place: The loaner will earn reward points based on the number of items they put up for loan and the number of transactions they closed. When a loaner collects enough rewards, (s)he will start paying lower Anyshare commission fee.

The question we need to address at this point is if this is a promising business opportunity and what the business model is. The business model for our company is very simple. The main source of our revenue will be the per transaction Anyshare commission fee paid by the loaner. Each loaner specifies the daily or hourly fee of the item to be rented. When the transaction takes place, and the renter completes the payment, we will take out 2.5% of the earned amount before depositing the loaner's share. The renters will not be charged by the company for any of their transactions. As a method of payment, we will accept credit cards or PayPal. The business model will be profitable because it is easy to add new regions to the service area. With the running app and customer service infrastructure in place already, planting new set of lockers to the new region will be the only addition. With many potential loaners and many potential transactions, the revenue will be high even though the per transaction commission may be small. Even though the app will

be downloaded for free, and there will be no monthly fee, there will be a vast number of users accessing the app. With a high volume of users, there will be plenty of advertisement opportunities as well, which will contribute to our revenue.

Even though our project is motivated in part by building a community that encourages a reduction of consumerism and helps save our environment, it is not a social impact project aimed at foundations. At best, our project contributes to social good as a byproduct of financial rewards. However, our project is a good investment opportunity because it fills a gap in the current market, has unlimited growth potential, has an appeal that will attract a lot of users, and can offer versatile services. Initially, we will generate awareness in our target audience by running advertisements emphasizing the variety of tools/gadgets that can be rented or loaned, the money making and saving opportunities, chance to help the environment, and a clutter free lifestyle.

### **Social and Global Impact**

There are many applications available internationally which provide a service that a user needs but does not have. Some of these apps even attempt to solve broader societal needs, like global conservation. Uber is a great example of this, as it provides transportation to users that need it and contributes to decreased greenhouse gas emissions, especially when users carpool with Uber. Anyshare is similar to Uber and other services in that users on the platform can rent items they need but do not have while contributing to decreased consumerism, resulting in reduced greenhouse gas emissions from excess production.

While Uber aids in reducing greenhouse gas emissions, Anyshare aims to solve the problems materialistic culture creates. The impact of Anyshare on society is the decrease and minimization of these problems, consumerism and excess manufacturing of widely-needed items. Anyshare achieves this decrease in consumerism by facilitating loaning and renting of commonly-used items so users need not buy an item they will seldom use, but can rent it instead. By sharing commonly used items, like power tools, sports balls, etc., the wide use of Anyshare will inevitably lead to the reduction in manufacturing of these items. As a result, consumerism will decrease with excess manufacturing following suit. This decrease in manufacturing will ultimately lower the contribution to greenhouse gas emissions made by these manufacturers.

Similar to the vehicles used by Uber to provide their service that require emissions regulations, Anyshare, being a service, also requires regulation, albeit in varying degrees. Item size and proper item loaning are two potential issues that will require some sort of regulation. For example, a user loaning an item should not be able to rent an item larger than the size of the locker holding it. Thanks to the versatility of the Anyshare platform, this problem has a very simple solution. When renting with Anyshare, the interface contains attributes about the desired locker to store the item to be rented. With a simple addition of a “maximum size” attribute, Anyshare avoids this problem. In addition, Anyshare will provide alternate locations available based on the dimensions of the item to be rented. Secondly, immediate problems with Anyshare occur where a loaner loans an item different than the item they have advertised or a renter returns an incorrect item. For both cases, the interior of the locker contains a camera utilizing object-recognition software to attempt to alleviate this problem. A loaner will not be able to complete the loaning process with an item different than the item they listed for rent. Similarly, a renter will not be able to return an incorrect item without penalty, such as a charge for the cost of the original item. Overall, Anyshare attempts to solve these issues with slight regulation to ensure a great experience for all Anyshare users.

Along with the issues that occur with the fundamental concept of Anyshare, such as the dishonesty of renters and maleficence of loaners, there are potential global issues with this product. For example, in lower income countries, where Internet and phone access is limited, Anyshare would not have much use or benefit since manufacturing does not have as great an effect on the climate as in middle and above class regions. Additionally, in regions where consumerism is not as prevalent compared to many developed regions, Anyshare lockers would more often than not sit idle since consumerism does not have as much influence on the culture as it does in other, more developed countries. Anyshare seeks to solve some of the innate problems of the platform as well as tackle unexpected problems that may arise, such as international adoption. With the versatility of Anyshare, and the anticipated widespread use, consumerism will decrease, environmental costs of manufacturing will decrease, and the increase in global climate may be slowed.

