

# Software Requirements Specification for Software Engineering: subtitle describing software

Team 13, Speech Buddies

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## Revision History

Date	Version	Notes
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# **1 Purpose of the Project**

## **1.1 User Business**

Individuals with speech impairments face significant barriers when interacting with digital devices. VoiceBridge addresses this gap by providing an accurate, inclusive, and accessible speech-to-control system that enables users to communicate with their devices using their speech, regardless of clarity of articulation. Building on familiar technology, such as personal computers and mobile devices, may be one of the most cost-effective and easily adoptable approaches for improving an individual with disability's autonomy and access to the world around them. The rise of ASR technology and Artificial Intelligence (AI) integrations in the industry provides a novel landscape of opportunities to improve accessibility interfaces. VoiceBridge exploits bleeding-edge technology for a practical and impactful application.

## 1.2 Goals of the Project

ID	Goal	Description
G1	<b>Accurate Speech Transcription</b>	Reliably convert impaired or slurred speech into text.
G2	<b>Command Mapping</b>	Translate recognized speech into actionable browser commands.
G3	<b>User Independence</b>	Enable users with speech impairments to browse autonomously.
G4	<b>Lightweight &amp; Accessible Design</b>	Keep the system simple, fast, and cost-effective.
G5	<b>Cross-Browser Compatibility</b>	Support major browsers (e.g., Chrome, Edge, Firefox).
G6	<b>Robust Error Handling</b>	Detect and recover gracefully from common failures.
G7	<b>Data Privacy &amp; Security</b>	Protect user data and ensure secure local processing.
G8	<b>Customizable Interface</b>	Allow users to adjust sensitivity, shortcuts, and feedback modes.
G9	<b>Scalable Architecture</b>	Design the system for future integration beyond browsers.

Table 1: Project Goals for VoiceBridge

## 2 Stakeholders

### 2.1 Client

The primary client for the VoiceBridge project is the organization or individual funding or commissioning the system. The client is primarily concerned with achieving the following goals: **G1**, **G5**, and **G9**, ensuring accurate speech transcription, cross-browser compatibility, and scalable architecture.



## 2.2 Customer & Hands-On Users of the Project

The primary customers are also the users of the project, them being individuals with speech impairments, who seek independence and autonomy through technology. Their needs directly relate to: **G1**, **G2**, **G3**, and **G8**.

## 2.3 Other Stakeholders

Secondary stakeholders include experts in linguistics, speech processing, and healthcare domains:

- Speech researchers and linguistics specialists, including the project supervisor, Dr. Christian Brodbeck, who provide insight toward **G1** and **G6**.
- Healthcare professionals and speech therapists who advise on usability and accessibility, contributing to **G3** and **G8**.
- Accessibility advocates and organizations interested in promoting the application, aligned with **G4** and **G5**.
- Software developers who implement and maintain the system, supporting **G9** and **G6**.

Tertiary stakeholders include caregivers and professionals who interact with end users, supporting **G3** and **G7**.

## 2.4 Personas

Potential end users of VoiceBridge include:

- **Amira**, a 45-year-old with Parkinson's disease, uses the system to log into Gmail and send emails.
- **David**, a stroke survivor, uses the system to browse the web and make purchases.

## 2.5 Priorities Assigned to Users

The highest priorities are assigned to end users with speech impairments, as their experience with the system defines its success. Secondary priorities include caregivers and technical experts who support the end users in using and maintaining the system.

## 2.6 User Participation

Individuals matching the target user profiles will be recruited for prototype testing and personalization development. Their participation directly supports refining goals [G1](#), [G2](#), [G3](#), and [G8](#).

## 2.7 Maintenance Users and Service Technicians

### Maintenance Users:

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- **Role:** End-users or caregivers performing basic troubleshooting and initiating support requests.
- **Responsibilities:**
  - Reporting errors or unexpected system behavior ([G6](#)).
  - Installing application updates ([G9](#)).
  - Managing user-specific configurations ([G8](#)).

### Service Technicians:

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- **Role:** Trained technical staff with deeper access to system logs and back-end services.
- **Responsibilities:**
  - Investigating reported issues ([G6](#)).
  - Ensuring transcription accuracy ([G1](#)).
  - Deploying updates and patches ([G9](#)).

- Ensuring compatibility with operating systems and accessibility frameworks (**G5**).
- Performing preventive maintenance, including performance monitoring and optimization (**G1**, **G6**).

## 3 Mandated Constraints

### 3.1 Solution Constraints

ID	Constraint	Rationale	Fit Criterion
C1	The product shall run on consumer-grade hardware using a personal computer microphone and support macOS, Windows, and Linux distributions.	Requiring only consumer-grade hardware ensures broad accessibility for end users and avoids dependency on specialized equipment.	The system must successfully be integrated onto browsers and run on laptops or desktops across the supported operating systems, using either built-in or external microphones.
C2	The product shall accept non-deterministic user input in the form of natural language speech.	Individuals with speech impairments may produce varied speech patterns that cannot be handled by rigid or deterministic command structures.	The system must be capable of processing and responding to variable natural language inputs without requiring a fixed set of commands.
C3	The product shall integrate with a browser control application to execute voice-based commands.	Browser interaction is a primary accessibility point for most digital services, and browser control is essential for practical use of the system.	The system must successfully perform browser actions (e.g., opening tabs, navigating to URLs, scrolling) through the integrated control application.

