Bump avoided
thanks to Macy's!

OK

BumpAlert!®   *by Mango LLC*

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Executive Summary

Customer Need
Mobile devices are drawing more and more attention from their users, and this trend does not seem to be going away. As a result, mobile users are attempting to multitask with their devices while commuting to and from class, work, or other social meetings. The attention that is needed to operate the device lowers the alertness level of the user and increases their risk of running into someone or something. Since mobile devices are going to continue to draw the attention of their users there needs to be a method for ensuring the users remain safe while commuting.

Target Market
The target market for *BumpAlert!* is college students who walk to and from class while attempting to perform actions on a mobile device. When students are multitasking they are less aware of their surroundings which increases the likelihood of a hazardous condition developing without the user knowing. College students are also more likely to try out new technology, and are familiar with the app stores in which the application would be distributed.

Product Solution
BumpAlert! is an application for mobile devices that runs in the background and can identify objects that are in the direct walking path of the user. *BumpAlert!* uses only the built-in sensors, such as microphone, speaker, and accelerometers, to perform its duties which does not alter the usability or feel of the device for the user. By providing warning of oncoming threats, the user is able to maintain focus on their mobile device with piece of mind knowing that something else is helping to monitor their safety.

Value Proposition
The value of *BumpAlert!* lies both in its utility as well as its novelty. Today's college students are increasingly mobile in their on campus activities, as well as in their jobs and internships. By allowing these students to perform tasks while walking, they will see value from BumpAlert! by their increased efficiency. The ability to capitalize on the time they spend walking from place to place to answer those emails, set up appointments, or review that important documents, will also give them more free time at the end of the day or week to be able to focus on their personal lives.

Market Factors
An external agent that may affect the demand for *BumpAlert!* includes future competition. Currently, BumpAlert! has no other competitive products in this space. The lack of competition will allow Mango LLC to acquire the majority market share early after the release of BumpAlert!. Also, the possibility for imitation and replacement will be resisted by the intellectual property that will be secured by Mango LLC. With that being said, there are always companies looking to generate a profit off of other company's ideas, and any competitors must be monitored closely.

Market Entry
In order to properly address the projected market need, a three phase plan is proposed to effectively and efficiently introduce *BumpAlert!* to the market. Phase 1 would be a beta release that needs to take place to verify the app's performance and receive feedback from users on that app's features. The second phase would initiate the full release of *BumpAlert!* to the previously discussed target market of college students in the United States. The third phase

would be to refocus the marketing strategy away from college students and move into another demographic, such as urbanites throughout the U.S.'s largest cities to continue to increase the user base and Mango LLC's revenue stream.

Capital Plans and Needs
The revenue model for this product included four years of projections which include the final development stages of the app through distribution to two user demographics. The model projections show that the business will require $60,000 in startup capital, but will generate a profit of nearly 367,000 USD at the end of the four year projection period. The start up capital would be acquired through the addition of another equity holder aside from the founders, who would be given 10% equity in the company in exchange for the capital.

1. Opportunity

It is undeniable the overwhelming amount of people walking around with their heads down, texting friends and coworkers, checking e-mail, searching to satisfy curiosity, scheduling meetings, perusing websites, performing financial transactions…the list is endless! These distracted pedestrians are at risk to each other and society at large. Ask yourself if you have ever been the victim (or perpetrator!) of texting while walking.

While the health risk of collision may not be taken as seriously by some as by others, the risk of pure embarrassment or confrontation when walking into a fellow pedestrian, garbage can, or brick wall may strike a chord. There is a real, palpable, frustration with people texting and walking. [1] There is a huge gap that should be filled in the mobile application space which remedies this need: the need for confidence and peace of mind while walking from place to place while staying productive.

With sufficient amount of technical prowess and deep understanding of the potential customer base, an application can and should be developed which is a subtle but an effective and profitable solution to this need, the empowerment to continue using a mobile device without the fear or anticipation of collision or mishap. The following sections detail the traits of the founding members of Mango LLC and assess the outlook of market factors to prove the potential for success in producing a mobile application to solve this problem.

1.1. PEST

A PEST analysis was conducted in order to understand the political, economic, socio-cultural, and technological factors that may affect the ability for Mango LLC to thrive in developing, distributing, and supporting *BumpAlert!*.

1.1.1. Political

Mango LLC has little worry with respect to political regulation or political opinions. Tax law and governmental safety regulation were identified as the greatest possible implications. A pertinent example is the YouTube advertising system. Once an account holder receives more than $600 in one year from advertising revenue, Google issues them a 1099 form. [2] Should advertising be incorporated into the revenue generating scheme of *BumpAlert!*, Mango LLC will surely need to track this income for proper payment of taxes. Awareness of this taxation will help prevent the possibility of IRS penalty and leans on assets. Government concerns of safety, particularly as they pertain to mobile applications are most developed with respect to medical aids. Mango LLC would only be concerned with this in the event that the market segment is expanded from college students and urbanites to those that are visually impaired. Appendix C of the FDA's Mobile Medical Applications document contains a comprehensive list of examples of mobile

applications which are the focus of the FDA's regulatory oversight. [3] Table 1 shows the only regulations that may be remotely applicable to Mango LLCs mobile application technology, taken directly from the document cited above.

Table 1: Excerpts of Possible Health Regulation Implications

Examples of Mobile Apps that are the focus of FDA's regulatory oversight
1. Mobile apps that use tools within the mobile platform (e.g., speaker) to produce controlled levels of test tones and signals intended for use in conducting diagnostic hearing evaluations and assisting in the diagnosis of possible otologic disorders (i.e., an audiometer). Possible product code: EWO (21 CFR 874.1050).
2. Mobile apps that use a microphone or speaker within a mobile platform to serve as a audiometer to allow healthcare providers to determine hearing loss at different frequencies. Possible product code: EWO (21 CFR 874.1050)

1.1.2. Economic

Numerous searches on the preeminent application marketplaces, namely the Google Play Marketplace and the App Store turned up no applications which provide the same or similar services as *BumpAlert!*. This is a positive truth for Mango LLC in that the majority of the market share can be captured early in the release of *BumpAlert!* without cause for competition. Judging by the beta factor of 1.34 (associated with the most closely related industry, Internet Software Development), Mango LLC could be somewhat affected by macro-economic recession. If an ad-based revenue model is chosen, a lower beta value could be assumed as advertising has a beta value of 1.08. [4] This lower beta value, coupled with the pervasiveness of mobile device ownership and wireless data plan subscriptions, shows that consistent revenue is expected with this model.

1.1.3. Socio-cultural

The social tendency of the target segment will play to our advantage. Society will benefit as a whole, as this product can help counteract the growing number of accidents due to mobile device usage while walking, which has grown tenfold from 2005 to 2010. [5] Once the segment has been seeded by the downloaded app by first adopters, the distribution will be primarily through word-of-mouth referral. What little promotion of the application that is necessary will feature the thought that society is gaining value on the whole and will be widely accepted by users and non-users alike.

