Wearables Project

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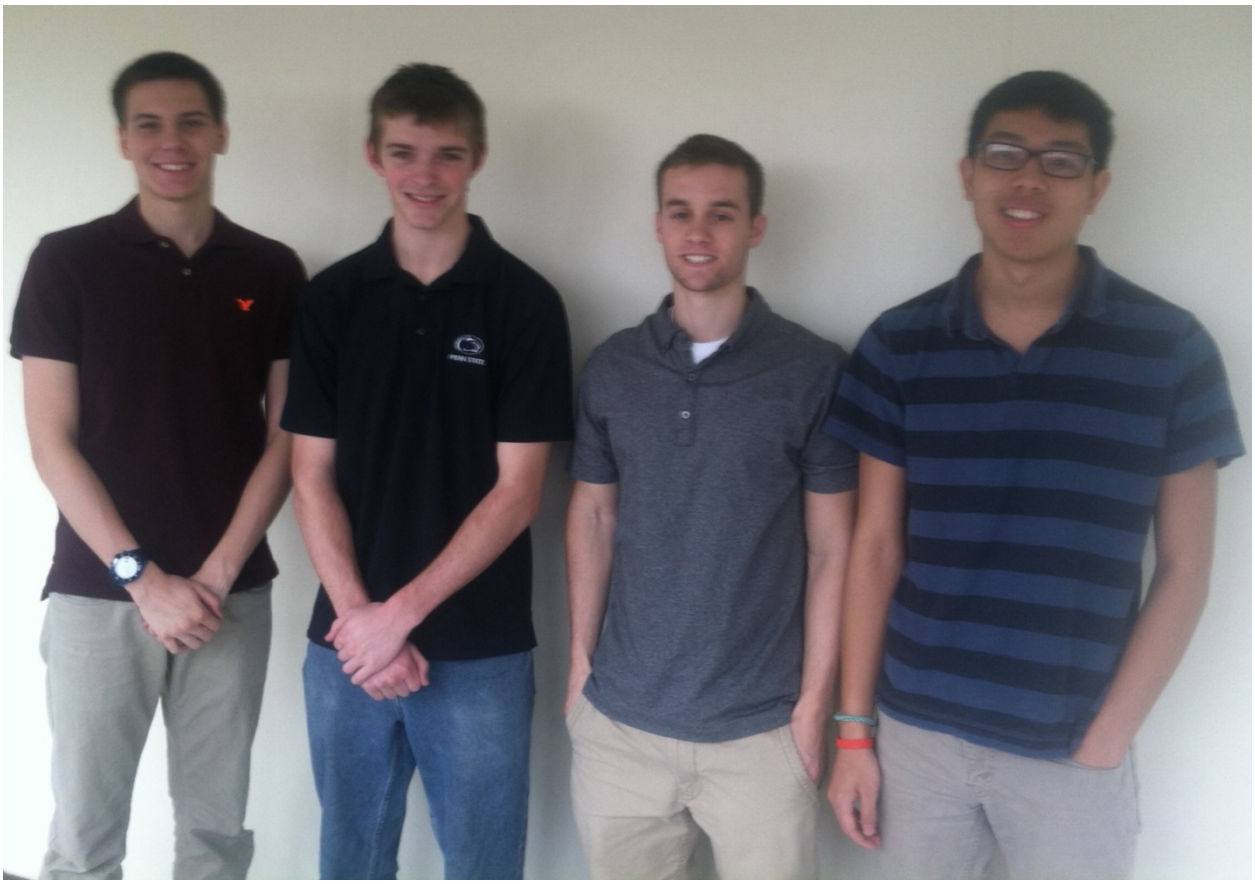

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Abstract

Executive Summary:

Our goal was to create the next popular wearable. In today's world, technology is just getting more and more advanced which is leading to smaller and faster technology. We were commissioned to create a comfortable aesthetically pleasing wearable that could compete with other Wearables on the market today in both price and functionality. We started our project with surveying people about wearable technology and how often they used it. From there we generated concepts and rated them against each other to see which the best was. Once we were finished with that we had to decide what our wearable, a smart glove, would actually be able to do, and how it would do it. And once all of that was finished we created a functioning design and followed up with a solid works model.