### 3.2 Implementation Environment of the Current System

ID	Constraint	Rationale	Fit Criterion
C4	The product will operate within a consumer computing environment consisting of personal computers equipped with microphones.	This setup reflects the most common user hardware configuration, ensuring the solution is accessible without additional devices.	All core functionalities must operate correctly on standard personal computers with a functioning audio input device.

### 3.3 Partner or Collaborative Applications

ID	Constraint	Rationale	Fit Criterion
C5	The initial integration target is Browser Use, an open-source browser control and automation application.	Leveraging existing open-source browser automation tools accelerates development and reduces implementation complexity.	The system must demonstrate the ability to execute at least three browser actions through the integrated partner application during testing.
C6	Future integrations may include API servers, mobile device agents, and home assistants to extend accessibility and functionality.	Ensuring extensibility allows the system to grow and adapt to new platforms or user needs.	The system architecture must allow seamless integration with additional partner applications without major redesign.

### 3.4 Off-the-Shelf Software

ID	Constraint	Rationale	Fit Criterion
C7	The product will rely on off-the-shelf software components, specifically Browser Use for automation and Project Euphonia for voice recording.	Using established open-source components allows focus on core functionality, improves maintainability, and supports experimentation with real-world data.	These components must be successfully integrated into the development workflow, and collected recordings must be stored and processed for model training without licensing conflicts.

### 3.5 Anticipated Workplace Environment

ID	Constraint	Rationale	Fit Criterion
C8	The product may be used at home, in public spaces, or in clinical settings, each with varying background noise conditions.	The product must function effectively across diverse real-world environments to meet accessibility goals.	The speech recognition system must maintain acceptable accuracy and responsiveness across all three identified environments during testing.

### 3.6 Schedule Constraints

ID	Constraint	Rationale	Fit Criterion
C9	Proof of concept must be completed by November 17, 2025. MVP must be ready within eight months, by May 2026.	Deadlines align with capstone project milestones and funding timelines, ensuring timely testing and delivery.	All proof of concept requirements must be met by the November deadline, and MVP functionality must be fully operational by May 2026.

### 3.7 Budget Constraints

ID	Constraint	Rationale	Fit Criterion
C10	The project must operate within the capstone budget allocated for compute infrastructure and development resources.	Budget limitations require prioritizing open-source solutions and efficient resource allocation.	Total cost of infrastructure, hosting, and third-party services must not exceed the allocated capstone budget.

### 3.8 Enterprise Constraints

ID	Constraint	Rationale	Fit Criterion
C11	The product must comply with all relevant accessibility and privacy regulations, including data usage and user privacy agreements.	Compliance protects user rights, upholds institutional standards, and avoids legal or ethical issues.	All data collection and processing workflows must undergo compliance review, and accessibility features must align with recognized standards (e.g., WCAG).

## 4 Naming Conventions and Terminology

### 4.1 Glossary of All Terms, Including Acronyms, Used by Stakeholders involved in the Project

*Insert your content here.*

### 4.2 Technical Terminology

**ASR** - Automatic Speech Recognition

**TTS** - Text To Speech

**STT** - Speech To Text

### 4.3 Medical Terminology

**Aphasia** - A condition that robs you of the ability to communicate. It can affect your ability to speak, write and understand language, both verbal and written. Aphasia usually occurs suddenly after a stroke or a head injury. But it can also come on gradually, as in the case of a brain tumor or a progressive neurological disease.

**ALS** - Amyotrophic Lateral Sclerosis

**Dysarthria** - A motor speech disorder that makes it hard to speak. It is caused by damage to the nervous system, which can affect the muscles used for speaking. People with dysarthria may have slurred or slow speech, and they may have difficulty controlling the pitch, volume, and rhythm of their speech.