1.1.4. Technological

The proprietary technology of *BumpAlert!* will be hard to replicate by the average application developer. Should imitation or duplication be attempted, Mango LLCs intellectual property licenses will help diffuse those who try to market apps with the same capability using the same methods. Because *BumpAlert!* runs in the background, the churn rate of customers is expected to be low. (Churn rate is defined as the percentage of subscribers to a service that discontinue their subscription to that service in a given period of time.) Churn will only manifest in users actively shutting off the applications services in the back panel. Once the users have had their first experience, they will continue to receive added value to their daily commutes.

1.2. SWOT

A SWOT analysis was performed in order for Mango LLC to become more self-aware of the factors, both internal to the group and external, that will be relevant to the success and growth

of *BumpAlert!* as a product. Mango LLC is an eclectic group of individuals with complementary tasks which proves the capability to develop a product and a business.

The group's intrinsic skills include application development and acoustics engineering backgrounds and prior experience of managing capital funds for engineering projects. The founding members of Mango LLC are also part of the target demographic. This means that not only does the group have the capability to relate to the target segment, but the members have the best ability to understand feedback or trends in the demographic that may affect the release, distribution, maintenance and evolution of *BumpAlert!*. Finally, Mango LLC is capable of securing the intellectual rights to the invention at the core of the product. This will help thwart imitation and/or coping of the app.

Shortcomings of the group include lack of initial capital possessed by the founders, lack of experience in legal documentation and dealings as they pertain to business startup, development, and operation. Also, none of the founding members have connections in advertising. A salaried employee may be needed with a background in solicitation of companies who would be interested in their ads appearing on *BumpAlerts!*'s platform.

The market opportunities are shown by the clear lack of a pedestrian collision avoidance solution. Because the cause stems from the mobile device with which the user allows themselves to be distracted, the best solution is to send a notification of an oncoming collision directly to their attentive space. Other positive truths external to the group are that no reasonable solution currently exists, there is a large segment of potential users, and there is little if any government policy that restricts the sale and usage of such an app (see Table 1).

Finally, external threats to the success of Mango LLC include possible duplication or imitation of the product. While there is a definite possibility for other cunning app developers to copy this concept, *BumpAlerts!*'s proprietary echolocation algorithms are state-of-the-art and would take quite an effort to sufficiently emulate. One last concern is the willingness of individuals to accept the idea to trust a mobile app to watch out for them as they walk with their heads down. Mango LLC feels that offering a free download will increase the value perceived by the customer greatly enough to help them overcome this initial fear. Once a group of early adopters spreads the word of its subtle yet effective usage, public trust in the concept will become stronger. There is always a possibility of lawsuit from disgruntled customers, but proper terms of usage and conditions should be displayed and confirmed by the user upon download and installation.

Table 2: SWOT Table for Mango LLC: Internal and External Influences on Success of *BumpAlert!*

	Helpful	Harmful
Organizational Attributes	**Strengths** Application Development Acoustics Engineering Funds Management Members of the Target Demographic Intellectual Property	**Weaknesses** Little initial capital Inexperienced in legal dealings No connections in advertising
Attributes of the Environment	**Opportunities** True Need for Pedestrian Collision Avoidance No Competitors Currently in this Space Large segment of potential users Little governmental restriction	**Threats** Possible attempts at imitation Lack of initial customer trust that product will work Possible lawsuit from disgruntled customers

2. Technology

The proposed solution is a software-based system called *BumpAlert!*, which integrates built-in sensors on any common mobile device, including tablets, to detect objects ahead of the user. Once an object is detected within the user's walking trajectory, an alert will pop up in the form of a badge or banner to remind them to avoid dangerous bumps into others or collision with inanimate objects. The details of this technology and its current performance are introduced in the following sections.

2.1. System Overview

Figure 1 below shows the system overview of *BumpAlert!*. When the mobile application is actively running on the mobile device as a background process, the device's speaker continuously plays an inaudible sound at 20 to 24 kHz. The reflection of this sound from the environment is then picked up by the mobile device's microphone. By analyzing the reflected signal using sonar algorithms, the distance to the nearby objects can be estimated. In the meantime, both the walking direction and speed of the user is monitored by the phone's gyroscopes and accelerometer. By considering all of this information in concert, *BumpAlert!* can make a determination as whether to warn the user of imminent collision, regardless of the user's current trajectory.
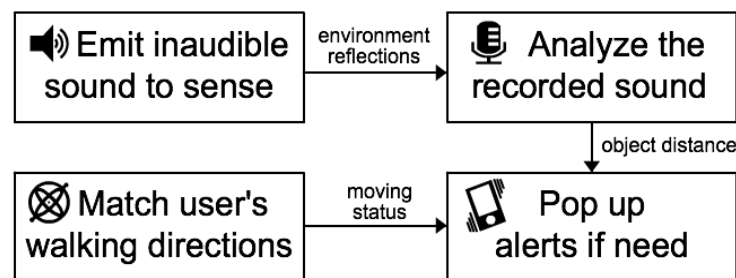
Figure 1: *BumpAlert!* System Flow Diagram

2.2. Prototype
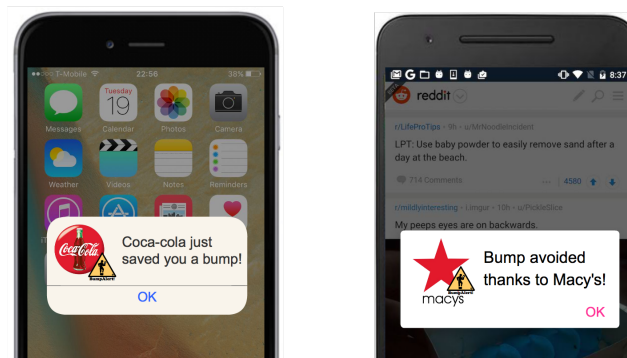
Figure 2: Demonstration of BumpAlert! Alerts featuring Advertisements

The latest prototype of BumpAlert! is showcased in Figure 2 above. The current prototype has been proven on two different platforms, namely Android and iOS. When objects ahead of a user are sufficiently close, the user is notified of possible collision. The alert view can also showcase an advertisement from a company sponsor of *BumpAlert!*.

