Eli Lilly & Company

Senior Capstone Report

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Executive Summary

Team 9.1 is working with Eli Lilly to build on a project that started development dating back to 2018 with the Lilly Senior Design Team. After meeting with our Eli Lilly client mentor, Brian Good, it was clear that the team would be working to improve upon the existing Vuzix wearable device. The team will be working to improve the device to make data collection quicker and more efficient during laboratory activities. Eli Lilly's current process of writing down notes and data has proven to be inefficient and possibly inaccurate at times. Our solution is to implement a device able to capture and record the exact view that the scientist has to accurately capture data. The device should be able to integrate with the Microsoft Cloud Platform (Sharepoint, Teams, Azure…) in order to funnel the data to the majority of Eli Lilly's staff who are out of the office due to Covid 19 [1]. Through thought and consideration, our

mentor decided that the RealWear HMT-1 and Microsoft HoloLens 2 is the device capable of carrying out such tasks and it is now upon us to experiment and implement the device according to our predetermined specifications. Upon continuing our project, the team has also added a functionality comparison between the RealWear HMT-1 and new device, Microsoft HoloLens 2. Eli Lilly would like the team to compare the usability of each device connected to the Microsoft Suite. Ultimately, the goal is to capture data, upload it to the power app the team creates, and access the data from other Microsoft applications including SharePoint and Microsoft Teams.

SECTION 1: Project Background and History

1.1: Statement of Problem

Scientists at Eli Lilly are looking to optimize their existing data capturing solutions. Improvements to this already existing product will allow for standardization and enterprise level scalability. Team 9.1 has ordered two RealWear HMT-1 devices as well as a Microsoft HoloLens 2 which are augmented reality headsets. Eli Lilly wants the team to complete three different tasks. First, being able to connect the headset to their information infrastructure. This infrastructure is their software database that uses all Microsoft programs such as Office 365, Power Apps, Azure, and SharePoint. Second, we have been tasked with comparing and contrasting the RealWear HMT-1 and Microsoft HoloLens 2 user experience and the functionality of the two devices. We also will explore possible new device functions, such as health monitoring, static electricity, battery life, and any other solution that can benefit Eli Lilly.

1.2: Literature Review of the Problem Area

In the journal “Initial Experience and Usage Patterns With the Owlet Smart Sock Monitor in 47,495 Newborns”, a study was conducted where the objective was to describe the initial experience of the home use of the Owlet Smart Sock for newborn health monitoring. The device is used for monitoring vitals in newborns including oxygen saturation and heart rate. The study was also used to point out the utility of the Owlet Smart Sock regarding future capabilities of improvements for consumers that would use this product for infants with specific medical conditions. The study outlined the different components of the monitoring device including the Owlet Smart Sock features, cloud software, and the usage of the Owlet Application for smartphone monitoring.

The application of the Owlet Smart Sock may be of use for the project for ideation of the prototype of a health wearable device. The study can give clear data of using the device as well as the different components the team may need to research for the future prototype. This can be a good reference point of what is currently out on the market [2].

This source from Digital Medicine focuses on the back story of why athletes wear health devices as well as the impact that these devices have on the athletes training as so on. Athletes and coaches have been looking for ways to maximize their physical output and such devices work towards improving such abilities. These devices are utilized to monitor the athlete's recovery as well. Not only do these wearable technologies monitor the internal workload that certain sports have on an athlete, but they also concentrate on the external load. There remains yet another technological gap in these systems though. And that is, sports medical personnel are trying to figure out how to monitor saliva and sweat in as non-invasive ways as possible. Basically, the biochemical aspect of the device technology is still in need of making progress [3].

This source from Docwire News examines 5 new and emerging wearable medical devices. The article begins by explaining the potential for wearable devices in the future, and then dives into the 5 chosen products. This can be of assistance as we begin our project that focuses on a new medical technology. This source allows us to analyze existing technologies we may be able learn from and potentially build off. This source includes information on an AI device created by Current Health, a device for predicting Alzheimer's, a sweat-sensor device, a device for detecting cancer cells, and a device for Peritoneal Disease [4].

This source shows a potential system that could help alleviate this impending stress on healthcare is the development of cost-effective, non-invasive, wearable sensors. This technology would allow patients real time feedback from textile based sensors on their person. Textiles would have functions that could monitor the cardiovascular system and joint movement. Also, PPG measurements, activity monitoring, and a central BSN node would be features included in the development of these systems.This directly relates to our capstone project because we are developing a wearable health monitoring device. This publishing is reporting on science and technology that is the foundation of our project. We have a goal of developing these systems and devices mentioned in the paper cited above into an all-inclusive wearable textile device that will monitor our customer's health [5].

This source from HealthTech Magazine defines the pros and cons for wearable health devices that our capstone project needs. In this web article, Andrew Steger explains how wearable health devices can track multiple levels of one's health such as blood pressure, heart

rate, weight, step count, and etc. Wearable health devices also are the up and coming new wearable devices as they are expected to sell over $60 billion within the next five years. Coronavirus can also be tracked by using wearable health devices which is another pro. The main con our group should worry about is making sure the consumer's experience is great at first hand and that they have privacy with their health data. If either of these cons become a problem for the consumer, more than likely they will never use the device again. All of this information in this web article is both relevant and appropriate for our capstone project. The reasoning for this is because before we brainstorm ideas for our wearable health device, we need to understand the pros and cons of these devices that have already been created and sold to the public. If we are able to perfect a wearable health device, we could potentially corner the market in these products [6].

This source reports on a study done about a physician time management workshop. They mention that time management is one of the most important skills a physician can have. This time management allows the physicians to balance multiple patients at one time, increasing the number of people that can be treated during the same time period. The results of the study are that time management skills can be improved upon, and that the physicians find that they feel better and would recommend other physicians take the workshop [7].

Amazon will be releasing their version of a wearable device called the Halo. It has all the features of devices like the Apple Watch and Fitbits and more. With new features such as tracking the user's emotions, creating a 3D render of the user's body, being able to calculate a user's BMI, and more it will surely be a major player in the market. The device is worn like a watch and works with a smartphone app and subscription service. The device is meant to be worn all the time to accurately track the user's movements. It has no screen, just two LED lights, and comes in a variety of sizes. This article allowed me to become well informed on a product that is very similar to what my group and I will be working on this year. The article spends large sections on the design and features of the device as well as how the user interacts with it. Many of these features are similar to what we plan to implement on our device. Going forward my group and I will be able to reference this source for inspiration, quality examples of the design, and a baseline for features [8].

1.3: Scope of Work

Team 9.1 has the goal of expanding upon previous capstone projects and existing devices to meet the needs specified. Eli Lilly is looking for a wearable device with video and audio capability, remote data storage, voice commands, telepresence, and a speech-to-text feature. To accomplish this, both hardware and software development need to be strongly considered. Device specifications such as battery life, operating systems, and user safety were gathered from existing solutions (see **Section 2.1**). After that, information has been gathered and specifications must meet the criteria in the Requirements Matrix (see **Section 2.2**). The RealWear HMT-1 and Microsoft HoloLens 2 have many apps that are offered within their own app store, but different companies that make AR software may be considered to get the tasks completed. Hardware and software will then be selected and testing will be performed in order to gather results. It will then be analyzed how well the device accomplishes its functionality parameters set by the Requirements Matrix.

1.4: Team Members and Roles

Jacob Cole- Team Leader & Design

Description: responsible for primary communication to client and faculty mentor. Composes emails, documents, and other information to all team members and stakeholders in an organized and timely manner. Responsible for design of all features in the project.