### ***Technical Innovation***

The technologies that are involved in Anyshare project can be divided into two main sections: mobile application development and machine learning. Within machine learning are two subsections of technology: the locking mechanism and object recognition technology. By integrating these three separate mechanisms into one single project, Anyshare aims to provide an advanced, novel solution for the world to appreciate.

The first of these three segments of technology that goes into this project is mobile application development. Utilizing Java and Kotlin as the main developing languages, Anyshare has come up with a newly designed app that is easy for any first-time user to use. With a user-friendly interface, the renters can easily find the items they want by typing them on the search bar, and the locations of searched items will be displayed on a map inside the app. The map uses the geo-locations API that Google Maps platform provides. When a user clicks any locker from the map and makes a payment, a QR code will be generated and be specifically used to unlock the locker with the item. The mobile application enables the entire process of reserving items to be done with these simple steps. With this simplicity of Anyshare app, users will be able to explore the complex machine vision development and fully operate them on their hands.

Next is the locking mechanism. The locking mechanism requires the following products: Raspberry Pi 4, a webcam (Arducam), an August Smart Lock and their Wi-Fi bridge. The first step of this locking mechanism begins with reading a QR code. The webcam attached to the Raspberry Pi will read the QR code generated from the app when users retrieve items from the lockers. The Raspberry Pi will validate the code by communicating with the server. If the code is invalid, it will return an error message to the server and block invalid users from accessing the locker. If the code is valid, the Raspberry Pi will send a signal to the smart lock through the Wi-Fi bridge to unlock the lock. Once the loaner/renter retrieves the item, the system will lock the locker again until the renter returns the item. The system will repeat the same process upon returning the item. By allowing multiple different devices interacting with each other, Anyshare has developed its own technology of a new smart lock system.

Last but not least is the object recognition technology. Recognizing the object inside the locker is perhaps the most important technology for Anyshare project. The TensorFlow model, provided by Google with multiple useful libraries, is the main technology that handles the object recognition. This model enables recognizing default models of objects such as drills, yeti cups, etc. In addition to what this model can read, Anyshare implemented some custom additions to recognize other objects that are not part of those default models. Although Anyshare is utilizing the existing technology created by Google, with the

extra custom additions, Anyshare has taken this technology to the next level.

Anyshare has combined all of these technologies together and has come up with a whole new way of sharing items among people. No other firm provides such service that integrates these technologies together and broadens up the option of sharing items for customers. With the integration of mobile application and machine learning, people can now freely and effectively share items with one another and contribute their belongings to their neighbors, to society, and to the world.

### ***Technical Feasibility***

Many services available today like Uber and Airbnb, would not be available without the Internet and personal phone prevalence. The Internet and cell phones have expanded our abilities as a society to stay connected and get what we need, when and where we need it. In addition to the Internet and cell phones, technical resources available today, such as Tensorflow, purpose-built libraries, and app development software, are the foundation of the Anyshare platform. Without these resources, Anyshare would be both infeasible and impractical. However, if these resources are difficult to use or access, Anyshare may still be impractical, provide a subpar experience, and users may resort to brick and mortar stores. These resources can be separated into two categories: those responsible for the implementation of the locker and security measures, and those responsible for the application connecting the grid of Anyshare lockers available.

Many of the aforementioned resources are readily available and relatively easy to use, contributing to the feasibility of Anyshare. The resources responsible for the Anyshare locker implementation are Tensorflow, Raspberry Pi, and purpose-built libraries for QR code recognition and lock communication. Without these resources, the implementation of Anyshare would be more intensive, requiring separate teams for machine vision development (Tensorflow and QR codes), systems development (Raspberry Pi) and network engineers (lock communication). Since these resources are readily available and digestible, a 3-person team can certainly implement the Anyshare service. However, if these resources were not reliable, the feasibility of this platform would be questionable. Google engineers, a reliable source, constantly develop and maintain the Tensorflow software, proving it's viability. In addition to Google, other conglomerates of tech developers and enthusiasts develop and create the Raspberry Pi, lock and QR code recognition. In fact, Linux was derived from open-source development and is a trusted operating system used in millions of devices daily. Consequently, these resources are reliable and will make the implementation of the Anyshare platform a challenging, yet feasible, technical feat.