2.3. Performance Analysis

Figure 3 shows the trial detection measurements of the current prototype of *BumpAlert!*. The TP (true positive) value indicates the probability to detect the target object and the FP (false positive) indicates the false alarm rate. As shown in this figure, the current prototype can handle varying objects (e.g., large and small) and different scenarios (e.g., indoor and outdoor environments). Based on the feedback of the testing participants, the detection range has been set to about 6 feet in distance and the detection function is temporary disabled when the user is located in a cluttered environment to avoid continuously showing the alert.
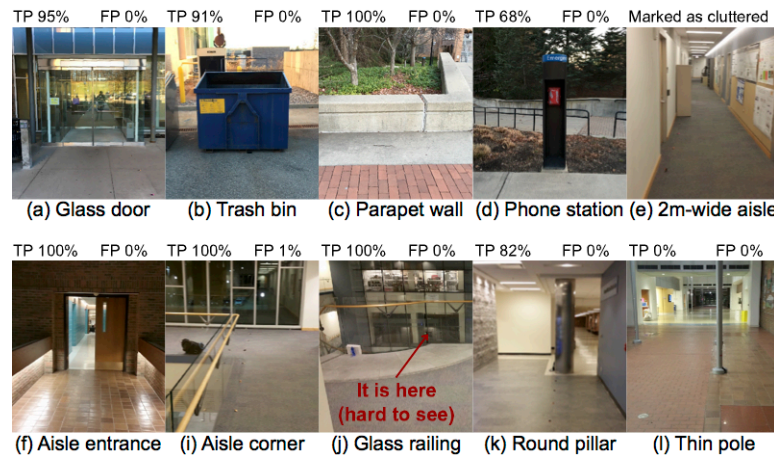
Figure 3: Scenarios for Performance Analysis

The energy consumption of *BumpAlert!* is 300 to 400 mW. Table 3 shows the energy consumption measured on the Galaxy Note 4 in different scenarios. As suggested by this table, when users are walking and surfing the internet, the overhead of running *BumpAlert!* is about 15%. Based on our estimation, this overhead may reduce the battery life of surfing the internet from 6 to a little over 5 hours. By considering that the usual length of an individual's travel on foot is less than 1 hour per day, this overhead is considered acceptable for the vast majority of users.

Table 3: Power consumption in milliWatts for the Galaxy Note 4

Setting	Idle	Backlight on	BumpAlert! (w/ backlight)	Website	Game
Power [mW]	33	856	1160	2564	3692

Table 4: Battery Life Reduction for Various Devices in Hours

Device	Rated Browsing Endurance [hours]	Rated Browsing with BumpAlert! [hours]
Galaxy Note 4	5.9	5.0
iPhone 6s	5.5	4.7
iPhone 6s Plus	6.6	5.6

3. Business Model

As mentioned earlier, the opportunity is to provide a product that helps users to avoid bumping into other pedestrians or obstacles when they are walking and using their mobile device. The proposed product is a software-based app that utilizes only the built-in sensors of mobile devices, so that it may be easily developed and distributed.

3.1. Monetization Plan

The product will be monetized based on ad revenue. The advertisement will be displayed on the alert view which is also alerts the user of an upcoming hazard. Because the advertisement is played when users are focusing on their phone, it is expected to have high value for selling the advertisement compared to the normal app ads that are only shown on the bottom of applications. Moreover, it is also plausible to show the advertisement based on the user's location, such as showing an ad for a nearby business or convenience store. The details of our market analysis and profit estimation are presented in the latter sections.

3.1.1. Value Proposition

Since the product is software-based solution, the cost (C) to deliver products is extremely low, which gives the room of the business to make profit. The value (V) of the proposed product is self-evident. Once users successfully avoid a single bump based on the product, the value is higher than using nothing and bumping into the obstacles. We set the price (P) for our app to 0 and monetize the business mainly based on revenue from advertisements. This market strategy helps to increase people's wellness to use the product and penetrate the market. In summary, the proposed product is believed to meet the business criteria: C < P < V, and make a reasonably high profit.

3.1.2. Intellectual Property

Each individual component of the system, such as estimating the distance to nearby objects, is unable to be patented, since those are based on known sonar technology. However, the technique used to integrate all components within the mobile device is patentable. For example, it needs non-trivial computation to identify the direction of objects because the microphone and speaker are omni-directional. The patent of *BumpAlert!* has been filled and it is expected to help thwart attempts of imitation.

3.2. Startup

The first step of this business is to develop the product and adjust the development strategy based on the users' feedback. For example, the detection sensibility and range need to be tuned based on the users' need. The initial release will only be featured in English, since the target customers are major cities in the US and European countries. During the beta release, the product manager will start looking for the cooperation agreement with advertisement companies, such as Google, or other major companies who are willing to support this business in exchange for ad space, such as Coca-Cola. Later on, once the app has been released to public, the Financial Manager of the business will start to analyze the selling and market responses so the next steps of the business approach can be determined.

3.3. Roles & Responsibilities

The following professional descriptions of each position show the well-rounded nature of this start-up company. At the start of this enterprise, roles and responsibilities were thoroughly discussed as to keep all aspects and concerns of the business consistently under control.

3.3.1. Product Manager

The responsibilities of the product manager are to ensure that the customer needs are being met whilst managing their expectations. The product manager also sees to the product having the best possible perception by the market segment and the public in general. Brandon has conducted analyses in which the application's operation, look and feel have been best defined in the eyes of the customer and properly communicated to the product engineer.

3.3.2. Product Engineer

The roles of product engineer are to design a product that functions smoothly and reliably whilst maintaining a modular coding framework such that the application can be easily debugged, updated, and upgraded with little interference perceived by the customer. Yu-Chih has achieved this through the use of a multi-platform source language. He has and will continue to develop and maintain the back panel development as well as user interface functionality.

3.3.3. Financial Manager

The responsibility of the financial manager is to project the flow of revenue needed to maintain operations as well as to meet the profit goals laid out to satisfy the investors. Jaymes keeps a diligent eye on the monies going in and out and keeps the project members aware of shifts needed in software licenses for development, capital investment and income. He is willing and most capable of keeping the project financially in check.

4. Market Analysis

Every great product needs to have a target market to focus their branding and distribution to in order to ensure that their product will be utilized and their business will grow. *BumpAlert!* is no exception. The primary purpose of *BumpAlert!* is to allow users to focus on their mobile devices while walking in dynamic environments. This allows the users to devote more of their mental capacity to the activity they are performing on the go with a reduced fear of running into other people or objects.

4.1. Market Research

The user who would be most likely to require this type of assistance would be individuals who just can't seem to put their mobile devices down. Today's **college students** have grown up in a world where they are constantly on the go, and they take their mobile devices with them. These individuals have the desire to be remotely connected to their offices, social networks, and families, and they do not want their current activity or location to limit their exposure to these facets of their lives. Using mobile devices while walking across campus or from classroom to classroom has even driven Utah Valley University to implement a "texting lane" in one of their stairwells [6]. This shows that college students are extremely attached to their mobile devices, and reinforces the need for them to be able to interact with their mobile device safely. For these reasons, Mango LLC will initially target college students in the United States as the primary users of *BumpAlert!*.

However, the trend of constantly being connected to a mobile device is not exclusive to today's college students. Virtually connecting to the office is becoming more and more popular every year. According to the Society for Human Resource Management (SHRM), 46 percent of organizations polled in 2012 contain some form of a virtual team [7]. This trend of using virtual teams is also growing rapidly. The Nemertes Research Group estimates that there has been an 800 percent increase in the number of virtual workers from 2008 to 2013 [8]. This behavior also seems to be one that is here to stay; a recent Gallup poll shows that 79% of employees felt that being able to connect to their work outside of the office is a positive development in their workplace [9]. This strong connection to work from outside of the office environment requires a need to focus on a mobile device safely while commuting to and from the office.

The method and quantification of the target market for *BumpAlert!* users is listed in detail in section 5.2 of this report.

