

February 20, 2019

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Re: ENSC 405W/440W Requirement Specification for a Minute Taker Device

Dear Dr. Scratchley,

In the attached document, you will find the *Requirement Specifications for an Autonomous Minute Taking Device MeetAssist* as our Capstone Engineering Science Project. The Lazy Tech team is constructing an AI-powered minute taking a device that will capture meeting minutes, resolve the problem of identifying the speaker and provide a web application interface that creates a wholesome user experience with analytics and reports.

This document's purpose is to provide general system requirements, hardware requirements and software requirements that would make the project successful. All requirements will be elaborated in different phases of product development: proof of concept, prototype and final product.

Lazy Tech consists of five final-year engineering students each with industry experience and specializing in various concentration from Electronic Engineering, Computer Engineering, to System Engineering: Vanshaj Kochar, Sarthak Sood, Arghavan Nassiri, Yagnik Vadher and Rafiul Islam. This document will be heavily relied upon during the design considerations and various development phases of our product. Should you have any questions regarding our requirement specifications, please contact our Chief Communication Officer at anassiri@sfu.ca.

Sincerely,



Yagnik Vadher
Chief Executive Officer
Lazy Tech

Enclosure: *Requirement Specifications for an Autonomous Minute Taking Device*



Requirements Specification

MeetAssist

Meetings Evolved

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Issue Date

February 24th, 2019

Revision

1.0

Abstract

In the enterprise world, corporation has put a large significance on meetings where key decisions determine the future of organizations. The National Statistics Council claims that 37% of an employee's time is spent in meetings and 47% of employees consider the meetings a waste of time [1]. Various reasons behind these unproductive meetings have been identified, namely the lack of a summary of the meeting, identifying a proper conclusion and sudden change of discussions with no arrangement of predetermined speakers.

Despite various solutions existing in the market, none provide the meeting attendees with a centralized web application interface that provides real-time transcription of the meetings along with a summary and analytics on team engagement. Furthermore, the problem with identifying speakers during a meeting still remains, causing inconsistent discussions. Such a lack of a comprehensive design has left a gap in the market to fill.

Lazy Tech intends to fill this gap by prototyping a solution that composes of hardware and software which will work seamlessly with one another. The hardware will consist of microphone clips designed to smoothly interact with a central hub that connects to a cloud server through an internet connection. This is where Lazy Tech's cutting edge software will process audio data gathered from hardware to display real-time transcription and recording the meeting on cloud storage. The largest software component will be the web application that provides a graphical user interface for the user to review meeting notes, summary and analytics.

This requirement specification document will not only clarify the requirements for hardware and software components but will further expand on engineering standards, safety and sustainability measures that the Lazy Tech team will consider during development. Starting with the clip and the hub, all hardware and physical requirements will be addressed. Software requirements will expand on audio processing, cloud technology and the web application. Lazy Tech aims to meet all requirements and provide a superior experience to meeting attendees who want to bring their meetings to a high level of productivity and to understand where their meeting productivity is going.

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1 Introduction/Background

Last decade has been undoubtedly great for the artificial intelligence and wearable Internet of things technologies. Lots of application of Artificial intelligence and Internet of things have been developed to solve complex problems. As a result, Lazy tech introduced “MeetAssist”, an application of the Internet of things and Artificial intelligence that aims to achieve high productivity and efficiency in the meetings.

To date, meetings are not evolved very much over time and have been the key component of human development and teamwork. Meetings are neither recorded, nor stored in the most efficient way. There exists a manual process where a dedicated person writes meeting notes or meeting conversation. Also, individually choose to write their own notes on the important topics. This process could vary based on the nature of the meeting. In short, there is a huge need for automating a process of writing meeting minutes and share it across a team. To make meetings more efficient and productive, Lazy Tech’s product MeetAssist will autonomously record the meetings and provide meeting minutes. In fig 1.1, a high-level behavioural overview has given.



Fig 1.1 High-level behavioural Overview

As depicted in fig 1.1, *MeetAssist* does a three-step process to achieve the main deliverables. First one being, recording the audio of meeting from each individual with user recognition. Second step is to analyze these meetings audio, convert it to text and run summarizer to create meeting minutes. Third step is to display the results in the highly configurable, editable and most user comfortable way possible by the means of the web application (web app).

This document will outline and describe the requirement specification for achieving this functionality. These specifications will be organized into the following categories.