Introduction

Problem Statement:

The AT&T Company needed new ideas and concepts for using communication to improve existing technology. In the future smart technology wearable items will become an integral part of everyday life. More specifically the wearable device has to be able to have human accessibility and the ability to communicate with other devices. The objective of this project is to design and test an new wearable that has the ability to provide its user with real time information and the ability to a interact with other devices.

During the design process, our team kept several options open. The engineering process will help us in choosing and narrowing down which design would be the best. Another thing our team will keep in mind is is if there are any previously existing smart technology Wearables and seek to differentiate our design from them.

We plan on building a wearable on the needs of having the ability to sense user interaction through sensors without user interaction. <-What? It also must be small and appealing in appearance to the customer. The reason our team wants to design this wearable is too improve the lives of consumers as well as effectively use new communication technology.

Mission Statement:

With the task at hand in mind, our group set out to design a piece of wearable technology that would satisfy the customer's wants while also being an innovative new piece of technology. The product we intended on designing needed to be able to improve the user's life by being a natural addition to their daily functions.

Wearables Survey

In order to get a better idea of what our customers really wanted out of a Wearable, we conducted a survey. We chose to ask 20 individuals at random at Penn State University how they felt about Wearableas. The questionnaire below consists of questions such as:

Question	# Agreed	# Surveryed	Percent
Do you own a Wearable	1	20	5%
Do you think there too expensive	15	20	75%
Would you buy if cheaper? (Under $300)	18	20	90%
Which Item most interest you?			
i. Watch	4	20	20%
ii. Glasses	6	20	30%
iii. Other	10	20	50%

The survey correlated pretty well with what we researched about Wearables, the market is there but the prices are too high. It means that people are interested in Wearables but the high prices are steering people away from them. The survey gives us confidence to know that there really is a market for what we are trying to sell. It also helped us learn that even though Google Glasses and smart watches such as the Pebble are out there, people want something different by seeing half the survey say they “want another option”. Although a small survey, we do feel confident we can use this information going forward.

Customer Needs Analysis

One of the most important things we had to consider were our customer needs since they are the ones buying our product. From AT&T we were given certain needs such as connecting to other machines, but we came up with our own from the surveys that we completed.

Customer Statements	Need Statements
I want to be able to connect to other devices	The wearable needs to employ internet of things and man to machine interactions
I want it to look fashionable	The wearable needs be comfortable and appealing to customers
I want it to be able to communicate with my phone and computer	The wearable needs be able to communicate and interact with other devices
I want to be able to use it everyday	The wearable needs to have an impact on the daily life of the consumer

With the customer needs, we were able to get a good idea of where we should start in our design process. We were able to see what the customer felt important and what not.

External Research

Wearables Research

Google Glasses

Name: Google Glasses

Summary: Google glass is a wearable computer. It was developed by google with the mission of producing a mass-market computer that was hands free. Google glass displays information like smartphone such as incoming calls, messages, and Facetime. Users can also communicate with the internet via voice commands. Google has entered partnerships with eyewear company Luxottica, owners of Ray-Ban, Oakley, and other brands, to offer frame designs. A touchpad is offered on the side of the screen to other for swiping through timeline-like interface displayed on the screen.

Created: Google

Display: High resolution display of a 25 inch high definition screen from eight feet away

Camera: Photos – 5MP

Videos – 720P

Audio: Bone Conduction Transducer

Connectivity: Wifi – 802.11 b/g

Bluetooth

Storage: 12 GB of usable memory, synced with google cloud storage. 16 GB flash total

Battery: One day of typical use. Some features, like video calls and video recording, are more battery intensive

Charger: Included Micro USB cable and charger

Tech Specs:

- Android 4.0.4 and higher
- 640x360 Himax helloHX7309 LCoS Display
- Texas Instruments
- 682MB RAM
- 3 axis gyroscope
- 3 axis accelerometer
- 3 axis magnetometer (compass)
- Ambient light sensing and proximity sensor
- Bone conduction audio transducer
- Weight: 50g
- Price: Under $1,500

Nike+ FuelBand

Name: Nike+ FuelBand

Summary: The Nike+ FuelBand is an activity tracker that is worn on the wrist and is compatible with Apple Devices. The FuelBand allows its wearers to track their physical activity, steps taken daily, and amount of calories burned. The information that the FuelBand collects is sent to an online community and phone app, allowing users to set their own fitness goals and monitor their progress. Progress can be shared with friends and used to engage in competition.