4.2. Market Survey

A market survey was conducted in order to gauge the preferences of the target segment of *BumpAlert!*. After participants were introduced to the product's concept (a mobile app for safer and more productive walking-and-tasking), inquires as to four major aspects of the product were made. The participants were asked to indicate their preference of the following categories: willingness-to-pay, notification type, notification timing, and detection sensitivity. The resulting data of this survey can be viewed in the appendix.

4.2.1. Willingness-to-Pay

What the participants would be willing to pay for such an application if it were made available in a typical app marketplace such as the App Store or the Google Play Marketplace. Participants were shown the following discrete price points as choices: $0.00, $0.50, $1.00, $1.50, $2.00, $2.50.

4.2.2. Notification Type

How the participants would most want the bump notification to be delivered to them. They were given four choices: tone, banner, badge or vibration.

4.2.3. Notification Timing

How much distance the participant would be comfortable having between them and a detected object before receiving the alert. Three choices were presented: 6ft, 12ft, and 18ft.

4.2.4. Detection Sensitivity

The sensitivity of the detection system is defined as a minimum threshold, i.e. how large an object must be to trigger an alert. Participants were given three choices to choose from: large, medium, or small.

4.3. Market Survey Results

The average willingness-to-pay for all participant was found to be about $0.88. This is slightly lower than the typical price point of the majority of applications in the current marketplaces, which are not offered for free. This shows the potential to generate revenue from direct sales to the customers through the app stores. If the app were to be priced at one dollar, it would be possible to gain the majority of the market segment. The discrete percentages of the survey participants are shown in Figure 4. 70% of all participants indicated that they were willing to pay $0.50 or $1.00, substantiating the potential for a direct sales model.
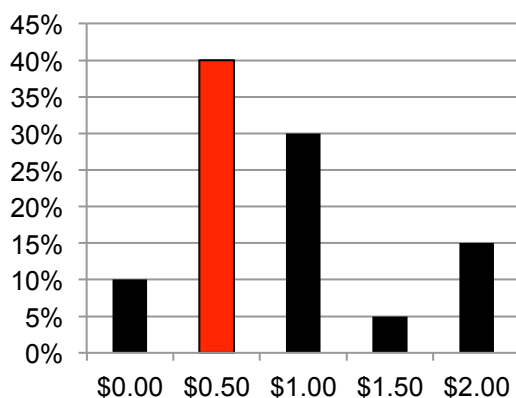

**Figure 4: Percentages of Participants'
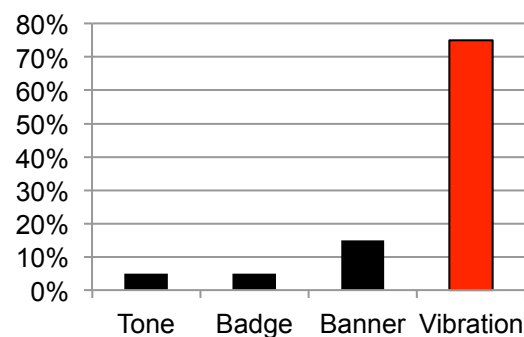Willingness to Pay**

**Figure 5: Percentages of Participants' Preferred
Notification Type**

Overwhelmingly, survey participants indicated vibration as the preferred notification type. This makes sense intuitively as it is the least intrusive to the users screen space and generally most potent type of notification. Banner notifications were second most popular following by a tie for last between badge and tone notifications. In consideration of the distribution model and definition of product features, Mango LLC could leverage the popularity of the vibration and banner notification types to use a freemium model in which the core product is given away for free and a premium version of the product can be sold to a small group of the target segment for a premium. [10] The premium version would manifest in a separate download or update for $1. The free version would not have the more popular notification types, however if the customer were willing to upgrade for the $1, they would unlock them. When asked as to the timing of the alert for oncoming objects, survey participant indicated that six feet in distance would be sufficient for them to react and avoid collision (as shown in Figure 6). According to Wolchover, this indication lies somewhere between the limit of personal space and social space for the average individual. [11] While this may make intuitive sense, this high level of confidence in the survey participants may not offer enough actual reaction time. After the team considered this, it seemed necessary to add a back panel to the application after data is gathered from a beta release. This way the user may be able to dial in their own level of comfort as to how much time they have to react based on the detection mechanisms threshold distance.
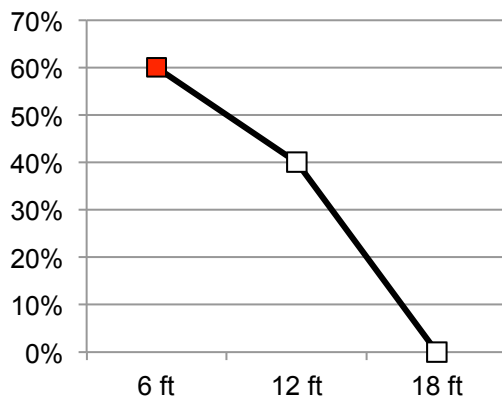
Figure 6: Percentages of Participants' Preferred Notification Distance
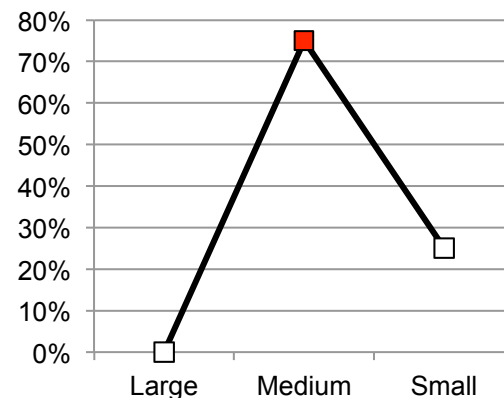
Figure 7: Percentages of Participants' Preferred *BumpAlert!* Sensitivity

A somewhat subjective question was posed on the survey participants: how large must the approaching objects be in order to trigger an alert. A large majority of the participants (over 70%) indicated medium size objects would be sufficient, as shown in Figure 7. The assumption is made that anything bigger than a standard step or curb shall trigger *BumpAlert!* to warn the user of a possible collision. Because mobile device users are less likely to acknowledge other people, walk more slowly, and change directions more often, any notification sensitivity less than medium would be irresponsible to distribute. [12]

4.4. Conjoint Analysis

A conjoint analysis was performed in order to better see what the market survey indicates as to the form of the product when released. Reference partworths were assigned to a single type of each attribute and partworths for all other types of each attribute were generated based on the results of the market survey. Types of each of the attributes which were assigned zero partworths are shown in Table 5 below. They are also signified by a black plot point in the figures.