## 5 Relevant Facts And Assumptions

### 5.1 Relevant Facts

*Insert your content here.*

### 5.2 Business Rules

*Insert your content here.*

### **5.3 Assumptions**

*Insert your content here.*

## **6 The Scope of the Work**

### **6.1 The Current Situation**

*Insert your content here.*

### **6.2 The Context of the Work**

*Insert your content here.*

### **6.3 Work Partitioning**

*Insert your content here.*

### **6.4 Specifying a Business Use Case (BUC)**

*Insert your content here.*

## **7 Business Data Model and Data Dictionary**

### **7.1 Business Data Model**

*Insert your content here.*

### **7.2 Data Dictionary**

*Insert your content here.*

## **8 The Scope of the Product**

### **8.1 Product Boundary**

*Insert your content here.*



## **8.2 Product Use Case Table**

*Insert your content here.*

## **8.3 Individual Product Use Cases (PUC's)**

*Insert your content here.*

# **9 Functional Requirements**

## **9.1 Functional Requirements**

*Insert your content here.*

# **10 Look and Feel Requirements**

## **10.1 Appearance Requirements**

*Insert your content here.*

## **10.2 Style Requirements**

*Insert your content here.*

# **11 Usability and Humanity Requirements**

## **11.1 Ease of Use Requirements**

*Insert your content here.*

## **11.2 Personalization and Internationalization Requirements**

*Insert your content here.*

### **11.3 Learning Requirements**

*Insert your content here.*

### **11.4 Understandability and Politeness Requirements**

*Insert your content here.*

### **11.5 Accessibility Requirements**

*Insert your content here.*

## **12 Performance Requirements**

### **12.1 Speed and Latency Requirements**

*Insert your content here.*

### **12.2 Safety-Critical Requirements**

*Insert your content here.*

### **12.3 Precision or Accuracy Requirements**

*Insert your content here.*

### **12.4 Robustness or Fault-Tolerance Requirements**

*Insert your content here.*

### **12.5 Capacity Requirements**

*Insert your content here.*

### **12.6 Scalability or Extensibility Requirements**

*Insert your content here.*

## **12.7 Longevity Requirements**

*Insert your content here.*

# **13 Operational and Environmental Requirements**

## **13.1 Expected Physical Environment**

*Insert your content here.*

## **13.2 Wider Environment Requirements**

*Insert your content here.*

## **13.3 Requirements for Interfacing with Adjacent Systems**

*Insert your content here.*

## **13.4 Productization Requirements**

*Insert your content here.*

## **13.5 Release Requirements**

*Insert your content here.*

# **14 Maintainability and Support Requirements**

## **14.1 Maintenance Requirements**

*Insert your content here.*

## **14.2 Supportability Requirements**

*Insert your content here.*

### **14.3 Adaptability Requirements**

*Insert your content here.*

## **15 Security Requirements**

### **15.1 Access Requirements**

*Insert your content here.*

### **15.2 Integrity Requirements**

*Insert your content here.*

### **15.3 Privacy Requirements**

*Insert your content here.*

### **15.4 Audit Requirements**

*Insert your content here.*

### **15.5 Immunity Requirements**

*Insert your content here.*

## **16 Cultural Requirements**

### **16.1 Cultural Requirements**

*Insert your content here.*

## **17 Compliance Requirements**

### **17.1 Legal Requirements**

*Insert your content here.*

## **17.2 Standards Compliance Requirements**

*Insert your content here.*

## **18 Open Issues**

*Insert your content here.*

## **19 Off-the-Shelf Solutions**

### **19.1 Ready-Made Products**

*Insert your content here.*

### **19.2 Reusable Components**

*Insert your content here.*

### **19.3 Products That Can Be Copied**

*Insert your content here.*

## **20 New Problems**

### **20.1 Effects on the Current Environment**

*Insert your content here.*

### **20.2 Effects on the Installed Systems**

*Insert your content here.*

### **20.3 Potential User Problems**

*Insert your content here.*

## **20.4 Limitations in the Anticipated Implementation Environment That May Inhibit the New Product**

*Insert your content here.*

## **20.5 Follow-Up Problems**

*Insert your content here.*

# **21 Tasks**

## **21.1 Project Planning**

*Insert your content here.*

## **21.2 Planning of the Development Phases**

*Insert your content here.*

# **22 Migration to the New Product**

## **22.1 Requirements for Migration to the New Product**

*Insert your content here.*

## **22.2 Data That Has to be Modified or Translated for the New System**

*Insert your content here.*

# **23 Costs**

*Insert your content here.*

## **24 User Documentation and Training**

### **24.1 User Documentation Requirements**

*Insert your content here.*

### **24.2 Training Requirements**

*Insert your content here.*

## **25 Waiting Room**

*Insert your content here.*

## **26 Ideas for Solution**

*Insert your content here.*

## Appendix — Reflection

The purpose of reflection questions is to give you a chance to assess your own learning and that of your group as a whole, and to find ways to improve in the future. Reflection is an important part of the learning process. Reflection is also an essential component of a successful software development process.

Reflections are most interesting and useful when they're honest, even if the stories they tell are imperfect. You will be marked based on your depth of thought and analysis, and not based on the content of the reflections themselves. Thus, for full marks we encourage you to answer openly and honestly and to avoid simply writing "what you think the evaluator wants to hear."

Please answer the following questions. Some questions can be answered on the team level, but where appropriate, each team member should write their own response:

1. What went well while writing this deliverable?
2. What pain points did you experience during this deliverable, and how did you resolve them?
3. How many of your requirements were inspired by speaking to your client(s) or their proxies (e.g. your peers, stakeholders, potential users)?
4. Which of the courses you have taken, or are currently taking, will help your team to be successful with your capstone project.
5. What knowledge and skills will the team collectively need to acquire to successfully complete this capstone project? Examples of possible knowledge to acquire include domain specific knowledge from the domain of your application, or software engineering knowledge, mechatronics knowledge or computer science knowledge. Skills may be related to technology, or writing, or presentation, or team management, etc. You should look to identify at least one item for each team member.
6. For each of the knowledge areas and skills identified in the previous question, what are at least two approaches to acquiring the knowledge or mastering the skill? Of the identified approaches, which will each team member pursue, and why did they make this choice?