Even with the implementation of the Anyshare lockers using the resources previously mentioned, the platform would be meaningless without a server backend and user-facing interface to interact with the platform. Using the Internet, Android, and Android Studio, we developed this interface. This platform differentiates itself from brick and mortar stores in it's spatial locality. Whereas brick and mortar stores are often located farther than the next street block for many people, Anyshare lockers can be placed anywhere, even on the sidewalk. The far-reaching potential of the Anyshare platform is a product of the creation of mobile operating systems, specifically Android, in the case of Anyshare. In addition to these mobile operating systems, the accompanying development platforms, like Android Studio, enable easier and quicker development of these applications that would otherwise take longer without the available optimizations. The Anyshare platform depends on all of these resources to provide a user-facing rental experience that easily competes with brick and mortar stores. Anyshare has been proven to work by proxy of other successful, geolocation-based services, like Uber and Airbnb. As a result, Anyshare is entirely feasible and reliable.

### ***Cost, Risks, and Risk Mitigation***

Project development requires extensive planning, which includes cost management, risk management plans, and a timeline for important milestones. While cost-related planning helps the project to stay within the budget, risk management helps contain and mitigate the threats to the success of the



project. When the project started, we prepared a detailed plan for the entire project from start to finish. After its approval, the supervisors started monitoring the progress of the project via weekly meetings, which will continue throughout the lifetime of the project. These periodic checks will help to make sure the cost, risks, and timeline adhere to the plan.

During the cost management planning, we have identified the materials that each team member needs for developing his/her part of the project. The list included Nokia Android Nougat 8GB Smartphone, data plan, Raspberry Pi 4, a reference book for Raspberry Pi and Java, lock-style solenoid, 2 cameras for QR code recognition, 2 smart locks, August Connect WiFi Bridge, 2 webcams for interior object recognition, and 2 lockers. After the budget approval, the supervisors provided these purchased materials to the developers. The total cost for the hardware was \$300. Compared to the mentioned hardware cost, the software cost was minimal. The development software we need such as Android Studio and TensorFlow are available for free. However, at a later step of the project, we will have to get an API key from Google to access the Internet from the app. Google will use this key associated with our app to charge us based on the density of the traffic Anyshare will use. We expect to pay \$200 per month to Google for this service during the debugging phase. The code required for this app will be sizeable. We expect 500,000 lines of code. Both Airbnb and Uber apps have 750,000 lines of code approximately, and Anyshare is a comparable app to Uber and Airbnb. Since the developers are software engineers, there will not be any additional cost associated with the design, implementation, and testing phases of the project. Therefore, the total budget for the project will be lower than \$1000, and the supervisors will make sure the cost stays lower than this limit via weekly progress checks.

Identification and classification of technical risks is the second important part of the project. During the development phase, these become part of a plan that links each to a mitigation strategy. The project managers monitor the risk throughout the lifetime of the project, and initiate the implementation of the corresponding mitigating action. The main risks we have identified are lagging behind the timeline that was prepared at the initial phase of the planning. This plan includes several milestones. The first milestone is to finish the development of 3 independent components: front end development, QR code recognition, lock implementation. The deadline for this phase is December 2019. The next milestone is the integration of the front end, QR code recognition and lock implementation. The integrated system requires all 3 independently developed pieces to communicate: Once the locking mechanism begins with reading a QR code, the webcam attached to the Raspberry Pi will read the QR code generated from the app when users retrieve items from the lockers. The Raspberry Pi will validate the code by communicating with the server. If the code is valid, the Raspberry Pi will send a signal to the smart lock through the Wi-Fi bridge to unlock the lock. Once the loaner/renter retrieves the item, the system will lock the locker again until the renter returns the item. The system will repeat the same process upon returning the item. We expect this step to be the most complicated phase of the project and put pressure on the deadline set March 2019. Our risk mitigation strategy is to extend this deadline to April 2019. We will test the prototype after the integration for a month. The project prototype will be ready by May 2019.