Krista Bauer- Research & Design

Description: responsible for research, design, contact with Purdue's Envision Center, and implementation of any feature in the project.

Stephen Backscheider- Systems Integrator

Description: responsible for implementing any electrical systems within the project.

Daniel Isbell- Research & Implementation

Description: responsible for collecting relevant information and data and turning ideas into practical actions.

Joseph Fraseur- Hardware Designer

Description: responsible for research and design of hardware and software features of the electrical systems within the product.

Chad Timmons- Research & Data Analyst

Description: responsible for collecting relevant information and sorting through data to create solutions for our product.

Ian Holmes- Meeting Manager

Description: responsible for scheduling and overseeing group meetings, as well as communication between the group and mentors.

Nik Benton- Electrical Systems Analyst

Description: responsible for verifying the hardware used and make pieces of hardware compatible with one another

1.4.1: Team Strengths

Name	Major	Strengths/Focus
Krista Bauer	Supply Chain Management Technology	Supply Chain, Data Analytics
Jacob Cole	Mechanical Engineering Technology	Software Design
Stephen Backscheider	Electrical Engineering Technology	Electrical System Designer
Daniel Isbell	Industrial Engineering Technology	Optimization, Supply Chain
Joseph Fraseur	Electrical Engineering Technology	Software, Hardware
Chad Timmons	Supply Chain Management Technology	Supply Chain, Data Analytics
Ian Holmes	Robotic Engineering Technology	CAD Design, Mechanical system design
Nik Benton	Electrical Engineering Technology	Analog, RF, Hardware

1.4.2: Team Charter

Team Communication Plan:

GroupMe will be the preferred form of communication for casual communications and project planning. As of now, the team will use Google Drive for any internal documents for the project. Email will be utilized for planning meetings that include the client or academic mentor.

The team will be utilizing virtual meetings in some cases and will use Webex or Zoom for these times.

Minor decisions will be communicated through GroupMe and then will meet as a team if a solution needs to be talked about further. The team will be meeting at least twice a week during class/lab time as well as outside hours when deemed necessary.

Communications Tools Summary:

- Client meetings- likely virtually as scheduled
- Team meetings- weekly inperson/virtually via Zoom or Webex
- Team communication- GroupMe, email, in person meeting
- File sharing- Google Drive

1.4.2.1 CATME

- 1- No effort was made to complete work
- 2- Did some work or work was unfinished
- 3- Average work and did what was expected on time
- 4- Above average work was completed on time or early
- 5- Exceptional work was completed, member excelled, helped others

1.4.2.2 Expectations from team members to receive a CATME rating of 3

- Every member should be present for each scheduled meeting. If a member cannot participate they must communicate to the team.
- Every member should complete quality work in a timely manner.
- Every member should act professional when meeting with a faculty mentor or client.
- Every member should share the workload as evenly as possible and help other members who may have difficulties completing their tasks.
- Every member should dress formally and be prepared for any presentations including knowing the material and participating.

- Every member should be on time for any meetings they can attend and communicate ahead of time of any scheduling difficulties.

1.4.2.3 Team Member Expectations

Team members should attend as many meetings as possible or otherwise be present via WebEx or Zoom. If conflict arises, team members should communicate any conflicts with meetings or project due dates. Failure to do so will result in a low rating in the CATME survey.

1.4.2.4 Faculty Mentor Expectations

Faculty mentor is expected to meet with the team weekly and is responsible for grading gate reports. Also, the mentor should communicate in a timely manner to the team.

1.4.2.5 Customer Mentor Expectations

The customer mentor will meet with the team during the agreed upon schedule to give guidance and advice.

1.4.2.6 Signatures

By signing this document, the team member verifies that they will comply with the rules and meet expectations discussed in the Team Charter for the duration of this project.

Team Signatures

Daniel Isbell 09/24/2020

Nikolas Benton 9/24/2020

Stephen Backscheider 09/24/2020

Krista Bauer 09/24/2020

Joseph Fraseur 09/24/2020

Chad Timmons 09/24/2020

Jacob Cole 09/24/2020

Ian Holmes 09/24/2020

SECTION 2: Project Development Phase

2.1 Exploratory Concepts

In the previous capstone projects, the Vuzix M300 was the model product. Since then, Vuzix has released the Blade, M300 XL, M 400, and M 4000 [12]. Vuzix utilizes bluetooth connectivity along with Wi-Fi capability, voice control, gesture control, and video recording. The devices offer all-day comfort and versatility while also built on a rugged IP67 and drop tested body. Vuzix offers models with stereo speakers and smart glass powered by an 8-core augmented reality processor running on the latest Android OS [9].

The RealWear HMT-1 is another product brought forward by Eli Lilly. The RealWear HMT-1 is a similar product that utilizes augmented reality technology [10]. It also runs on the Android 8.1 operating system, and it is controlled with voice commands. The RealWear HMT-1 is explained in further detail in section 2.3, as this is the product Eli Lilly has decided we will move forward with.

2.2 Requirements Matrix

Below are the requirements matrix for the project. As the project continues, these requirements may change as the client, mentor, or group sees fit. These are basic items the team will address as the project progresses.

The team's initial reference is from the continuation of past capstone projects and from conversations from the client mentor, Brian Good.

Table 1: Requirements Matrix [16]

#	Requirement	Description	Test	Rationale	Source
1	**Speech Recognition**	Basic commands are able to be understood with speech	Demonstration	Scientists need a hands free approach to record data	Previous capstone continuation

		to text kept in mind		and upload results	
2	**Noise Cancelling**	Can still perform with significant outside noise	Demonstration	Equipment must withstand outside noise	Previous capstone continuation
3	**Lilly Platform Capability**	Must be able to link to Lilly's existing technology/cloud	Demonstration /Analysis	Data needs to be securely stored and accessible to whole company	Conversations/meetings with Brian Good
4	**Cost**	Costs are approved as project progresses	Analysis	Cost must be kept in mind in terms of budget	Conversations with Brian Good.. this requirement isn't as high
5	**Encryption**	System requires authentication	Demonstration	Data must be secured for the security of the company	Previous capstone continuation
6	**Comfort Level**	Ability to be worn for long periods of time	Test/Analysis	User must be happy with the fit and weight of the device for	Previous capstone continuation

				amounted time	
7	**Scalability**	Pharmaceutical industry/size of company kept in mind	Analysis	Device must be able to be multiplied throughout user needs	Conversations and meetings with Brian Good.. ability to access anywhere is high on needs

2.3 Detailed Concept Designs

2.3.1 RealWear HMT-1

The RealWear HMT-1 was found to meet the requirements of Eli Lilly more so than other products on the market. The RealWear has proven to be a durable product that is also compatible with 3rd party software, such as Microsoft applications [1]. This product has advanced speech recognition and noise cancelling technologies. The list below outlines some important features of the RealWear device, and why it was chosen by Eli Lilly.