Created: Nike

Connectivity: Compatible with iOS 5.0+

Bluetooth compatible

Size:

Sizes: Small (5.97 in), Medium (6.77 in), Large (7.76 in)

-fit strands

Width: .63in at LED, .75in at latch

Thickness: 0.27in at LED, 0.32in at Latch

Weight: 27g -35g

Battery type: 3.7V (Up to 7 days)

Display Modes

-Time

-Calories Burned

-Steps Taken

-NikeFuel earned

Tech Specs:

- Warranty: 1 year out of box
- Water Resistant: Yes
- Waterproof: No
- Cost: $149.99

Pebble

Name: Pebble Smart watch

Summary: The Pebble is a smart watch developed by Pebble Technology and released in 2013 that was funded via the crowd platform kickstarter. The Pebble is compatible with IPhones and select android devices. When connected to your phone, it is able to receive a vibrated alert to text messages, emails, incoming calls, and notifications from social media accounts, Facebook and Twitter. The Pebble can hold up to eight apps at a time that can all be bought on the IPhone and Android App stores.

Created: Pebble Technology and funded by Kickstarter

Connectivity: Compatible with IPhone 4, 4s, 5, 5c, and 5s and iOS 6, iOS 7, and Android 4.0 or later

Bluetooth Compatible

Size:

Height: 2 in

Width: 1.3 in

Depth: 0.4 in

Weight: 5.3 ounces

Color: Black

Tech Specs:

Notifications

- Allow you to view updates from your e-mail, SMS, caller ID, calendar, and favorite apps like Facebook, Instagram, and Twitter on your wrist
- E-Paper Display, clear screen view even outdoors
- Downloadable watch faces and apps
- Rechargeable battery, allows up to 7 days of use with a full charge

- Waterproof
- Cost: $149.99

Smarty Ring

Name: Smarty Ring

Summary: Smarty rings free you from searching in your bag for your phone, or reaching into your back pocket to find new notifications. Notifies you of incoming/outgoing calls, alerts for Text and E-mail messages, real time updates from Facebook, Twitter, Hangout, and Skype

Tech Specs:

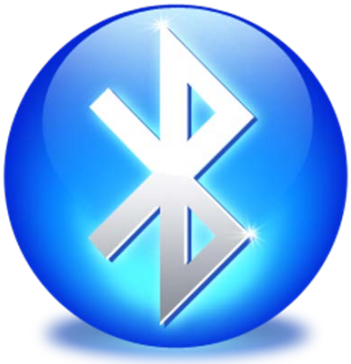
1. Remote control
    a. Control your phone without touching it
    b. Accept or reject incoming calls
    c. Make outgoing calls
    d. Trigger camera
    e. Control Music
    f. Change Profile
2. Clock at your finger tips

    a. Clock able to check up to five time zones
    b. Also a stopwatch and countdown timer
3. Track your phone
4. Never forget your phone again and prevent theft
    a. Alert your phone when your lost in a crowd
    b. Alert goes off when your phone is on silent
    c. Beeps when your phone is more than 30 meters away
5. Design
    a. High quality stainless steel
    b. Suited for both men and women
    c. Waterproof
    d. LED Display
6. Wireless Charger
    a. Charge smartphone and Smarty Ring at the same time
7. Interactive One Screen App
    a. Compatible with iOS and Android
    b. Set time zones and adjust clock
    c. Adjust LED brightness
    d. Adjust Beeper's volume
    e. Assign buttons to control speed dials
8. Battery
    a. Guaranteed running time of 24 hours
    b. Free battery replacement
9. Misc.
    a. Bluetooth 4.0
    b. Size: 13mm Wide and 4mm Thick

Cost: Retail – 275$

Technologies

Bluetooth



Bluetooth is a very common way for devices to interact over short distances. It uses short-wavelength UHF radio waves. Because your phone will almost always be close at hand if you’re using the glove we decided that Bluetooth would be the best for this short distance communication.