4.4.1. Partworths

Table 5: Attribute Type which were Assigned 0 Partworths as Reference

Attribute	Type
Price	$1.00
Notification Type	Vibration
Alert Timing	12 ft
Detection Sensitivity	Large
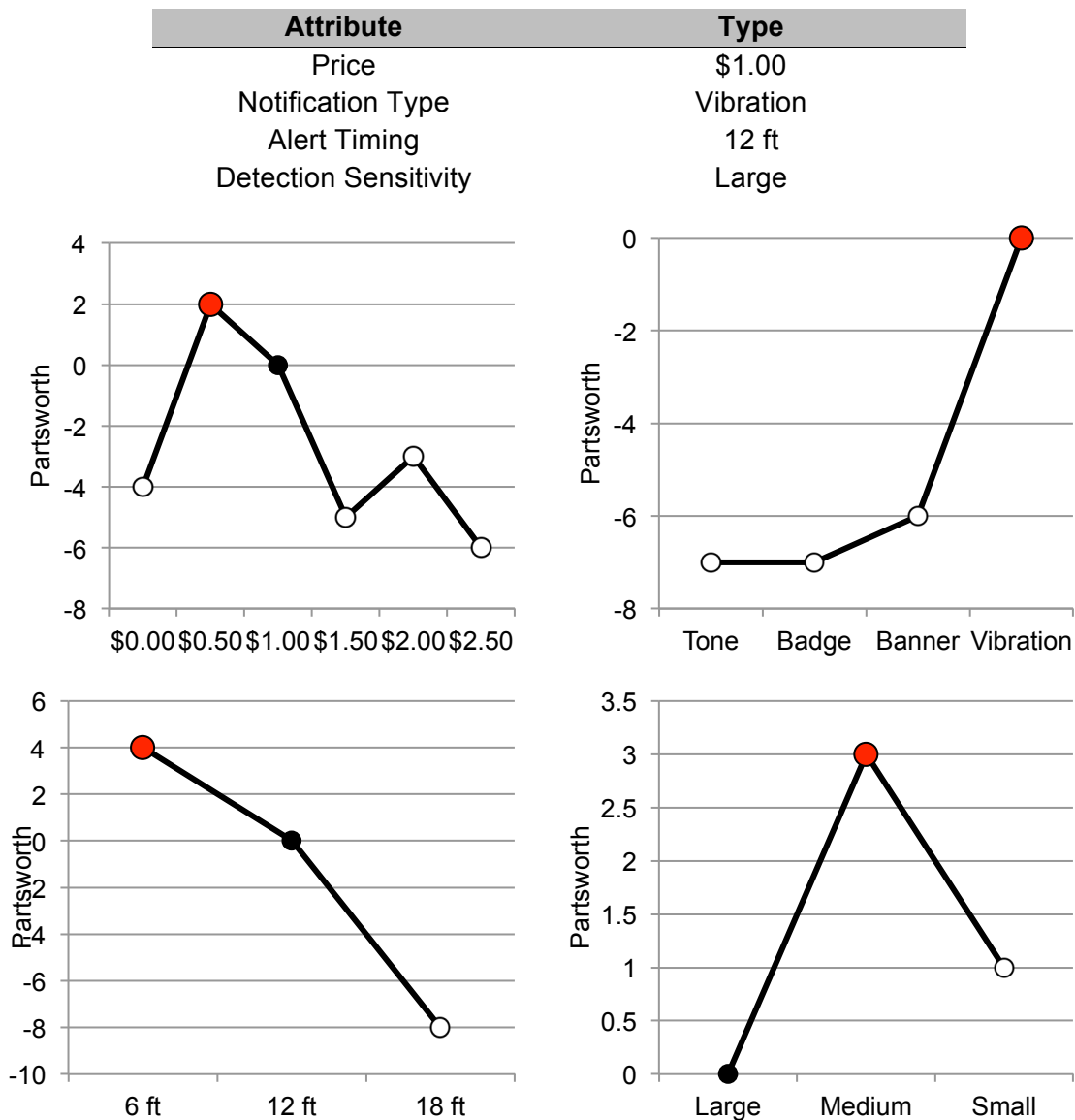
Figure 8: Partworths Definition: Price, Notification Type, Alert Timing, Sensitivity

In the context of the data shown in Figure 8, the analysis would tell us that pricing the application around $0.50 and featuring a vibration notification with 6 feet notification distance and operating with medium sensitivity would be the most marketable product. Should the customer have to pay anything for *BumpAlert!,* they would perceive more value than if they payed $0.50, on average. Using any other notification type other than vibration could decrease the perceived value of the product. It has already been stated in the previous section that the detection distance may be hubris by the survey participants; however the initial release should feature a distance threshold of 6 feet for alerts. Finally, sensitivity would best be kept at a medium rating as described in the previous section.

4.4.2. Trade Studies
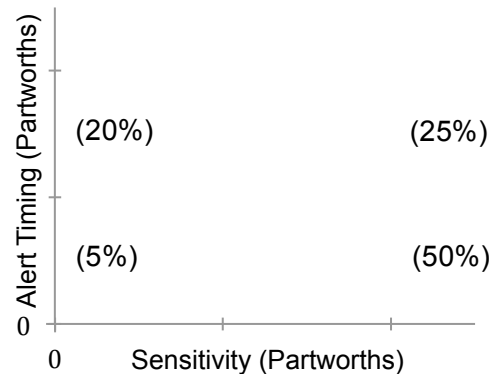
Figure 9: Partworths Correlation – Sensitivity vs. Distance

To dig a little deeper, partworths were plotted against each other for each participant to see if an optimization for the operation for the product interface, as well as the manner of releasing features could be made. Figure 9 shows a comparison of the relative partworths of sensitivity and distance. Each discrete point represents a number of survey participants. While the red point signifies 50% of survey participants, movement up and to the left from that point may not indicate a very significant affect in the average user's perceived value. It may in fact satisfy more customers on average! More importantly, this ultimately translates to added flexibility for the developer when tuning the detection distance and size threshold performance. This in turn translates into less development and a quicker time to market.
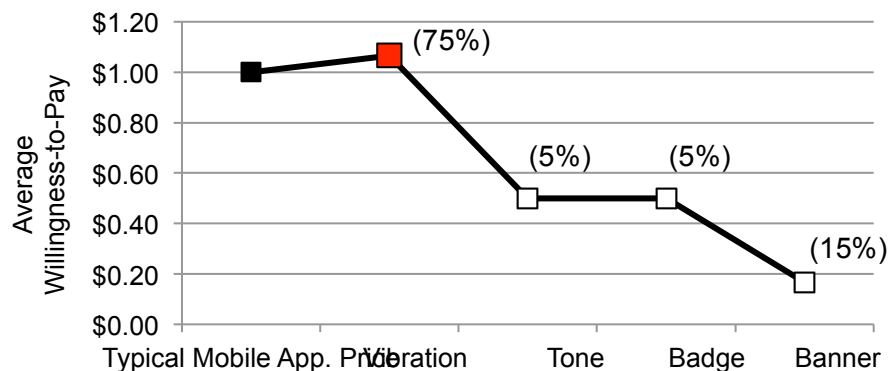
Figure 10: Correlation between Average Willingness to Pay and Notification Type

Finally, the average willingness-to-pay was computed for each of the notification types based on each survey participant. Figure 10 shows the willingness-to-pay distribution against notification type. The typical price of a mobile application for a first time buyer or a freemium upgrader was added to the plot to give a reference value. [13] The average willingness-to-pay of those who would prefer vibration bump alerts being greater than $1 is substantiating evidence; if the application were sold in an app marketplace with a freemium model, those who adamantly prefer the vibration notification would pay for it or perhaps later upgrade to get it. The possibility of free download and later upgrading for a price is substantiated by Mirani in his article titled, "The amount most people are willing to pay for an app is $0 – until they've actually downloaded it." [14] It is clear that consumers would rather have the trial first, and then are more likely to pay than initially buying the premium version. Because this model is somewhat different than one in which revenue is generated purely by advertising, it could be used to boost popularity or simply

compliment the main revenue stream as it would not imply that getting the premium version removed ads. Using this information can only be beneficial to the distribution and perceived value by the customer.