- Size adjustable / left or right eye compatible
- 380 grams in weight
- PPE compatible
- 9-10 hour battery life
- 4 microphones with noise cancellation
- Audio port and speakers
- Micro USB & USB C ports
- Display appears as 7” tablet
- 16 GB internal storage, 2 GB RAM, SD card slot
- Document Navigator, Camera with Barcode Reader, Video Recorder, Media Player
- Compatible w 3rd party software

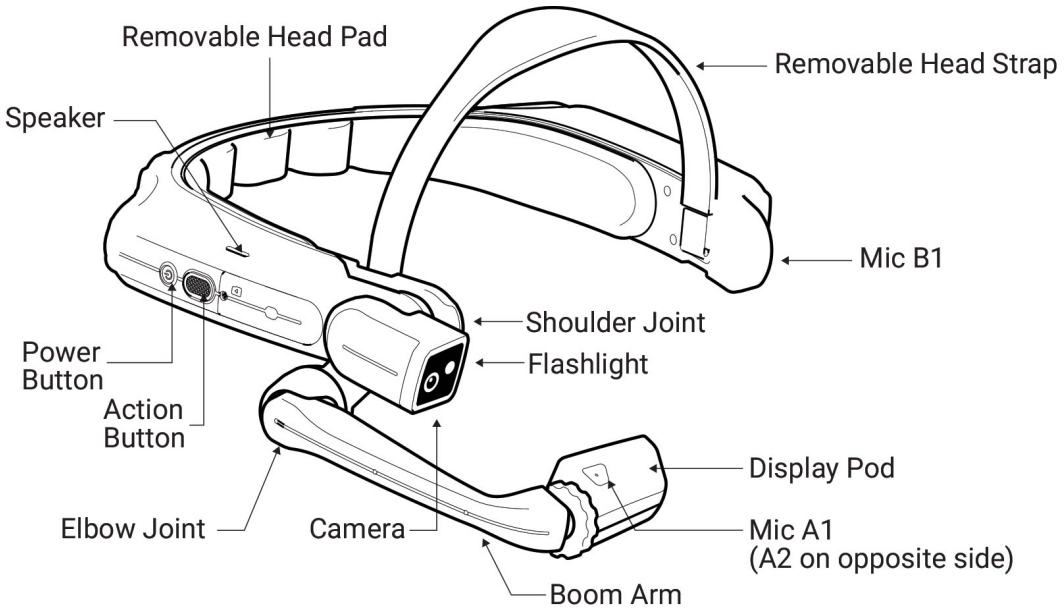


Figure 2.3.1.1 RealWear HMT-1 Diagram [11]

All physical features of the RealWear HMT-1 device can be seen above in Figure 2.3.1. The HMT-1 is worn with the head pad against the back of the user's head, and with the head strap, which is adjustable, going over the top of the head. As it is controlled primarily by voice commands, there are only two buttons on this device. The power button is used to activate the device, and the action button will return the tablet display to the home page. The display pod, as seen in the figure above, should be situated below the users eye, and will display the 7” screen. Above the display pod, at eye level, is the 16 MP camera with flashlight [1].

The capability that the RealWear HMT-1 has that many other competitors do not is its usage with Microsoft Teams. According to RealWear’s website, it has the potential to reduce downtime as well as dependence on handheld devices in dangerous work environments [13]. The person wearing the device can connect to a call from anywhere to resolve any procedure by voice command. An expert can pull up any Microsoft Office 365 document or file and send it to the worker’s micro-display. In real time, the issue can be resolved and can be sent back instantly. To use the Microsoft Teams, a free Foresight account is required [13].

2.3.2 Microsoft Hololens 2

The Microsoft HoloLens 2 was attained per request by Eli Lilly. The Microsoft Power platform is Eli Lilly's preferred digital information platform. The HoloLens 2 is easily integrated to the Power platform. The HoloLens is also compatible with third party applications. The device was requested due to its ease of integration and Eli Lilly's desire to find the most capable and user friendly device on the market.

Display

- Optics: See-through holographic lenses (waveguides)
- Resolution: 2k 3:2 light engines
- Holographic density: >2.5k radiants (light points per radian)
- Eye-based rendering: Display optimization for 3D eye position

Sensors

- Head tracking: 4 visible light cameras
- Eye tracking: 2 IR cameras
- Depth: 1-MP Time-of-Flight (ToF) depth sensor
- IMU: Accelerometer, gyroscope, magnetometer
- Camera: 8-MP stills, 1080p30 video

Audio and Speech

- Microphone array: 5 channels
- Speakers: Built-in spatial sound

Human Understanding

- Hand tracking: Two-handed fully articulated model, direct manipulation
- Eye tracking: Real-time tracking
- Voice: Command and control on-device; natural language with internet connectivity
- Windows Hello: Enterprise-grade security with iris recognition

Environment Understanding

- 6DoF tracking: World-scale positional tracking
- Spatial Mapping: Real-time environment mesh
- Mixed Reality Capture: Mixed hologram and physical environment photos and videos

Compute and Connectivity

- SoC: Qualcomm Snapdragon 850 Compute Platform
- HPU: Second-generation custom-built holographic processing unit
- Memory: 4-GB LPDDR4x system DRAM
- Storage: 64-GB UFS 2.1
- WiFi: Wi-Fi: Wi-Fi 5 (802.11ac 2x2)
- Bluetooth: 5
- USB: USB Type-C

Fit

- Single size
- Fits over glasses

Weight

- 556g

Software

- Windows Holographic Operating System
- Microsoft Edge
- Dynamics 365 Remote Assist
- Dynamics 365 Guides
- 3D Viewer

Power

- Battery life: 2-3 hours of active use
- Charging: USB-PD for fast charging
- Cooling: Passive (no fans)
- Contains lithium batteries

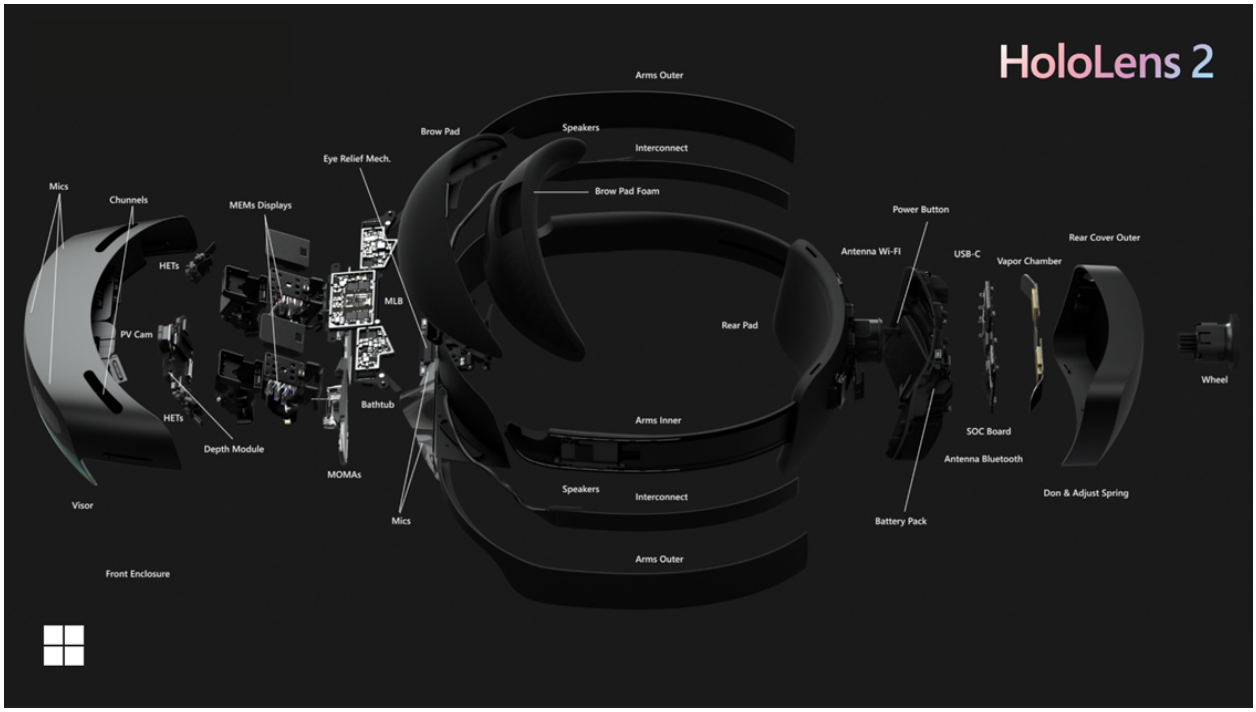


Figure 2.3.2.1 Microsoft HoloLens 2 [15]

All physical features of the Microsoft HoloLens device can be seen above in Figure 2.3.2.1 The HoloLens is worn with the head pad around the user's head, and with the head strap, which is adjustable, going over the top of the head. The device is controlled primarily by gestures so there is only 1 button for power. The power button is used to activate the device, and the action button will return the hologram display to the home page and begin the power on sequence. The display will then guide the user through a retina mapping sequence that will calibrate the device to the user's eyes.