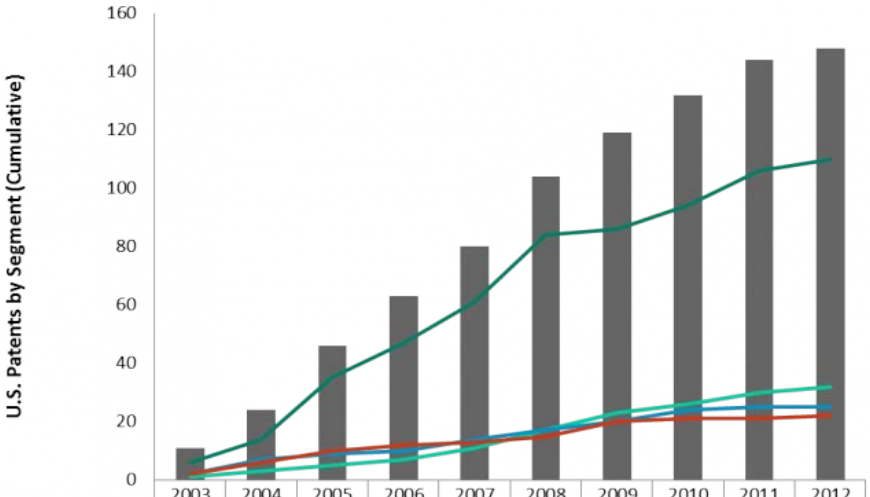
NFC

Near Field Communication or NFC for short is a creative way of passing information from one device to another. By touching two devices together or getting them within a few inches of each other you can pass data from one device to another almost instantly.

Patent Research

With the growth of the Wearables market, there has been a major spike in the battle for patents. A major competitor in the Wearables market is Apple. Apple recently submitted a patent application in 2012 for a smart-wrist mounted pedometer that can automatically determine its location on a user's body and compensate for missed steps and advanced processing algorithms. Apple credits the invention Yash Rohit Modi. Apple also has a design patent named D604305 which cover's their screen home page. The Nike Fuelband has a patent number D676457 that is for the display screen with animated user interface.

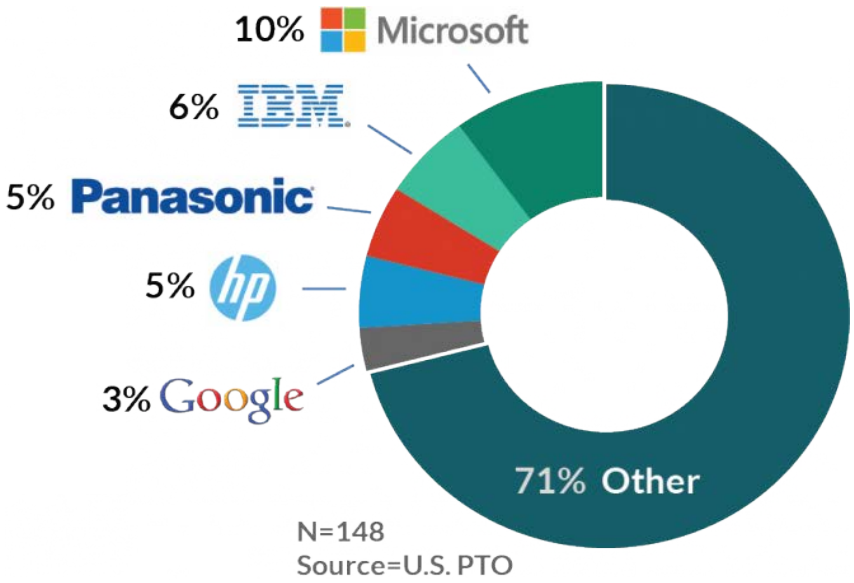
Annual filing frequency is trending downward since 2008 when 34 patents were filed. Search results included 148 patents, spanning segments such as watches, glasses, cameras, and textiles.