5. Financial Projections

In order to ensure the launch of *BumpAlert!* will generate a profit for its owners, a financial analysis was performed over the first four years of Mango LLC. It is assumed that the financial analysis will begin in the first quarter of 2016, and the time step through the four year timeline will be in quarter year increments.

5.1. Company Costs

Since *BumpAlert!* is a mobile application, there is not a lot of capital equipment needed to begin "production." The primary expenses associated with starting the company will be the intellectual property (IP) protection that needs to be put in place to prevent other companies from copying the technology and becoming competitors in this space. The cost for generating a patent for the currently developed technology is $10,000 and this will need to be covered as soon as the company is founded.

Following the IP protection, the programming software is needed for two software developers to finalize the application prior to its beta release. The final touches to the application should be complete by the second quarter of 2016 and this is also the target date for the beta testing. The development environment that is used to program the application is MATLAB. The costs for two standard MATLAB licenses is $4,300. This software is used on the software developer's personal computers in an effort to minimize startup capital. The final startup cost is two cell phones that can be used as testing devices for the application. One of these phones is an Apple phone using the iOS operating system and the other is an Android phone. This allows the developers to ensure that the application is cross platform compatible. Since these phones are not part of a contract, they are purchased at full retail price for a total of $1600. The full list of costs for the first quarter of 2016 is summarized in Table 6. Also, since the product is not yet released, it should be pointed out that there will be no revenue the first quarter.

Table 6: Mango LLC First Quarter Costs

Item	Cost (USD)
IP Protection	10,000
Development Software Licensing	4,300
Development Phones	1,600
Total	15,900

Costs in the second quarter of 2016 will be low compared to the first quarter, and only include two more development phones to continue to ensure the software's compatibility with many devices. This additional $1,600 cost will not be covered by any revenue. The beta testing that is to begin during the second quarter of 2016 will not include any advertisements. The purpose of the beta testing is not to generate revenue, but rather to explore how the application reacts in the hands of actual users. It will be expected that because the application will be ad-free, the beta testers will provide the developers with feedback to improve upon the application's robustness and functionality. An example of this feedback is instead of an advertisement appearing with an alert, it will be two buttons that ask the user if this was an actual object, or a

false detection. This type of feedback will provide valuable data to the developers in finishing up the application before its full release.

The third quarter of 2016 is when the full release of the application will take place. The distribution of the application will be through conventional methods, such as the Apple App Store and Google Play Marketplace. Since the product is an app, there is nothing to ship, and therefore no cost of distribution to Mango LLC. However, since the founders of Mango LLC wish to distribute the application as fast as possible, in order to bring in more revenue quickly, Mango LLC will hire a Sales and Marketing Employee for $100,000 per year. This additional employee, along with the third founder, will begin making contact with potential customers in an effort to generate users, and therefore revenue. Since an additional employee was added to the company, Mango LLC will also provide this employee with a company computer and open a small office to work out of in the Ann Arbor, MI area. An overview for the third quarter costs for 2016 can be seen in Table 7.

Table 7: Mango LLC Third Quarter Costs

Item	Cost (USD)
Sales & Marketing Employee	25,000
Employee Laptop	1,000
Office Space Rent	3,000
Total	29,000

It should be noted that the office rent and employee salary will be recurring costs for each quarter following the third quarter of 2016. However, since the product is in its fully released state, there will also be ad revenue to offset these higher costs. The revenue model will be detailed in a later section.

Starting in the fourth quarter of 2016, an allotment for advertising costs is added to the financial projections. These advertising methods are to reinforce the initial direct contact made by the employees of Mango LLC to continue to increase the user base of the application. These advertising campaigns will target college students on their favorite social media sites like Facebook, Twitter, and YouTube. The cost of this advertising campaign will be $3,000 per quarter for the remainder of the financial analysis.

The operating costs for the remaining three years of the financial analysis will fluctuate between $33,740 and $37,850. This covers the costs of the additional employee, rent, and advertising campaigns. The fluctuations that are observed come from the number of trips that the employees will need to make in order to reach college campuses around the country (plane tickets, lodging, per diem, etc.). The final costs per quarter can be seen in Table 11.

5.2. User Acquisition and Revenue Model

The user base for *BumpAlert!* will begin to be generated in the third quarter of 2016. The initial target market for *BumpAlert!* will be the major regional universities in the area surrounding Ann Arbor, MI.

The primary campuses that will be reached in the third quarter of 2016 will be the largest regional campuses around Ann Arbor, MI. These universities, and their student populations, can be seen in Table 8. These universities are the initial targets because it will allow Mango LLC to reach the most potential users with little travel costs. It will be imperative to capitalize on this market to increase company revenue while minimizing costs.

Table 8: Regional Universities and their student populations

College/University	City	Population
University of Michigan	Ann Arbor	43,625
Michigan State University	East Lansing	50,085
Ohio State University	Columbus	64,868
Indiana University	Bloomington	48,514
Wayne State University	Detroit	25,619
Oakland University	Detroit	16,935
Total		249,646

As it is shown, there are nearly a quarter of a million potential users in the regional area around Mango LLC It will be assumed for the financial analysis that the conversion rate for each university that is directly contacted by Mango LLC will reach 15 percent in the three quarters following the initial contact with that university. The acquisition rate by quarter will be 3%, 8%, and then 4%, respectively. This acquisition rate not only accounts for the targeted efforts by Mango LLC, but also for the spreading of the application via word-of-mouth from student to student.

The marketing plan for the third quarter of 2016 will also include targeting the largest university campuses in the United States. The revenue generated from the regional user base will be used to increase the amount of travel. The largest universities and their populations can be seen in Table 9.

Table 9: Largest U.S. Universities and their student populations

College/University	City	Population
Penn State University	State College, PA	40,514
Texas A&M	College Station, TX	47,093
University of Texas	Austin, TX	39,523
Arizona State Univ.	Phoenix, AZ	39,968
University of Central Florida	Orlando, FL	52,532
Total		219,630

Other financial models were examined in which the additional sales and marketing employee was not hired until a later quarter in the business plan, but this caused the user base to grow much slower than in the final model. In the long run, it was observed that spending more money on the additional employee sooner caused the user base and profits to increase at a much faster rate. This additional revenue was greater than the increased costs associated with the additional employee.