2.4 Critical Issues Identification

After meeting multiple times with our industry mentor from Elil Lilly, we specified a few key issues that our group needed to find solutions to. More than once, we discussed how the previous device, Vuzix, was obsolete that the previous capstone group worked with. Our mentor believes that the market is always changing and improving in the AR type of technology. He even mentioned that once we integrated the RealWear, there may be a chance that it could become obsolete in the near future as well. Another critical issue we found was finding a

compatible device for the specific use at Eli Lilly. Lilly has decided on the platform and technology prior to our group's creation this semester.

Some initial critical issues the group will need to address are learning the RealWear system and its capabilities, learning how to integrate the Microsoft power apps, seeing how data can be pulled from Microsoft Teams and Sharepoint [10], learning the OS, brainstorming testing environments, and researching any additional usage Lilly could use in their laboratories. These may prove challenging, but much research and learning will be vital in the success and completion of these critical issues.

Beyond these critical issues, the group was given a few overarching goals by Lilly in order to complete the project and to be satisfactory. One of the biggest goals is finding and integrating the use of the RealWear technology within the compatible power apps. The team learned that Lilly has company wide compatibility with Microsoft. This includes Microsoft Teams and Microsoft Sharepoint [10]. It is the group's industry contact's hope that the group would be able to integrate the software in these for the optimal capability usage. This will help Lilly share laboratory data among all of their employees and tests. Also, since RealWear is used especially in the manufacturing industry, there is also a goal to find any more uses for the RealWear devices within the healthcare/pharmaceutical industry.

There was also discussion and interest in possibly adding an additional use case to the group project as a whole to find methods RealWear can report or monitor health diagnostics of Lilly professionals using the laboratories. It was also mentioned the hardware could be used in Lilly virtual visits, although this is not Lilly's main priority.

As the project progressed, the team had trouble connecting the RealWear HMT-1 to Purdue's Wifi network at the end of the first semester. Our client also wanted the team to add a second device, Microsoft HoloLens2. For the second semester, the team's first critical issue was making sure both devices could connect to Purdue's Wifi as well as downloading Microsoft Office 365 and SharePoint.

After a meeting with the client, the next phase of the project is focused on creating a power app for data captured by the devices to share to. The power app must be able to share data to Microsoft Sharepoint in order for access to the data anywhere in the network.

SECTION 3: Process/Project Design Stage

3.1 Design Review

The RealWear HMT-1 was the device given to us that Lilly wants to integrate across their company. The RealWear HMT-1 is the world's first hands-free Android tablet class wearable computer for consumers. It can be used in all environments in its state of the art design. It is a fully rugged head-mounted device which can be used on all other personal protective equipment including hats or bump caps. It can be used with safety glasses or corrective eyeglasses. The high resolution micro display fits below the line of sign and views like a seven inch tablet [10].

RealWear-HMT-1 Hardware [9]

RealWear-HMT-1 on User [9]

The HoloLens 2 is a secondary device that we ordered upon Eli Lilly's request. This device is a relatively similar device to the RealWear HMT-1 in that it is also an Augmented Reality wearable device. A major difference between the RealWear HMT-1 and the HoloLens 2 is that the HoloLens 2 does not have a small screen on a moveable arm, rather displaying the data in an almost heads-up display fashion. The heads-up display is projected onto the glasses attached to the headset. The headset contains a microphone and 8 megapixel camera [14].

3.2 Description Refinement

As stated in section **3.1,** the devices already ordered are the devices the group will work with for the project. Since the devices the group is using are specifically selected by

the company client, the processes and design of the product used does not need to be refined at this time. This could change after more testing and researching capabilities the RealWear HMT-1 could bring to the company. The HMT-1 is the device Lilly would like to research more about and how to efficiently use it with their own lab testing data. The Microsoft HoloLens 2 is the device that it will be compared to. It will require additional usage testing and research to see what competitors will be using it for.

3.3 Failure Modes and Effects Analysis (FMEA)

Table 3.3.1: FMEA Analysis

Failure Modes and Effects Analysis (FMEA)										
Step/Part	Potential Failure Mode	Potential Failure Effect	SEV	Potential Causes	OCC	Current Controls	DET	RPN	Recommended Actions	Actions Taken
Voice Dictation	Voice dictation fails and hears background noise	Device unable to meet consumer requirements	5	Software issue	2	Sofware compatibility	2	20	Troubleshoot, make sure software and hardware are being worn correctly	Hardware is worn correctly, device is used in a low noise environment and configured correctly
Microsoft Power App Integration	Unable to connect to Microsoft Power Apps	Important project requirement, goal of the project	9	RealWear apps, user error	4	Software compatibility	4	144	Contact RealWear, research Microsoft integration in devices similar	Contacted campus network (ITap), connected when on campus
Data Analysis	Data processed unable to be shared in network	Lilly users unable to share testing data	7	Software or network issues, user	4	Sofware compatibility, Microsoft integration	3	84	Make sure device is connected to appropriate network, make sure formatting is correct	Should be approved once on Lilly campus
Control Efficiency	Controls are found that are not already currently being used but could potentially help	Lilly not using devices to its potential	5	Lack of knowledge	4	Software compaitibility, knowledge needed	5	100	Research availability in RealWear software, see what competitors can do	Research is conducted through power app integration, IRB/SUS is conducted
Testing Environment	Testing conditions not adequate, fail to show fair results	Testing data not trusted	6	Wrong conditions	1	Testing environements on campus or online	3	18	Strategically test in appropriate conditions to mimic lab testing	Testing conditions are in controlled lab
Record Video	Device unable to complete request	User unable to record video of test	5	Software or network issues, user	2	Sofware compatibility	2	20	Troubleshoot device, make sure it is connected to network, device is worn correctly	Troubleshooted device, device is worn correctly
Open Files	Device unable to complete request	User unable to open files	6	Software or network issues, user	3	Software compatibility	3	54	Troubleshoot device, make sure it is connected to network, device is worn correctly	Troubleshooted device, device is worn correctly
Record Audio	Device unable to complete request	User unable to record audo of a test	4	Sofware or network issues, user	2	Software compatibility	2	16	Troubleshoot device, make sure it is connected to network, device is worn correctly	Troubleshooted device, device is worn correctly
Open Web Application	Device unable to complete request	User unable to open a web application	5	Software of network issues, user	3	Software compatibility	3	45	Troubleshoot device, make sure it is connected to network, device is worn correctly	Troubleshooted device, device is worn correctly

Recommended actions may be added, deleted, and changed as well as severity, likelihood, and detectability. Understanding these steps to test the device will be crucial to receive the best testing results and achieve the goals of the project. Plan of action will be up to group members availability, resources, and time. Since the devices were picked by the client, testing to understand if the device is applicable are not needed. However, the group decided to gather testing data concerned around the usability and feasibility of both devices. Testing conditions will be met during lab time when being tested on other students enrolled

in Purdue Capstone II. A small guide to walk participants through will be provided in order to ensure participants have a head start and guide to complete testing effectively.