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Cumulative	11	24	46	63	80	104	119	132	144	148
Watches	6	14	35	47	61	84	86	94	106	110
Glasses	1	3	5	7	11	17	23	26	30	32
Cameras	2	7	9	10	14	17	20	24	25	25
Textiles	2	6	10	12	13	15	20	21	21	22

Note: Cumulative filings do not equal total filings due to several patents containing more than one segment
Source: U.S. PTO, Hanover Research analysis

Of the 148 patents, Hanover identified 82 filing companies responsible for 137 patents. The remaining 11 patents are attributable to unknown companies.



The market is still in search for the first blockbuster product. Google Glass is top of mind when people think about wearable technology. After research, we find our product to not be in interference with any of these patents, as they implemented different techniques designed for customer convenience.

Literature Review

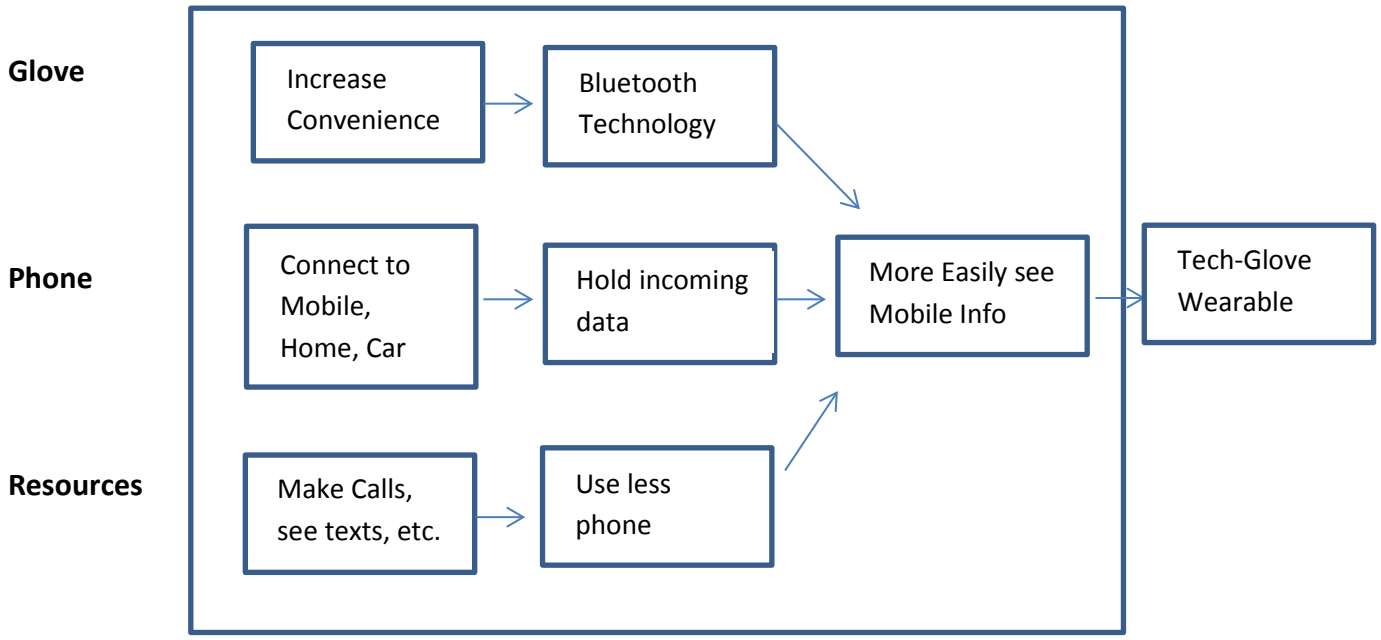
Calculator watches came out in the 1980's but there was very little advancement in wearable technology until hands free headsets got popular around 2000. This led to the creation of the Bluetooth headset. In 2000 a watch was created that ran Linux but the idea was scrapped within a couple years. Popularity for smart watches was pretty much nonexistent until Samsung released their galaxy gear watch in 2013. In the same year google released its google glasses for testing.