1. Product requirements (Section 3)
 - MeetAssist’s product requirements are presented. Detailed requirements for individual product component is listed.
2. Engineering Standards (Section 4)
 - Lists and explains the engineering standards that Lazy Tech will comply with in order to be considered for client utilization.
3. Sustainability and Safety (Section 5-6)
 - Describes the requirements related to sustainability and safety of the device. It discusses the cradle-to-cradle cycle of the product.

1.1 Scope

It is the expectation of this document to indicate the individual necessities of MeetAssist product and also its consistency with Engineering Standards and endeavours towards Sustainability/Safety. Furthermore, these documents aim to provide overall product deliverables in specific stages such as proof of concepts, prototype stage and final product stage.

1.2 Intended Audience

This document is intended to be a guideline during the development stages of Product MeetAssist for Lazy Tech members, potential clients/partners, Dr. Craig Scratchley, Dr. Andrew Rawicz and teaching assistants. The hardware and software engineers of the project can use this document as a reference at any time during the development and/or testing stages of the product.

1.3 Requirement Classification

For consistency purposes, this document will adopt the following scheme:

Req {Section}.{Subsection}.{Requirement Number}–{Design Stage}

The different design stages and their corresponding coding schemes are outlined in the Table below.

| Requirement Scheme | |
|--------------------|------------------------|
| Coding Scheme | Design Stage |
| PC | Proof Of Concept (PoC) |
| PT | Prototype |
| FP | Final Product |

Fig 1.2 Requirement Scheme

For example, the first functional requirement of section 4.1 corresponding to the Prototype design stage will be labelled as

Req 4.1.1-PT

Requirements are classified into the following parts.

1. General Requirements
2. Hardware requirements
3. Software requirements

Above categories will allow the team Lazy Tech to realize the full picture of the product in the most convenient way.

2 System Overview

MeetAssist consists of three main components: the Hub, Clips and web portal. Fig 2.1 shows the overall product design.

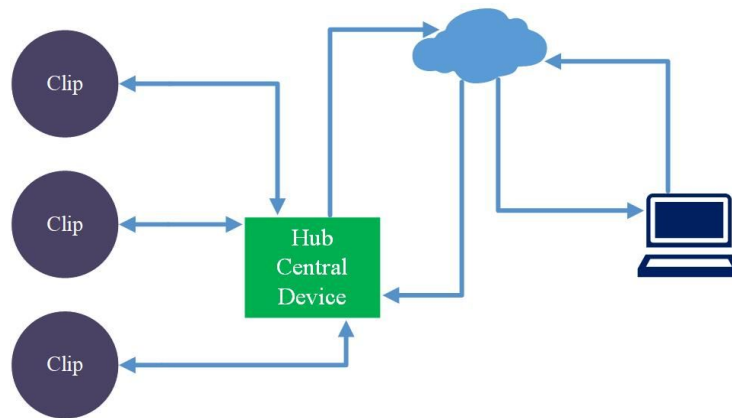


Fig 2.1 Product overview

Clips are the devices that are responsible to record the high-quality audio and transmit to the device namely the Hub. The hub is platform and device which is responsible to collect all the recordings from the clips and send it to cloud in real time. The third component is the web portal. It serves the platform where everyone can see the meetings or project manager could edit, make changes and access other features. All the communication is bidirectional and therefore it should utilize the minimum throughput and provide real-time data transfer. Following figure 2.2 shows the expected look for the clip and the hub device.



Fig 2.2 Clip (Left) and the Hub (Right)

2.1 Clip

This clip is a device that consists of a microcontroller, microphone and BLE(Bluetooth low energy) module with a small battery which main task is to record high-quality audio and transfer over the BLE(Bluetooth low energy). Reason for choosing the BLE is low power consumption. The overall design for the clip is described in fig 2.3 which will serve the solution for the problem statement.

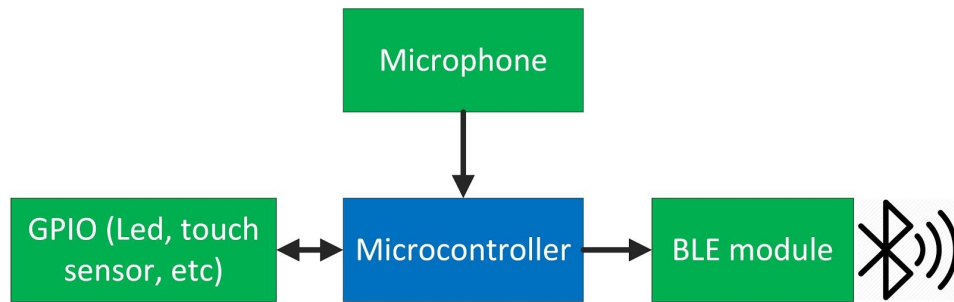


Fig 2.1.1 Clip system overview

2.2 The Hub

The Hub is a central device which connects two of the component. It connects to the hub via BLE and connects to web portal via the Internet. It serves as a communication medium. Hub is expected to be a mini computer capable of delivering expected requirements.