3.4 Final Budget

At this point in the project as well as after confirmation from our client mentor from Eli Lilly, there are no real constraints when it comes to our project. Thus far in the project, we have been approved to order two RealWear HMT-1 at $2,500 each and the Microsoft HoloLens 2 at $3,500. As needed, the group will continue adding to our bill of materials. The RealWear device is the main device the project is focused on with its integration to Microsoft applications and Lilly testing data. The Microsoft HoloLens 2 will be used to compare the devices sense competitors are using the HoloLens for much of their integration capabilities.

Table 3.4.1 Cost Table

Qty	Description	Unit Cost	Ext
2	RealWear HMT-1	$2,520	$ 5,040.00
1	Microsoft HoloLens 2	$3,500	$ 3,500.00
			$8,540.00

3.5 Materials and Equipment Procurement

Physical procurement for the project is of no issue for the project. No six week constraint is appropriate for the project since all items are already in use by members. All devices have been ordered, shipped, delivered, and picked up for use by the group. Devices are easily able to be set up by connecting to internet networks once we moved to Heavilon Hall. The group is making progress as the group is able to continue using the devices in the lab and at this time do not see any more additional equipment for the progress of the project.

SECTION 4: Project Deliverables

4.1 Implemented Documentation

For the RealWear HMT-1, our team successfully added five different applications to the device. Those being Microsoft Teams, Office 365, SharePoint, Power Apps, and OneNote. Each of these applications were selected for their ability to be interfaced with the RealWear HMT-1 and their capability of collaborative work sharing.

SECTION 5: Project Testing

5.1 System Usability Study

In addition to the usability comparison, the team conducted a system usability study of ten questions to consented participants. The goal of the study is to capture data from participants in the questionnaire as well as the open ended response questions. The system usability study is added into the appendix of this report.

Testing environment for the usability testing will be completed while in the lab for Purdue students enrolled in Senior Capstone II. The lab is a controlled working environment for students located in Heavilon Hall on campus. Participants will agree to participate in the study at their own discretion. Users will be gathered by members of the team, from students and instructors within ENGT 380/381 and ENGT 480/481.

5.2 User Guide

The user guides, which can be found in the SUS User Guides section at the end of the report, were created for both the Microsoft Hololens and the Realwear HMT-1 in an attempt to make the process of uploading files to Sharepoint as streamlined as possible. Outside users participating in the usability study will be able to clearly follow the instructions and carry out the task given.

5.3 Testing Results

After completing testing, we used the general system usability study (SUS) scale and equations to understand the data. We completed 20 tests with students from Purdue Capstone courses. We took the sum of all of the odd number response questions and subtracted 5 to equal

the X variable. We then took 25 and subtracted the sum of all of the even number response questions to equal the Y variable. To get the SUS score the equation is (X+Y)*2.5.

After calculating, we found that the RealWear HMT-1 had a rating of 55 while the Microsoft HoloLens 2 had a rating of 77.5. On the general scale, this means that the RealWear HMT-1 is considered a grade D and "poor" rating while the Microsoft HoloLens 2 is considered a B and a "good" rating.

5.4 Testing Observations and Conclusions

After reading the feedback and observing the tests, we found that students did not like the small display screen on the RealWear HMT-1. They found that it was hard to adjust to their eyesight or not as efficient as the other device. However, they enjoyed the quicker set up of the device overall. It was easy to understand what commands needed to be said for the process. The voice commands worked about 90% of the time during the tests.

Feedback from the Microsoft HoloLens 2 included that the students like the interactiveness with the system. It was faster to load files and had a much bigger display compared to the RealWear HMT-1. Students also liked how there was a mic of voice and touch commands for the device. Some feedback we received include that there was a learning curve when it came to seeing the holograms in the head set view. It took some adjusting to the device. Also, the device had to be calibrated for each new user. Overall, this device was more user friendly and faster for the process given to them. If we were to do this study again, we would like to have had a larger sample of testees. This could also include a more diverse pool of age groups and background since this study was only with students at Purdue University.

SECTION 6: Project Management

6.1 Project Schedule

This section covers the project schedule and the milestones we have reached to this point. The initial table displays major events accomplished to date. Below this, is a more detailed Gantt Chart. The Gantt Chart outlines the project schedule through the end of Gate 6 and provides a timeline that includes task durations and completion percentage.

Table 6.1.1: Important Dates Project Schedule

Description	Date	Notes
Meeting with Industry Sponsor *3:30PM*	Wednesday, 10/1/2020	First meeting with Brian, learned about his background with Eli Lilly, goals for the project, went over few requirements
Meeting with Academic Mentor *4:30 PM*	Wednesday, 10/7/2020	Learned more about last year's projects and discussed background information as well as goals for this year's project.
Email sent to Brian	Thursday, 10/8/20	Asked about weekly meeting times and Bill of Materials information
Gate 1 Report Due *Deadline 11:59 PM*	Friday, 10/9/2020	Roles assigned to all group members. Project scope defined.
Gate 1 CATME Due *Deadline 11:59 PM*	Monday, 10/12/2020	CATME sent via email
Meeting with Envision Center *9:00 AM*	Wednesday, 10/14/2020	Introductions with Envision Center for technology guidance
Meeting with Academic Mentor *4:30 PM*	Wednesday, 10/14/2020	Guidance and feedback from Gate 1 report, discussing next steps for project
BOM submitted	Friday, 10/16/20	Emailed to Sally for approval and order
Device ordered	Monday, 10/19/20	Approved for funding and device ordered
Meeting with Academic Mentor *4:30 PM*	Wednesday, 10/21/2020	Guidance on HW 8, scheduled practice time on 10/26/2020, planned presentation slides.
Meeting with Industrial Sponsor	Thursday, 10/22/2020	Priority is to connect the device to Microsoft platform.

3:30 PM		
Meeting with AcademicMentor *3:30 PM*	Moday, 10/26/2020	Practiced Gate 2 presentation.
Meeting with Academic Mentor *4:30 PM*	Wednesday, 10/28/2020	Gate 2 Presentation
RealWear Device is delivered	Thursday, 10/29/20	Devices are delivered to camps and picked up by team

Meeting with Academic Sponsor *4:30 PM*	Wednesday, 11/4/2020	Weekly meeting with Prof. Berry. Assigned responsibilities for Gate 2 report.
Gate 2 Report Due *Deadline at 11:59 PM on Brightspace*	Monday, 11/9/20	Design and critical issues are major topics
Gate 4 Report Due and Lab Bench Demo	Tuesday, 02/02/21	Demonstrate that we got connected to Wifi on both Hololens 2 and HMT-1
Gate 4.5 Report Due and Lab Bench Demo	Tuesday, 02/23/21	Demonstrate most relevant information towards connecting devices to Microsoft Powerplatform
Gate 5 Report Due and Lab Bench Demo	Tuesday, 03/23/21	Demonstrate most relevant information towards connecting devices to Microsoft Powerplatform
Gate 6 Draft Report Due	Tuesday, 04/20/21	Submit a semi-complete version of final report
Tech Expo	Thursday, 04/29/21	Present our final solutions to the project
Gate 6 Report Due	Tuesday, 05/04/21	Submit edited project report