The final planned market for growing the user base for *BumpAlert!* includes targeting the universities in the largest cities within the United States. The idea behind targeting the students at these universities is that they will become familiar with *BumpAlert!* while in college and then share it with their co-workers upon graduation or during internships in these major cities, as listed in Table 10. This is the method selected for breaking into the urbanite market that could also take advantage of the benefits provided by *BumpAlert!*

Table 10: Universities in Major U.S. Cities and their student populations

College/University	City	Population
University of Chicago	Chicago	14,467
Columbia	New York	30,304
Georgetown	Washington D.C.	17,858
Stanford	Palo Alto, CA	16,136
San Diego State University	Sand Diego, CA	33,527
Mass. Inst. Of Tech.	Boston, MA	11,319
Boston College	Boston, MA	14,125
Total		137,736

The acquisition of the students in these final campuses will be the same as the previously visited campuses; however, the acquisition of the urbanite population in these cities will be different. It is assumed that 0.5% of the populations of these major cities will become users of *BumpAlert!* in three quarters at an acquisition rate will be 0.1%, 0.25%, and 0.15% respectively. The complete projections of *BumpAlert!* users per quarter, and by source, can be seen in Figure 11.

In order to approximate the revenue from advertisements in the growing user base, it will be assumed that each user used the application for 20 hours per month, and that there will be an average of 5 alerts per hour of run time. Also, the effective cost per mill (eCPM) is the revenue that Mango LLC will obtain per 1,000 ads that are generated through *BumpAlert!*. The eCPM is a standard measure for mobile and web based advertising, and the average eCPM is $1 in the US [15]. These assumptions will be used to generate revenue streams by quarter, as detailed later.

5.3. Required Initial Investment

The previous information on costs and user acquisition leads the founders of Mango LLC to set the precedence of the initial investment required to start the company. The initial investment will cover the initial capital costs and the operating expenses of the company until the quarterly revenue projections exceed the quarterly cost projections, and the company becomes profitable.

Mango LLC is seeking a $60,000 investment in exchange for a 10% equity stake in the company. As previously stated, this initial investment would secure the IP protection, startup costs, and hiring of an additional employee to focus on bringing in more users, more rapidly, in order to kick start the ad based revenue model for *BumpAlert!*. The financial analysis shows that the investor's equity will be worth more than their initial investment in the fourth quarter of 2017. The company's value is based on the present value of an annuity that's payment amount is equal to the annual profit of the company, paid out over 5 years, after accounting for an inflation rate of 1% per year. It is also projected that the value of the company at the end of year 4 will be over $976,000, which will generate a profit of over $37,000 for the investor who secured a 10% equity stake in Mango LLC. This translates to approximately a 15.4% annual return rate, which is greater than the risk adjusted return rate calculated for a startup such as Mango LLC as shown in the Appendix.

5.4. Financial Analysis Summary

Table 11 shows the overall summary of Mango LLC's financial condition throughout the financial analysis. This quantitative approximation lists the revenue, costs, profit, and amount of cash that the company is expected to have throughout its first four years.

Table 11: Summary of Mango LLC's Financial Analysis

Period	Total Users	Quarterly Ad Revenue	Total Ad Revenue	Quarterly Costs	Quarterly Profit	Total Profit	Cash on Hand
Start							$ 60,000.00
2016 Q1	0	$ -	$ -	$ 15,900.00	$ (15,900.00)	$ (15,900.00)	$ 44,100.00
2016 Q2	0	$ -	$ -	$ 1,600.00	$ (1,600.00)	$ (17,500.00)	$ 42,500.00
2016 Q3	15979	$ 4,793.63	$ 4,793.63	$ 29,000.00	$ (24,206.37)	$ (41,706.37)	$ 18,293.63
2016 Q4	68412	$ 20,523.45	$ 25,317.08	$ 37,850.00	$ (17,326.55)	$ (59,032.92)	$ 967.08
2017 Q1	123901	$ 37,170.21	$ 62,487.29	$ 37,850.00	$ (679.79)	$ (59,712.71)	$ 287.29
2017 Q2	172751	$ 51,825.33	$ 114,312.62	$ 37,850.00	$ 13,975.33	$ (45,737.38)	$ 14,262.62
2017 Q3	201070	$ 60,320.96	$ 174,633.57	$ 36,480.00	$ 23,840.96	$ (21,896.43)	$ 38,103.57
2017 Q4	216070	$ 64,820.96	$ 239,454.53	$ 33,740.00	$ 31,080.96	$ 9,184.53	$ 69,184.53
2018 Q1	231070	$ 69,320.96	$ 308,775.49	$ 33,740.00	$ 35,580.96	$ 44,765.49	$ 104,765.49
2018 Q2	243570	$ 73,070.96	$ 381,846.44	$ 33,740.00	$ 39,330.96	$ 84,096.44	$ 144,096.44
2018 Q3	254070	$ 76,220.96	$ 458,067.40	$ 33,740.00	$ 42,480.96	$ 126,577.40	$ 186,577.40
2018 Q4	262070	$ 78,620.96	$ 536,688.36	$ 33,740.00	$ 44,880.96	$ 171,458.36	$ 231,458.36
2019 Q1	270070	$ 81,020.96	$ 617,709.31	$ 33,740.00	$ 47,280.96	$ 218,739.31	$ 278,739.31
2019 Q2	274070	$ 82,220.96	$ 699,930.27	$ 33,740.00	$ 48,480.96	$ 267,220.27	$ 327,220.27
2019 Q3	278070	$ 83,420.96	$ 783,351.23	$ 33,740.00	$ 49,680.96	$ 316,901.23	$ 376,901.23
2019 Q4	280070	$ 84,020.96	$ 867,372.18	$ 33,740.00	$ 50,280.96	$ 367,182.18	$ 427,182.18

The financial projections that are shown in Table 11 are based on the user base highlighted in Figure 11. Included in the figure are some of the milestones that were discussed in previous sections to judge how these events affected the acquisition of users.
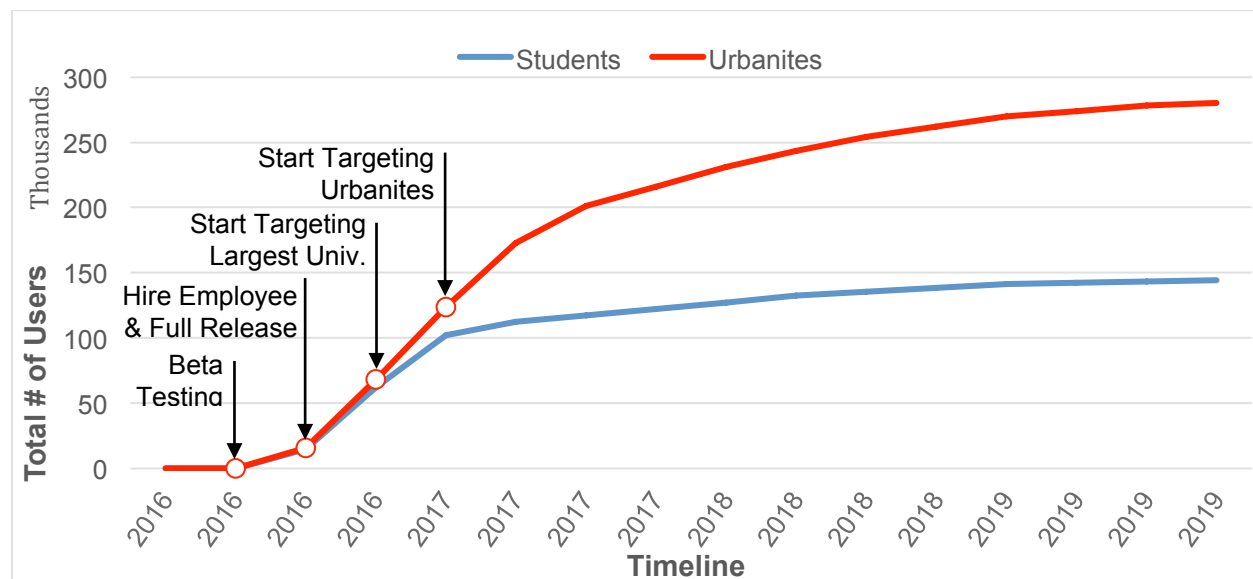