Concept Generation

Clarify the Problem:

The technology industry is moving so fast that we gone from snail mail to being able to send instant text messages. With that, it has gone so far that people do not even want to pull their phone out to see that text message. The wearable industry has grown dramatically in the past couple of years especially with the development of Google Glasses and Pebble Smart watch. Both of which have their ups and downs in the market. However, both deliver the need that people want, convenience.

Develop a Functional Diagram:



The diagram enables us to get a visual of several angles working together to approach the overall goal of a Wearable design.

Brainstorming

- Different color (red, black, blue, gray)
- Different sizes (small, medium, large)
- Opposite glove of screen has touch sensitive fingertips
- Connect to phone
- Phone connects to house
- Turn on car using glove
- Answer calls using phone
- Touch fingers together to make a call
- High five someone to transfer info
- One day battery life
- Lightweight
- Slim
- Bulkier glove for colder months
- Market more to Northern Regions
- Under $250
- One year warranty
- Touch Screen on glove palm
- User interface
- Flexible Screen
- Clap to transfer information
- Pinch fingers to answer call
- Speaker in pinky finger
- Lithium Battery
- Solar Powered

Concept Selection

Wearable:

After surveying people about Wearables we decided to weigh the pros and cons of different ideas for different types of wearable technology. Each of the criteria had a base value of zero for one of the Wearables, and we compared the other concepts against that, and said whether it was better or worse. At the end we said:

	Concepts	Watch	Glasses	Ring	Glove	Necklace
Criteria						
Unique		0	0	+	+	+
Versatile		0	+	-	+	-
Noticeable		0	-	+	+	-
Aesthetics		+	-	+	0	-
Price		-	-	+	+	0
+'s		1	1	4	4	1
-'s		1	3	1	0	3
0's		3	1	0	1	1
Sum		0	-2	3	4	-2
Rank		5	3	2	1	3