2.3 Web portal

The web portal is the user-centric product which displays the final outcomes of the meeting minutes, gives an editable and highly configurable platform for meeting management. It provides many features like summarizing, meeting sentiment analysis and so on. The web portal includes most of the standard meeting management features digitally.

3 System Requirements

3.1 General requirements

General requirements are the high-level requirements which target the main solution to the problem. These are the requirements that cover all other sub-requirements. Also, the requirements listed here are core requirements and additional features are mentioned in a particular section.

3.1.1 Functional general requirements

| Requirement ID | General Functional Description |
|----------------|--|
| Req 3.1.1.1-PT | Clip must record meeting minutes audio with sensitivity up to 105 db |
| Req 3.1.1.2-PT | Clip must transmit recordings to the Hub via Bluetooth low energy |
| Req 3.1.1.3-PT | Hub must connect with clip and receive data via Bluetooth low energy |
| Req 3.1.1.4-FP | Hub must transmit data over the internet to cloud for analytics |
| Req 3.1.1.5-PC | Software must be able to do speech to text transcription |

| | |
|----------------|--|
| Req 3.1.1.6-PT | Cloud services must translate audio recording to text |
| Req 3.1.1.7-FP | Cloud services must open up REST apis to public on authentication |
| Req 3.1.1.8-PT | Web portal must display meetings transcription |
| Req 3.1.1.9-FP | Web portal must have a user interface (UI) for editing meeting notes |

Table 3.1.1 A list of General Functional Requirements

3.1.2 Non-functional General requirements

| Requirement ID | General Non-functional Description |
|----------------|---|
| Req 3.1.2.1-FP | Clip shall be a wearable device that could be clipped on shirt or t-shirt |
| Req 3.1.2.1-F | Clip battery shall last more than 2 hours |
| Req 3.1.2.2-FP | Clip shall be of a size 60mm in all dimensions or less |
| Req 3.1.2.1-PT | Hub shall be powered by the power adapter |
| Req 3.1.2.3-PT | Hub shall connect to wifi with user wifi credential |
| Req 3.1.2.4-FP | User shall have a modern web browser |

Table 3.1.2 A list of Non-functional General Requirements

3.2 Physical requirements

In this section, we have listed the physical requirements of the hardware product namely Clip and hub. Requirements are separated into two sections: Hub and clip for the better readability and convenience.

3.2.1 Hub Physical requirements

| Requirement ID | Hub Physical Description |
|-----------------|---|
| Req 3.2.1.1-FP | Hub shall be of a size 90 mm × 90 mm, excluding protruding connectors |
| Req 3.2.1.2-PC | Hub shall have convenient power connector port |
| Req 3.2.1.3-FP | Hub shall not weigh more than 400gm |
| Req 3.2.1.4 -FP | Hub shall be fabricated with ESD free material |

Table 3.2.1 A list of Hub Physical Requirements

3.2.2 Clip Physical requirements

| Requirement ID | Clip Physical Description |
|----------------|---|
| Req 3.2.2.1-FP | Clip shall be fabricated by ESD free material |
| Req 3.2.2.2-FP | Clip must weigh under 50 gms |
| Req 3.2.2.3-FP | Clip shall have button to power on and off device |

Table 3.2.2 A list of Clip Physical Requirements

3.3 Software Requirements

Software plays a major part in the success of the product. It is of utmost significance that the end user has not only a user-friendly experience with the product but can find the value in using the various features offered on the software level. The requirements in this section of the report are consideration by our software team whom will need to consider the development of the software for processing audio input. The software team will further focus on familiarizing themselves with open-source or low-cost cloud solutions that are available to develop a robust web application. The web app should be capable of real-time recording and transcription of multiple speakers' audio in a single meeting while also providing history of recordings in a well-designed Graphical User Interface (GUI).