Figure 11: *BumpAlert!* User Projections by Quarter

Similarly, Figure 12 shows the quarterly profits of Mango LLC with some milestone events as well. This information is accompanied by the overall amount of cash on hand which Mango LLC will have each quarter as a result of the initial investment. Note that it is not projected for Mango LLC to require taking on any additional debt to begin the company, and this shows that the initial investment that the company is seeking is appropriate for the work previously described.
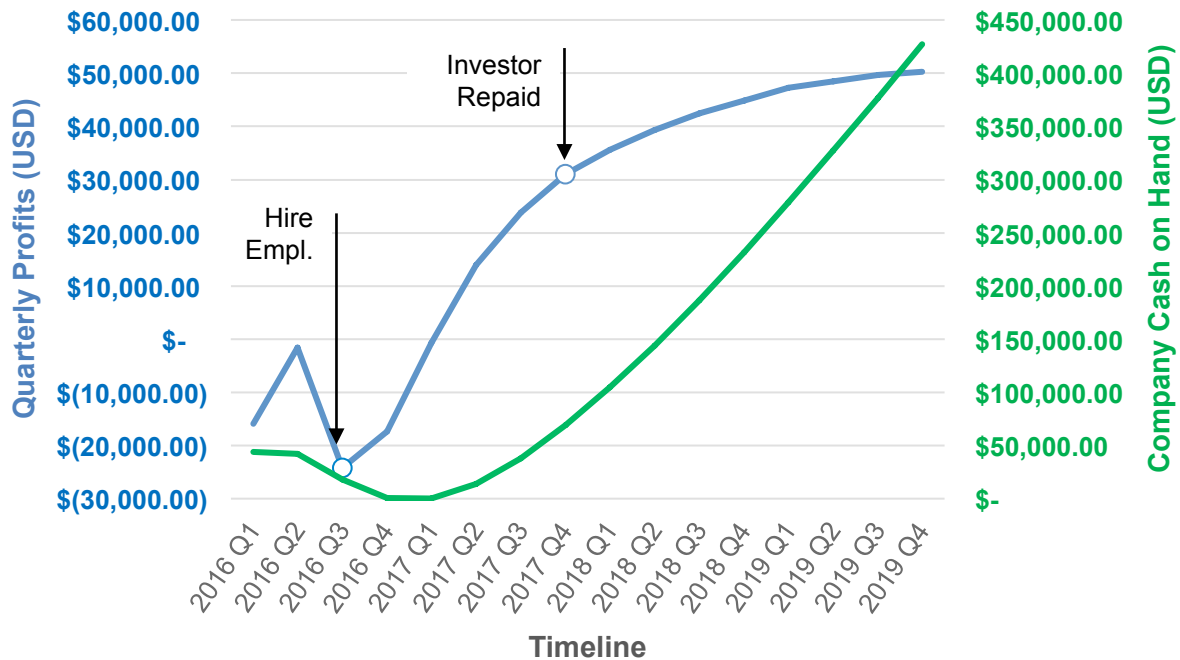
Figure 12: Overview of Bump Alert Financial Projections

Overall, the financial projections show that Mango LLC is able to generate sustainable profits through its advertisements in *BumpAlert!*. It also shows that an initial investment in exchange for a 10% stake in the company will have a significant return to the investor. It should also be stated that the intent of this financial analysis was to be conservative. Nowhere in this analysis was the idea of expanding into markets around the world introduced, nor was any profit generated by licensing our technology to other companies to help the visually impaired.

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7. Appendix

7.1. Market Survey Data

Participant	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Interested?	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪	▪		▪	▪
Prior Mishap?	▪	▪			▪		▪		▪				▪		▪				▪	
Perceived Beneficial?	▪	▪		▪	▪		▪		▪				▪		▪				▪	
Willingess-To-Pay [$]	1.00	1.50	0.50	1.00	0.00	2.00	0.50	0.50	1.00	1.00	1.00	0.50	2.00	0.50	1.00	0.50	0.50	0.50	2.00	0.00
Notification Ranking [4 best, 1 worst] — Tone	3	1	2	3	2	1	1	1	1	1	2	2	2	2	3	4	3	2	1	1
Notification Ranking [4 best, 1 worst] — Badge	2	2	1	1	1	2	4	2	2	3	3	3	1	1	2	1	1	1	2	2
Notification Ranking [4 best, 1 worst] — Banner	1	3	3	2	4	3	2	3	3	2	1	1	3	3	1	2	2	4	3	4
Notification Ranking [4 best, 1 worst] — Vibration	4	4	4	4	3	4	3	4	4	4	4	4	4	4	4	3	4	3	4	3
Reaction Distance [ft]	6	12	12	12	6	6	6	6	12	6	6	12	12	6	6	12	6	6	12	6
Detection Sensitivity [S, M, or L]	S	M	M	M	S	S	M	S	M	M	M	M	M	S	M	M	M	M	M	M

Figure 13: Market Survey Data: College Students Surveyed

7.2. CAPM

A Capital Asset Pricing Model analysis has been conducted and the details thereto are explained here. A risk free rate of return was assumed at 0.56% per year (based on the average daily Treasury Yield Curve Rate for the month of April 2016) [16]. The risk free rate of return is defined as the theoretical rate of return of an investment with zero risk. Then a beta value of 1.34 was assumed putting our venture at the same investment risk behavior as an online software development company when compared to the market as a whole. [4] Finally, 8% annual return was assumed for the expected rate of return which is about the current average for a technology investment fund. [17] Below is the estimated risk-adjusted rate of return that should be expected when investing in Mango LLC.

r = risk-adjusted rate
r_f = risk-free rate
r_m = typical specific market risk
β = volatility of an investment compared to the market as a whole

$$r = r_f + \beta * (r_m - r_f)$$

$$r = 10.53 \, \%$$