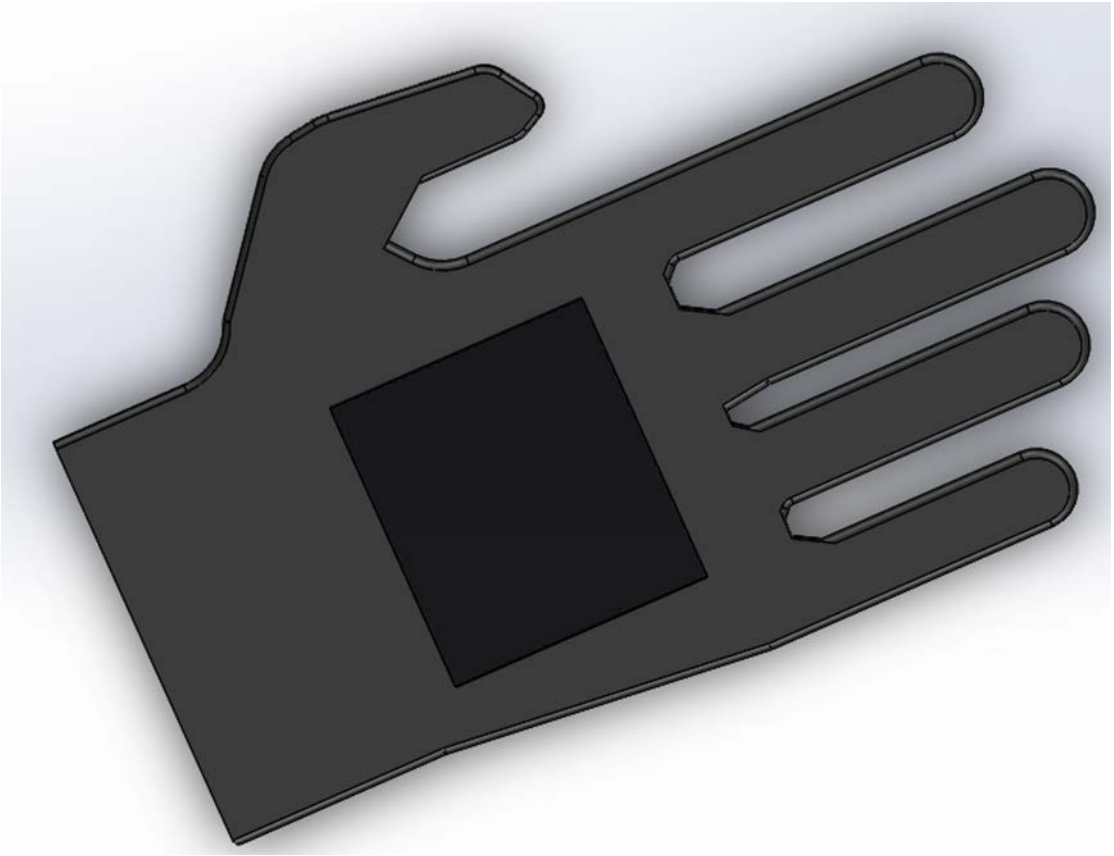
Financial

Cost Model:

The cost model lays out the production cost of an individual MobiGlove. Each component in the cost model was chosen for its quality and durability. The components also met the design specifications we needed in order to make our product complete and unique. This cost model allows us to identify the production cost of our model and allow us to have the ability to set a price at an acceptable range in order to draw in customers into purchasing our product, but to also make sure that we can make a profit while doing so. Our calculations set the cost at around $121 per unit. We set the marking price at $250. This allows us to have a $129 dollar profit per unit.

Component	Cost
Oled Flexible Screen	$8.50
Gloves	$35.00
Bluetooth Chip	$5.00
Gloves	$10.00
Protective Screen	$5.00
Processor	$55.00
NFC chip	$2.50
total	$121

Final Design Description



With Solidworks, we were able to create a prototype design of the MobiGlove. The glove is designed to fit any hand, and includes a 2.5 by 3 square inch screen on the palm that would be used to access important information, such as text messages, emails, missed calls, etc. The battery and processor would be included on the back side, so as to not interrupt the user's daily activities. The product contains useful technology, such as Bluetooth 4.0, which allows for high speed data transfer between our product and the users smartphone. In addition, the product's inclusion of Near Field Communication technology allows for users to perform common functions faster by possibly using their credit card information to pay with a swipe of the hand, or opening an id specific lock by simply holding the

id reader. Near Field Communication would also allow for users to transfer information between two separate MobiGloves with the simple gesture of high fiving.

With the design being a wearable glove that can access day to day information, the goal was to market the product towards areas of colder climate. There are many scenarios where an individual is cold, but has to take their gloves off in order to operate their smartphone. With the MobiGlove design, they would not need to take off their gloves or search around for their phone, as all of their pertinent data can be accessed right in the palm of their hand.

Conclusion

The goal of product design was to create a product that innovated the way customers interacted with their communication devices. The device needed to have internet of the things and machine to machine interaction as important features. We wanted to create a new innovate wearable device that allowed our customers to have the ability to interact and communicate in new ways. We chose the design to be a glove because the fact the current market lacked smart technology gloves. While glasses and watches were rising in the smart technology market, gloves and other types of Wearables were nonexistent. After choosing our design we wanted the glove to basically be an extension of the customer's phone allowing the customer to access their phone and have new ways of communicating with the world around them. Extensive research went to finding the necessary components in creating our product. For example, we had to find a screen that was small enough to fit in the palm of a hand but also have the ability to bend because we wanted to let our customers be able to open and close their hand. After choosing and finding the components we created a Solidworks model of our glove. The main goal of this product was to allow customers to have more convenience and comfort literally at their fingertips. The main groups of customers that would benefit greatly from this product would be people who live in cold areas of the world, teenagers, the elderly, and many other people. This product will innovate and change the market and the world of communication.

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