To achieve such high level of user experience, a smooth user flow must be researched, studied and tested. This likely will require the team to develop multiple iterations of the software. From proof of concept, all the way to final product, each iteration of the software will introduce new features while addressing any existing bugs and unintended behaviours.

3.3.1 Audio Processing

| Requirement ID | Audio Processing Description |
|----------------|---|
| Req 3.3.1.1-PC | Input audio must be recorded on a local computer as a MP3/4 file |
| Req 3.3.1.2-PC | A sample audio must put Google API to test to verify that the API is functional in transcribing audio to text |
| Req 3.3.1.3-PT | Input recording must be uploaded onto cloud storage |
| Req 3.3.1.4-PT | Input recording must be transcribed by Google APIs on the cloud level |
| Req 3.3.1.5-FP | Speaker shall be identified by the software and clearly indicated in transcriptions |

| | |
|----------------|--|
| Req 3.3.1.6-FP | Transcribed text must be presentable to the user through GUI |
| Req 3.3.1.7-FP | Input recording must be available for playback through GUI |

Table 3.3.1 A list of Audio Processing Requirements

3.3.2 Cloud

| Requirement ID | Cloud Description |
|----------------|---|
| Req 3.3.2.1-PT | Cloud server must clearly organize uploaded audio files in a date formatted folder structure |
| Req 3.3.2.2-PT | Cloud server must reserve relevant metadata of the audio files to help with organization of uploaded audio files |
| Req 3.3.2.3-PT | Cloud server must home the processing power for the web application while providing adequate storage for the recordings |
| Req 3.3.2.4-FP | Cloud server shall use data compression of audio files to optimize storage usage |
| Req 3.3.1.5-FP | Recordings must have an expiry date where they are deleted in order to avoid low storage space over time |

Table 3.3.2 A list of Cloud Requirements

3.3.3 Web Application

| Requirement ID | Web Application Description |
|----------------|---|
| Req 3.3.3.1-PT | The user must login to the web app in order to interact with features within the web app |
| Req 3.3.3.2-PT | In order to start recording a meeting on the web app, the user shall click the record button |
| Req 3.3.3.3-PT | The web app shall provide real-time transcription of the speaker's words while clearly indicating a new speaker is speaking |
| Req 3.3.3.4-FP | The web app must provide the user with the option of downloading the audio recording as an acceptable audio format |
| Req 3.3.3.5-FP | The web app must provide the user with the option of downloading the transcription of the meeting |

| | |
|----------------|--|
| Req 3.3.3.6-FP | The user shall be provided with a UI that clearly indicates recordings based on meeting titles and dates in a chronological manner |
| Req 3.3.3.7-FP | The meeting details must be present within Web App’s UI, clearing indicating date, time, location, title of the meeting and the participants |
| Req 3.3.3.8-FP | The meeting details must be editable upon user’s wish |

Table 3.3.1 A list of Web Application Requirements

3.4 Hardware Requirements

3.4.1 Clip

Clip is the component of our product that will contain a microphone and a microcontroller that supports BLE (Bluetooth low energy) module which will act as our medium to transfer data to the hub. Clip purpose is to detect voice through microphone and record meeting minutes and then send the data to the hub via BLE following the transfer protocol. For efficient clip design we look at the following component requirements that will be essential for the prototype and final product design.

3.4.1.1 Microphone requirements

| Requirement ID | Microphone Description |
|------------------|---|
| Req 3.4.1.1.1-PC | The microphone should operate between 1.6-3.6V power supply range [5] |
| Req 3.4.1.1.2-PC | The microphone normal mode of operation must operate with 1.8V/1.2mA power supply [5] |
| Req 3.4.1.1.3-PT | The microphone shall have a operating temperature range from -45 to 85°C [5] |
| Req 3.4.1.1.4-PT | The microphone shall incorporate for the signal to noise ratio (SNR) of at least 65 dBA [5] |
| Req 3.4.1.1.5-PT | The microphone shall have a frequency response between 45Hz-20kHz at -3dB point [5] |
| Req 3.4.1.1.6-PT | The microphone must have a acoustic dynamic range of about 104 dB which would be the acceptable voice for recording [5] |
| Req 3.4.1.1.7-FP | The microphone must have a sensitivity of -44 dBFS at 94 dB SPL (Sound Pressure Level) [5] |
| Req 3.4.1.1.8-FP | The microphone shall have total harmonic distortion of about 0.35% at 105 dB SPL to reduce any echo [5] |

| | |
|------------------|---|
| Req 3.4.1.1.9-FP | The microphone must have its latency less than 30 microseconds to reduce the signal processing time [5] |
|------------------|---|