6.1.2 Gantt Chart

Eli Lilly Capstone

Team 9.1

https://www.vertex42.com/ExcelTemplates/simple-gantt-chart.html

Project Start: Sun, 9/20/2020

Display Week: 1

TASK	ASSIGNED TO	PROGRESS	START	END
Gate 1		100%	9/20/20	10/9/20
Annotated Bibliographies		100%	9/20/20	9/21/20
Roles & Responsibilites/ Problem Statement		100%	9/21/20	9/28/20
Introduction w/ Brian Good		100%	10/1/20	10/1/20
Meeting w/ Academic Mentor		100%	10/7/20	10/7/20
Scope Defined / Requirements Matrix		100%	10/7/20	10/9/20
Gate 1 Submission		100%	10/9/20	10/9/20
Gate 2		100%	10/10/20	11/1/20
Meeting w/ Envision Center		100%	10/14/20	10/14/20
Meeting w/ Academic Mentor		100%	10/14/20	10/14/20
BOM Submitted for RealWear HMT-1		100%	10/16/20	10/16/20
HW 8 - Product Analysis		100%	10/18/20	10/21/20
Meeting with Brian Good		100%	10/21/20	10/21/20
Meeting with Academic Mentor		100%	10/21/20	10/21/20
Prepare Presentation		100%	10/21/20	10/26/20
Practice w Academic Mentor		100%	10/26/20	10/26/20
RealWear HMT 1 Received		100%	10/27/20	10/27/20
Gate 2 Presentation		100%	10/28/20	10/28/20
Gate 2 Report Submission		100%	11/1/20	11/1/20
Gate 3		100%	11/2/20	12/12/20
Product Analysis		100%	11/2/20	12/1/20
Meeting w Academic Mentor		100%	11/4/20	11/4/20
Meeting w Brian Good		100%	11/5/20	11/5/20
Software Testing		100%	11/10/20	12/1/20
Hardware Testing		100%	11/10/20	12/1/20
Ordered Holo Lens		100%	11/19/20	11/19/20
Gate 3 Presentation		100%	11/10/20	12/9/20
Gate 3 Submission		100%	12/12/20	12/12/20

Eli Lilly Capstone

Team 9.1

https://www.vertex42.com/ExcelTemplates/simple-gantt-chart.html

Project Start: Sun, 9/20/2020

Display Week: 20

TASK	ASSIGNED TO	PROGRESS	START	END
Gate 4		100%	1/19/21	2/23/21
Testing of HoloLens		100%	1/19/21	2/1/21
Continue tests with RealWear		100%	1/19/21	2/1/21
Gate 4 report due		100%	2/1/21	2/2/21
Lab Bench demo		100%	2/1/21	2/2/21
Gate 4.5 due		100%	2/23/21	2/23/21
Gate 5		100%	2/23/21	3/23/21
Gate 5 report due		100%	3/23/21	3/23/21
Lab Bench demo		100%	3/23/21	3/23/21
Gate 6		15%	3/23/21	5/4/21
System Usability Study		25%	3/23/21	4/9/21
Gate 6 draft due		0%	4/20/21	4/20/21
Tech Expo		0%	4/29/21	4/29/21
Gate 6 report due		0%	5/4/21	5/4/21

6.2 Plan to Resolve Critical Issues

The team has created a few strategy components to attain the goals and issues of the team. First, we ordered the RealWear HMT1 and received confirmation on the order. The team also received the shipment and are now in the process of assembling the hardware. The team has also gained mentorship from the Purdue Envision center in hopes of receiving expertise in terms of the usage and start up especially in the software component. The team has met with them once and are planning another soon.

Some steps and resources the team will use to resolve the critical issues outlined in **Section 2.4** include retaining and working with our partnership with the Purdue Envision center to help our team understand software and testing with the RealWear HMT-1. The team has received the hardware and will start implementing and researching how to integrate the Microsoft components Eli Lilly has asked for. When issues or conflicts arise before gate 3, the team may need additional assistance from the RealWear tech support or from other Purdue project groups also using AR systems in their projects. The team believes all experience and expertise will be helpful in the success of the project.

The biggest thing the group will do in resolving the critical issues will be hands on experimentation with the device. This includes assembly and getting acquainted with how it works. The team will also need to start brainstorming possible testing environments and test constraints when feasible. This brainstorm period will begin in the coming weeks before the due date of Gate 3 to set the team up for next semester as well.

After coming back to campus for the second semester, one of the largest critical issues needed to be dealt with was connecting the RealWear HMT-1 to Purdue's Wifi. We found that switching our lab location to Heavilon Hall on campus would solve this issue through contacting Purdue's ITAP and ECN. The group was able to successfully connect the device to Purdue's Wifi network.

The group was also given the task to also incorporate a new device, the Microsoft HoloLens 2, to the project. The priorities we need to focus on given to us from our client include finding a way to connect the HMT-1 to Microsoft Office 365/SharePoint, connect the Microsoft HoloLens 2 to Microsoft Office 365/SharePoint, and completing a comparison/contrast of functionality of the two devices.

The next set of critical issues the team has found is the next requirement of capturing and

storing data with both the HMT-1 and HoloLens 2. The team has to create a power app through Microsoft Sharepoint. The data captured from the devices will then be moved from the device to the power app and ultimately Sharepoint. Once the data is connected to Sharepoint, the person using the data should be able to access it from Microsoft Teams.

6.3 Demonstrated Solved Critical Issues

As explained in **Section 6.2**, the RealWear HMT-1 will require lots of hands-on experience as well as guidance from the Purdue Envision center, Purdue Engineering Computer Network (ECN), Information Technology at Purdue (ITaP), and RealWear tech support. With all of this support and the team's motive to research the RealWear HMT-1 extensively, there have already been some critical issues solved.

Upon receiving the device, the team figured out how to record audio and video as well as how to access these files by the first day of testing. Doing this results in saying commands and using head gestures to explore the device's dashboard with all of its features on display. The team has contacted Purdue's ECN and ITaP to connect to PAL3.0 which is the WiFi that students have access to use anywhere on campus. Connecting to PAL3.0 with the RealWear HMT-1 has been difficult since the firewall will not allow connection to the device. Purdue's ECN and ITaP set up a connection for our device by retrieving our MAC address of the device. By having this we were allowed to use a feature called PAL Gadgets which allows the RealWear HMT-1 to connect to PAL3.0 in our designated lab testing room. Now that we have internet access the team can start researching how to integrate Microsoft components that Eli Lilly has asked for.

With the Wifi connection, the group will now continue figuring out a way to download Microsoft Office 365 and SharePoint to the HMT-1 and HoloLens 2. The HMT-1 requires an APK file to be downloaded to the headset through RealWear Foresight while the Microsoft HoloLens 2 requires a download of an app called Microsoft Dynamics 365.

The team plans on using the Power App website and YouTube tutorials to create the power app to be used to capture the data and store. As mentioned in **Section 6.2,** the process of capturing and storing data will be solved once demonstrated with the power app.

References

[1] RealWear. 2020. MicrosoftTeams-Realwear. [online] Available at: <https://realwear.com/solutions/microsoft-teams/?hsCtaTracking=b2171303-29a4-4c4e-8e88-a9 841f4df1d7%7C4485d740-c9cc-410c-a74f-7bc8dccf11a0> [Accessed 9 November 2020].