Table 3.4.1.1 A list of Microphone Requirements

3.4.1.2 Microcontroller requirements

| Requirement ID | Microcontroller Description |
|------------------|--|
| Req 3.4.1.2.1-PC | The power supply operating range must lie between 1.8-3.8V [4] |
| Req 3.4.1.2.2-PC | The operating temperature range must be between -40 to 85 °C [4] |
| Req 3.4.1.2.3-PT | The microcontroller must have a throughput of at least 1 mbps for a reasonable data transmission [4] |
| Req 3.4.1.2.4-PT | The microcontroller shall have at least 32 kb RAM data memory to store voice data [4] |
| Req 3.4.1.2.5-PT | The microcontroller should be bluetooth 4.2 compliant for fast data transmission to the hub [4] |
| Req 3.4.1.2.6-PT | Low energy consumption shall require 8.2mA current to be transmitted at 2.4GHz [4] |
| Req 3.4.1.2.7-FP | The microcontroller must have 12 bit analog to digital converter (ADC) with 1 Msps [4] |
| Req 3.4.1.2.8-FP | The microcontroller must support GPIO (General-purpose input/output) pins to incorporate buttons and LED's [4] |
| Req 3.4.1.2.9-FP | The microcontroller must support UART connection [4] |

Table 3.4.1.2 A list of Microcontroller Requirements

3.4.1.3 General clip requirement

| Requirement ID | General Clip Description |
|------------------|---|
| Req 3.4.1.3.1-PT | Clip must be able to record audio of at least one person and transmit data to the hub |
| Req 3.4.1.3.2-FP | Multiple clips should be able to communicate with the hub and transmit data of more than one person |

| | |
|------------------|--|
| Req 3.4.1.3.3-FP | Clip must synchronise data transmission with the LED blinks on the hub |
|------------------|--|

Table 3.4.1.3 A list of General Clip Requirements

3.4.2 Hub

The Following section provides the Requirements for the Hub unit of MeetAssist. The Hub will play a central unit in the product and must meet the specified requirements for the proper functioning of the product. Core of the Hub will consist of Raspberry Pi Microprocessor along with the Modules for connection between the other components of the Product to exchange voice data.

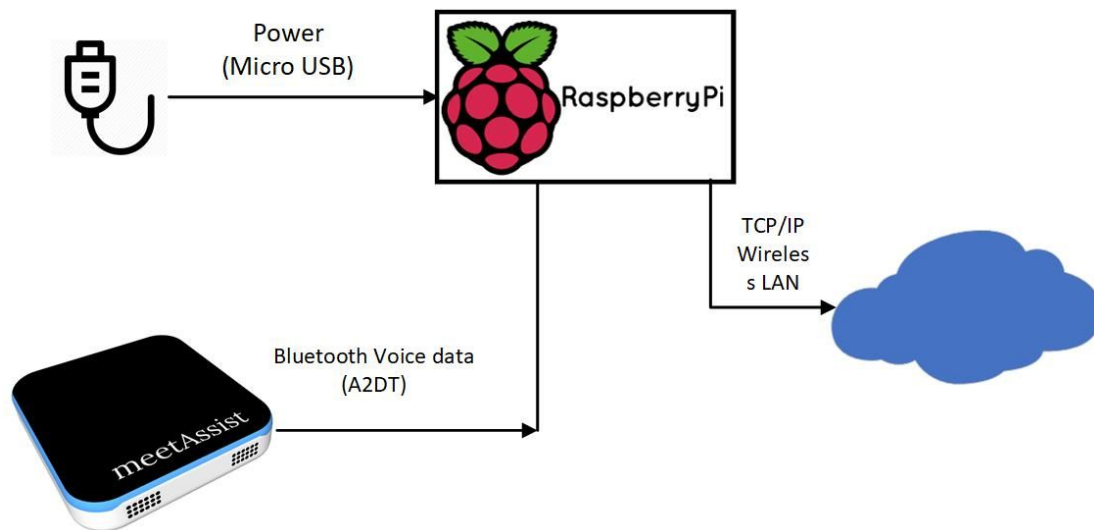


Fig 3.4.2.1 High level Diagram of HUB Data/Power Flow

3.4.2.1 Electrical Requirements

Following are the Electrical Requirements to provide the required power to the components of the hub, it includes Voltage and Current parameters, along with the resistance to external noise sources which could affect the electrical functioning of the microprocessor

| Requirement ID | Electrical Description |
|--------------------|---|
| Req 3.4.2.1.1- PC | Hub components shall be powered by a 5V/2.5A power unit |
| Req 3.4.2.1.2- PC | Hub components must be resistant to external sources of heat |
| Req 3.4.2.1.3 - PC | Hub components must be resistant to external sources of noise |

| | |
|--------------------|--|
| Req 3.4.2.1.4 - FP | Loss in electrical power must not result in loss of stored data on the HUB |
|--------------------|--|