[2] M. I. Dangerfield, K. Ward, L. Davidson, and M. Adamian, "Initial Experience and Usage Patterns With the Owlet Smart Sock Monitor in 47,495 Newborns," *Global Pediatric Health*, vol. 4, p. 2333794X1774275, Jan. 2017, doi: 10.1177/2333794X17742751.

[3] Seshadri, D., Li, R., Voos, J., Rowbottom, J., Alfes, C., Zorman, C. and Drummond, C., 2019. *Wearable Sensors for Monitoring the Physiological and Biochemical Profile of the Athlete*. [online] Available at: <https://doi.org/10.1038/s41746-019-0150-9> [Accessed 17 September 2020].

[4] J. C. -, By, -, and J. Carfagno, "5 New and Emerging Wearable Medical Devices," *Docwire News*, 20-May-2020. [Online]. Available: https://www.docwirenews.com/docwire-pick/future-of-medicine-picks/top-5-wearable-medical-devices/. [Accessed: 21-Sep-2020].

[5] T. M. M. J. D. Sumit Majumder, "Wearable Sensors for Remote Health Monitoring," Department of Electrical and Computer Engineering, McMaster University, Hamilton, ON L8S 4L8, Canada, 12 January 2017. [Online]. Available: https://www.mdpi.com/1424-8220/17/1/130/htm. [Accessed 20 September 2020].

[6] A. Steger, "Weighing the Pros and Cons of Wearable Health Technology," *Technology Solutions That Drive Healthcare*, 01-May-2019. [Online]. Available: https://healthtechmagazine.net/article/2020/04/weighing-pros-and-cons-wearable-health-technology-perfcon. [Accessed: 21-Sep-2020].

[7] C. Pitre, K. Pettit, L. Ladd, C. Chisholm, and J. L. Welch, "Physician Time Management," MedEdPORTAL : the journal of teaching and learning resources, 14-Feb-2018. [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6342364/. [Accessed: 19-Sep-2020].

[8] Farr, C., 2020. *Amazon Unveils Halo To Battle Apple Watch And Fitbit — Tracks Activity, Body Fat, Emotions*. [online] CNBC. Available at: <https://www.cnbc.com/2020/08/27/amazon-hal-wearable-tracks-activity-body-fat-emotions.html> [Accessed 19 September 2020].

[9] Vuzix, "Vuzix Products," *Vuzix*. [Online]. Available: https://www.vuzix.com/products. [Accessed: 01-Oct-2020].

[10] RealWear, "RealWear Means ROI," *RealWear*, 05-Nov-2020. [Online]. Available: https://www.realwear.com/. [Accessed: 09-Nov-2020].

[11] Home - Configure RealWear HMT. (n.d.). Retrieved November 09, 2020, from https://realwear.setupmyhmt.com/configure/guide/hmt-1

[12] Vuzix, "Vuzix is a Leading Developer of Smart and Augmented Reality Glasses," *Vuzix*. [Online]. Available: https://www.vuzix.com/. [Accessed: 10-Nov-2020].

[13] RealWear, "Microsoft Teams for RealWear," *RealWear*, 04-Nov-2020. [Online]. Available: https://www.realwear.com/solutions/microsoft-teams/. [Accessed: 10-Nov-2020].

[14] "Microsoft HoloLens: Mixed Reality Technology for Business," *Microsoft HoloLens | Mixed Reality Technology for Business*. [Online]. Available: https://www.microsoft.com/en-us/hololens. [Accessed: 08-Dec-2020].

[15] Microsoft , "HoloLens 2-Overview, Features, and Specs: Microsoft HoloLens," -*Overview, Features, and Specs | Microsoft HoloLens*, 2021. [Online]. Available: https://www.microsoft.com/en-us/hololens/hardware. [Accessed: 28-Jan-2021].

[16] B. Good, "Capstone Meetings" -*Microsoft Teams*. [Meeting]. [Occurred 2020-2021]

Appendices

SUS Questionnaires

		Strongly Disagree 1	2	3	4	Strongly Agree 5
1	I think that I would like to use the **RealWear HMT-1** frequently.					
2	I found the **RealWear HMT-1** to be simple.					
3	I thought the **RealWear HMT-1** was easy to use.					
4	I think that I could use the **RealWear HMT-1** without the support of a technical person.					
5	I found the various functions in the **RealWear HMT-1** were well integrated.					
6	I thought there was a lot of consistency in the **RealWear HMT-1**.					
7	I would imagine that most people would learn to use the **RealWear HMT-1** very quickly.					
8	I found the **RealWear HMT-1** very intuitive.					
9	I felt very confident using the **RealWear HMT-1**.					
10	I could use the **RealWear HMT-1** without having to learn anything new					

		Strongly Disagree 1	2	3	4	Strongly Agree 5
1	I think that I would like to use the **Microsoft HoloLens 2** frequently.					
2	I found the **Microsoft HoloLens 2** to be simple.					
3	I thought the **Microsoft HoloLens 2** was easy to use.					
4	I think that I could use the **Microsoft HoloLens 2** without the support of a technical person.					
5	I found the various functions in the **Microsoft HoloLens 2** were well integrated.					
6	I thought there was a lot of consistency in the **Microsoft HoloLens 2**.					
7	I would imagine that most people would learn to use the **Microsoft HoloLens 2** very quickly.					
8	I found the **Microsoft HoloLens 2** very intuitive.					

9	I felt very confident using the **Microsoft HoloLens 2**.					
10	I could use the **Microsoft HoloLens 2** without having to learn anything new					

Interviews

Undergraduate SoET students will be interviewed in person and asked the following two open ended interview questions.

- What was your favorite feature of the RealWear HMT-1? Least favorite? Why?
- What was your favorite feature of the Microsoft HoloLens-2? Least favorite? Why?
- If you were to capture a process or task, which device are you more likely to pick? Why?

Security Plan

All data collected will be in paper/hard copy form with no identifiable data recorded about the undergraduate SoET students. In addition, all data and records will be kept under lock and key with controlled access. Only the PI and the capstone team members will have access to the date. Also, once the research is completed all data will be destroyed by January 2022.

Analyze Down Time Records

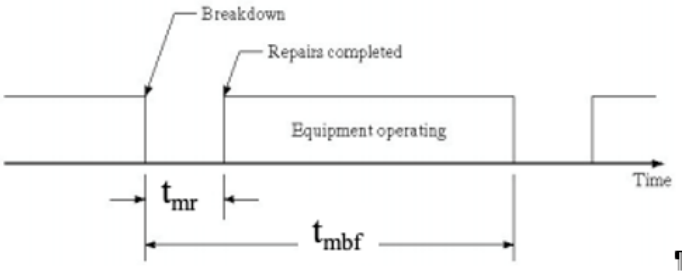
The mean time between failures and mean time between repairs will be utilized to determine the students' ability to use the RealWear HMT-1 and the Microsoft HoloLens 2 mixed reality systems, pre and post implementation.

$$A = 100\% - \frac{t_{mbf} - t_{mr}}{t_{mbf}}$$

$$A = Availability$$

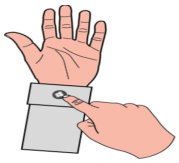
$$t_{mbf} = Mean\ Time\ Between\ Failures$$

$$t_{mr} = Mean\ Time\ Between\ Repair$$



SUS User Guides

Microsoft Hololens Participant Instructions

1. Put on headset
2. Open “My Camera” seen on home screen.
3. Take a photo of the document on the wall
4. Navigate back to home screen
5. Open Microsoft Edge 
6. Select the favorites icon 
7. Select “Eli Lilly 2”
8. Upload previously taken photo to the power app by opening attach file and finding in “Photos”
9. Click the “View Recent Uploaded File Button” to ensure the file selected is yours
10. Navigate back to the home screen
11. Power the Device OFF
12. Wipe down the headset and package
13. Place the Hololens 2 back in the box