Table 3.4.2.1 A list of Electrical Requirements

3.4.2.2 Microprocessor Requirements

The microprocessor selected should be stable under stress conditions for this purpose the team at LazyTech agreed upon Raspberry Pi 3+ to be the CPU unit for the HUB . It shall fulfill the following requirements for the microprocessor component of the HUB.

| Requirement ID | Microprocessor Description |
|--------------------|--|
| Req 3.4.2.2.1- PC | The microprocessor shall have Bluetooth 4.2 module to receive data from the clip[6] |
| Req 3.4.2.2.2- PC | The microprocessor shall consist of Gigabit Ethernet over USB 2.0 (maximum throughput 300 Mbps) to send data to test laptop[6] |
| Req 3.4.2.2.3- PC | The operating temperature must be kept between 0 - 50 °C for the microprocessor |
| Req 3.4.2.2.4 - PC | The microprocessor must be powered by 5V/2.5A DC micro-usb[7] |
| Req 3.4.2.2.5 - PC | The microprocessor must have 1GB LPDDR2 SDRAM to store the incoming data from the clip[6] |
| Req 3.4.2.2.6 - PC | The microprocessor shall not exceed more than 85x56 mm in size |
| Req 3.4.2.2.7- FP | The microprocessor shall have GPIO pins to indicate the state of the HUB (ON/OFF)[8] |
| Req 3.4.2.2.8- FP | The microprocessor must have standards to ensure there is no loss in transmission of data over the cloud |
| Req 3.4.2.2.9- FP | The microprocessor shall consist of 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN to send data to the cloud[9] |

Table 3.4.2.2 A list of Microprocessor Requirements

3.4.2.3 Firmware/Operating System

| Requirement ID | Firmware/Operating System Description |
|-------------------|--|
| Req 3.4.2.3.1- PC | The microprocessor shall use Raspbian Debian based operating system version 9[9] |
| Req 3.4.2.3.2- PC | The microprocessor shall use Linux Kernel version 4.14[9] |

| | |
|--------------------|---|
| Req 3.4.2.3.3 - PC | The installed Firmware on the microprocessor must have the capability to upgrade for future performance improvements |
| Req 3.4.2.3.4 - PT | The firmware shall use TCP/IP protocol to transfer data over the internet [9] |
| Req 3.4.2.3.5 - FP | The software running on the Hub must be advertisement free |
| Req 3.4.2.3.6- FP | The software written for the microprocessor must have functions to handle external interrupts and run time errors due to various components present in the microprocessor |

Table 3.4.2.3 A list of Firmware/Operating System Requirements

3.4.2.4 Microprocessor Functional Requirements

| Requirement ID | Microprocessor Functional Description |
|--------------------|---|
| Req 3.4.2.4.1 - PC | The Hub must support at least connection to one Bluetooth enabled clip for the exchange of voice data |
| Req 3.4.2.4.2 - PC | No unethical software shall be utilized to operate the HUB |
| Req 3.4.2.4.3 - PC | Open Source Projects and APIs must be used to reduce the overall cost of the project |
| Req 3.4.2.4.4 - FP | The Hub must support connection to eight Bluetooth enabled clips for the exchange of voice data |
| Req 3.4.2.4.5 - FP | The Hub must use data ensuring the privacy of the users in not compromised |

Table 3.4.2.4 A list of Microprocessors Functional Requirements

4 Engineering Standards

Following all the required standards for the production and development of our product is necessary in order to meet all our clients needs in terms of quality and safety. We here at Lazy Tech base our guidelines off the standards published by acclaimed organizations such as CSA and ISO. Since our product is powered by electricity it is crucial for us to follow the proper standards to prevent accidental mistakes such as shock. Additionally our product will be constantly recording, processing, and transmitting audio. Therefore, the safety standards regarding audio recording and wireless transmission will be included as well.