RealWear HMT-1 Participant Instruction

1. Unbox the Device
2. Put the headset on
3. Adjust the device until the full screen is visible
4. Open device camera by saying “My Camera”
5. Take a Photo of the document on the wall
6. Say “Navigate Home” to the navigate to the home screen
7. Open device programs by saying “My Programs”
8. Open PowerApps by saying “Power Apps”
9. Select Eli Lilly 2 by saying “Eli Lilly 2”
10. Upload the photo you took to the Power App by saying “Attach File”, “ Browse”, “My Photos”, “Camera” and then selecting your photo.
11. Select the the View Recent Uploaded File Button by saying “View Recent Uploaded File Button”to ensure the file selected was yours
12. Navigate back to the home screen by saying “Navigate Home”
13. Take the Headset off

14. Wipe down the headset
15. Place the RealWear-HMT1 back in boxes

Meeting Minutes

10/1/20
Meeting with Industry Contact - Brian Good

- Background by Brian
- Introductions by the team
- Goals for project
- Requirements

10/7/20
Meeting with Professor Berry

- Learned more about last year's project
- Background information and goals for this year's continuation

10/14/20
Meeting with Envision Center

- Introductions
- Asked about our goals and requirements
- Where is this project going?
- What are we focusing on?

10/14/20
Meeting with Professor Berry

- Guidance about Gate 1 Report
- Feedback, and regrading for report
- Discussing next steps for project
    - BOM, HW8, oral presentation

10/21/20
Meeting with Professor Berry

- Finish HW8
- Group is available after 3:30pm Monday, October 26, 2020 for practice presentation
- Start on presentation October 22, 2020
- Figure out what to ask the Envision Center
- Questions/clarifications to ask Brian Good for next meeting
- Presentation slides finished by Sunday, October 25, 2020

10/22/20
Meeting with Industry Contact - Brian Good

- #1 Priority - Connect the RealWear device with information infrastructure (Software)
    - All Microsoft
        - Office 365
        - Power Apps
        - SharePoint (Data)
        - Azure
    - Share information on SharePoint to Microsoft Teams
- #2 Priority - Figure out what the RealWear hardware can do
    - Health Monitoring (Lab Scientists)
    - Temperature Monitoring
    - Static electricity to change the device
    - Extend battery life
- Other Notes from meeting
    - How does the pharmaceutical products react to temperature, heat, light
    - Maybe split into 2 different groups? (Hardware and Software)
        - Brian said this can be a long term plan if need be
    - Eli Lilly is flexible on ideas that can be useful for them

10/26/20
Practice Presentation with Professor Berry

- Add slide numbers
- Add citations for images
- Create gantt chart for Design Plan/Schedule

10/28/20
Presentation Day at 4:30 via Webex
Everyone was in attendance

11/4/20
Weekly meeting with Professor Berry

- Will send copy of Gate 2 to him by Thursday night

Assigned parts of report to finish to group members
Discussed plan for 11/5 lab meeting to start building

11/11/20
Weekly meeting with Professor Berry

- Create a draft for the Purdue IRB in appendix for gate 3
- Create a demo before next Wednesday's meeting
    - Use RealWear and figure out as much of its capabilities
- Meet with envision center before next Wednesday
- Contact ECN
- Contact tech support for RealWear HMT-1
- Figure out one more date to meet with professor berry weekly
- Figure out date to present gate 3 oral presentation

11/18/20- weekly meeting with Berry

- Gate 3 presentation date changed to Nov 30 at 11:30
- Send email to try to get device connected to the wifi at Purdue
- What else could we show?
    - Voice commands only picked up the user's voice
    - Open up settings and menu
    - Bluetooth capability
    - Record video and how to open the video (this will be detailed design)
        - Each one is a slide
        - Good to take a little video of each with 2-3 bullets
- System design
    - You present and talk about the features, presenting the goggles only
    - Already in gate 2 report (the picture)

- Practice presentation sometime next week maybe saturday or sunday or sometime
    - Send Prof. Berry slide deck before practice presentation

- WBS
- Things that need to be tested
    - Page 20- a good start in the old report FMEA
    - Each one of the things we talked about needs its own line
    - IRB
    - SUS (system usability scale)
    - Get this to berry for him to build it out

1/28/21

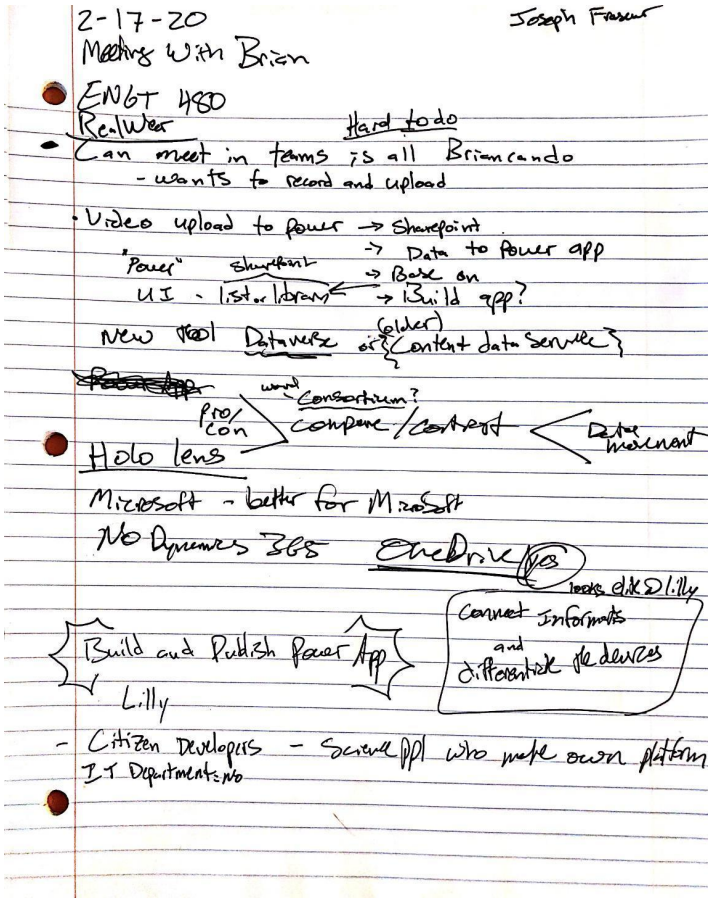
- Trouble shoot HMT-1 to get account set up
- Start on Revising Gate 4
- Assign rest for group members not present today
- Download software for HoloLens

2/4/21 - Bench Demo

- Conducted Bench Demo of HoloLens and HMT-1
    - Microsoft Teams
    - Microsoft Office Suite
    - Confirmed General Function of Products

2/17/21 - Meeting with Brian Good

- Determined the current direction for the project



- What needs to be done
    - IRB
    - Working on File Sharing
    - Work on Gate 4.5

2/18/21

- Gained access to files for IRB
- Continued working on Gate 4.5
- Created Microsoft Teams group for file sharing testing
- Began testing on Microsoft Power Apps

2/23/21

- Worked on Gate 4.5 report
- Start researching how to create power app
- Gate 4.5 Bench Demo
- Completed and Returned IRB forms to Berry

3/12/21

- Virtual Meeting with Brian Good on project direction

3/23/21

- Gate 5 Bench Demo

3/25/21

- Received notice to revise our IRB submission