| Standard ID | Description of Engineering Standards |
|---------------|--------------------------------------|
| IEEE 802.15.1 | Standards for WPAN/Bluetooth [10] |

| | |
|-----------------------------|--|
| IEEE 802.6 | Standards for information exchange between systems [11] |
| IEEE 830 | IEEE Recommended Practice for Software Requirements Specifications [12] |
| IEEE 1016 | Standard for Software Design Description [13] |
| IEEE 1074.1 | IEEE Guide for Software Development Life Cycle [14] |
| CAN/CSA-C22.2 NO.60065:16 | Cloud services must translate audio recording to text [15] |
| CAN/CSA-C22.2 NO.61508-1:17 | Audio, video and similar electronic apparatus - Safety requirements (Adopted IEC 60065:2014, eighth edition, 2014-06, with Canadian deviations) [15] |
| CAN/CSA-ISO 14040-06 | Environmental Management - Life Cycle Assessment - Principles and Framework [16] |
| CSA C22.1-15 PACKAGE – 2015 | Canadian electrical code, part I [17] |

Table 4 A list of Engineering Standards

5 Sustainability

At Lazy Tech, we care very much about the environment and it is very important that we are taking all the necessary steps to keep our environmental footprint to a minimum. As our products are intended to worn, it is our priority to design our products with the proper safety protocols in mind. To ensure that our devices will not contain any harmful chemicals and materials to the users and the environment, Lazy Tech will be following the Cradle-to-Cradle (C2C) design [18].

We will implement the following methodology to do more with less in order to minimize our environmental impact[19].Our company will also comply with all the guidelines from the Canadian Standards Association (CSA) for managing the “End of Life” (EOL) of our devices. We also follow the proper CSA guidelines for recycling a whole variety of EOL products[20]. We take great importance in the reusability and recyclability of our product from the beginning to the end of its life cycle.

Cradle to Cradle (C2C) refers to a sustainable manufacturing process where it mimics the recyclable behaviour of nature in which all waste is reused. In our case, we would be following this approach to disassemble and recycle our devices. According to [21], the C2C design may be broken down into the “Biological Lifecycle” and “Technical Lifecycle”. These life cycles are illustrated in figure 5, shown below.

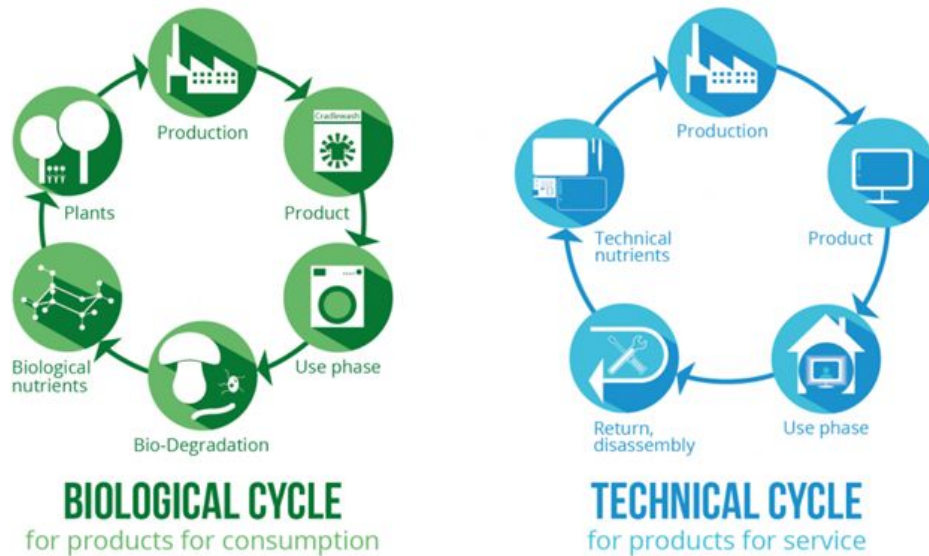


Fig 5.1 Cradle to Cradle Development Cycle (Biological/Technical) [23]

Since our product will be composed of PCB’s and various metals, we are taking all the necessary steps for its proper disposal. According to [22], there are countless places in North America that offer these specific recycling centers that are specialized in taking apart PCBs and properly disposing them.

6 Safety Requirements

Here at Lazy Tech, we take great importance in ensuring customer safety. As our product will be dealing with electrical components, it is important to follow all the necessary standards.

| Standard ID | Description of Engineering Standards |
|-----------------------------------|--|
| IEC 61508-2 | Requirements for electrical/electronic/programmable electronic safety-related systems [23] |
| CAN/CSA-C22.2 | Functional safety of electrical/ electronic/ programmable electronic safety related systems [24] |
| IEEE C2-2017 | 2017 National Electrical Safety Code ® (NESC(R)) [25] |
| IEC 60065:2014 | Audio, video and similar electronic apparatus — safety requirements [26] |
| CAN/CSA-C22.2 NO. 60065:16 | Audio, video and similar electronic apparatus - Safety requirements (Adopted IEC 60065:2014, eighth edition, 2014-06, with Canadian deviations) [27] |

Table 6 A list of Safety Requirements

7 Conclusion

MeetAssist provides a medium for storing verbal communication exchanged in a meeting by using speech to text AI in sync with speech differentiating microphone. This product provides a method for formatting and analyzing data which could be documented for the purpose of checking the productivity of a meeting. Through the use of a microphone component MeetAssist will differentiate between speakers in a meeting which could be vital in segregating meeting objectives once the meeting has been conducted. Our web app will offer the customer an elegant means to edit and manage their data.

The requirements stated in this document will ensure that product has all the basic functionality which is intended for it to function at a level which is acceptable to the end user. Requirements were categorised into three sections Proof of Concept, Prototype and Final Product thereby setting guidelines for the team to focus on core requirements first and then improve upon the product as development stages are achieved. The requirements stated will ensure the seamless integration of all the essential parts of the product such as the cloud server, Hub and Clip. Apart from general software and hardware requirements, since the product involves the use of microprocessor and microcontroller relevant electrical, firmware and functional requirements have been established. The requirement for the components have been researched and then finalized to ensure there is no compromise in the quality of the product. Safety and Sustainability has been taken into account and the adequate requirements have been decided upon that will ensure that the product meets the relevant engineering standards. The document will serve as a reference to Lazytech employees to ensure industry standards are met and serve as a tool in achieving the required functionality for MeetAssist.

8 Glossary

ADC - Analog to digital Converter
API - Application programming interface
BLE - Bluetooth Low Energy
CPU - Central Processing Unit
CSA - Canadian Standards Association
DC - Direct Current
ESD - Electrostatic discharge
GPIO - General-purpose Input/Output
GUI - Graphical User Interface
IEEE - Institute of Electrical and Electronics Engineers
IP - Information Protocol
ISO - International Organization for Standardization
LAN - Local Area Network
LED - Light Emitting Diode
LPDDR - Low-Power Double Data Rate
PCB - Printed Circuit Board
SDRAM - Synchronous dynamic random-access memory
SNR - Signal to Noise Ratio
SPL - Sound Pressure Level
TCP - Transmission Control Protocol
UART - Universal Asynchronous receiver-transmitter
UI - User Interface
USB - Universal Serial Bus
WPAN - Wireless Personal Area Network

9 References

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10 PoC Acceptance Test Plan

For our proof of concept iteration, our main intention is to prove, understand and benchmark main concepts/ideas for our project. There might be challenges faced, which will be mitigated by time allocated to test the product efficiently, this will allow the team to understand and find solutions to faced problems or pivot to different alternative.

Our goal for Proof of Concept is to fulfill the following crucial task which is the backbone of our product.

- 1) Capture audio voice using microphone and store it in memory.
- 2) Convert audio in the buffer and stream to our software for Speech to text transcription.
- 3) Software must be able to do speech to text transcription in real time.

The major Requirements for the Acceptance plan have been summarized in the below Table:

| Requirement Type | Acceptance Criteria | Requirement ID |
|------------------|------------------------------|--|
| Software | Must fulfill the requirement | Req 3.3.1.1-PC, Req 3.3.1.2 - PC, Req 3.4.2.3.1 - PC, Req 3.4.2.3.2 - PC, Req 3.4.2.3.3 - PC |
| Hardware | Must fulfill the requirement | Req 3.4.1.1.1-PC, Req 3.4.1.1.2 - PC, Req 3.4.1.2.1-PC, Req 3.4.1.2.2-PC |
| Physical | Research must be shown | Req 3.2.1.2-PC |
| General | Research must be shown | Req 3.1.1.5-PC |

Table 10 Acceptance testing plan for Proof Of Concept

The above requirements form the basis of our product. The team at Lazy Tech will aim to complete all the milestones set in the test plan and refer to this document to assure that the requirements are fulfilled, based on the acceptance test plan.