

Software Requirements Specification for Software Engineering: subtitle describing software

Team #23, Project Proxi

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Contents

1	Purpose of the Project	vi
1.1	User Business	vi
1.2	Goals of the Project	vi
2	Stakeholders	vii
2.1	Client	vii
2.2	Customer	vii
2.3	Other Stakeholders	vii
2.4	Hands-On Users of the Project	viii
2.5	Personas	viii
2.6	Priorities Assigned to Users	viii
2.7	User Participation	ix
2.8	Maintenance Users and Service Technicians	ix
3	Mandated Constraints	ix
3.1	Solution Constraints	ix
3.2	Implementation Environment of the Current System	x
3.3	Partner or Collaborative Applications	x
3.4	Off-the-Shelf Software	x
3.5	Anticipated Workplace Environment	x
3.6	Schedule Constraints	x
3.7	Budget Constraints	x
3.8	Enterprise Constraints	x
4	Naming Conventions and Terminology	x
4.1	Glossary of All Terms, Including Acronyms, Used by Stakeholders involved in the Project	x
5	Relevant Facts And Assumptions	xii
5.1	Relevant Facts	xii
5.2	Business Rules	xii
5.3	Assumptions	xii
6	The Scope of the Work	xii
6.1	The Current Situation	xii
6.2	The Context of the Work	xii
6.3	Work Partitioning	xii

6.4	Specifying a Business Use Case (BUC)	xii
7	Business Data Model and Data Dictionary	xiii
7.1	Business Data Model	xiii
7.2	Data Dictionary	xiii
8	The Scope of the Product	xiii
8.1	Product Boundary	xiii
8.2	Product Use Case Table	xiii
8.3	Individual Product Use Cases (PUC's)	xiii
9	Functional Requirements	xiii
9.1	Functional Requirements	xiii
10	Look and Feel Requirements	xiii
10.1	Appearance Requirements	xiii
10.2	Style Requirements	xiv
11	Usability and Humanity Requirements	xiv
11.1	Ease of Use Requirements	xiv
11.2	Personalization and Internationalization Requirements	xv
11.3	Learning Requirements	xv
11.4	Understandability and Politeness Requirements	xv
11.5	Accessibility Requirements	xv
12	Performance Requirements	xvi
12.1	Speed and Latency Requirements	xvi
12.2	Safety-Critical Requirements	xvi
12.3	Precision or Accuracy Requirements	xvi
12.4	Robustness or Fault-Tolerance Requirements	xvi
12.5	Capacity Requirements	xvi
12.6	Scalability or Extensibility Requirements	xvii
12.7	Longevity Requirements	xvii
13	Operational and Environmental Requirements	xvii
13.1	Expected Physical Environment	xvii
13.2	Wider Environment Requirements	xvii
13.3	Requirements for Interfacing with Adjacent Systems	xvii
13.4	Productization Requirements	xvii

13.5 Release Requirements	xviii
14 Maintainability and Support Requirements	xviii
14.1 Maintenance Requirements	xviii
14.2 Supportability Requirements	xviii
14.3 Adaptability Requirements	xviii
15 Security Requirements	xviii
15.1 Access Requirements	xviii
15.2 Integrity Requirements	xviii
15.3 Privacy Requirements	xviii
15.4 Audit Requirements	xviii
15.5 Immunity Requirements	xix
16 Cultural Requirements	xix
16.1 Cultural Requirements	xix
17 Compliance Requirements	xix
17.1 Legal Requirements	xix
17.2 Standards Compliance Requirements	xix
18 Open Issues	xix
19 Off-the-Shelf Solutions	xx
19.1 Ready-Made Products	xx
19.2 Reusable Components	xx
19.3 Products That Can Be Copied	xx
20 New Problems	xx
20.1 Effects on the Current Environment	xx
20.2 Effects on the Installed Systems	xx
20.3 Potential User Problems	xx
20.4 Limitations in the Anticipated Implementation Environment That May Inhibit the New Product	xx
20.5 Follow-Up Problems	xx
21 Tasks	xxi
21.1 Project Planning	xxi
21.2 Planning of the Development Phases	xxi

22 Migration to the New Product	xxi
22.1 Requirements for Migration to the New Product	xxi
22.2 Data That Has to be Modified or Translated for the New System	xxi
23 Costs	xxi
24 User Documentation and Training	xxi
24.1 User Documentation Requirements	xxi
24.2 Training Requirements	xxi
25 Waiting Room	xxii
26 Ideas for Solution	xxii

Revision History

Date	Version	Notes
Date 1	1.0	Notes
Date 2	1.1	Notes

1 Purpose of the Project

1.1 User Business

Proxi is an AI-powered desktop assistant that lets people operate a computer entirely through natural speech. It targets users who face barriers with traditional input devices (keyboard, mouse, complex UIs) and organizations that want to provide inclusive access to essential digital tasks (communication, learning, work). Proxi augments independence and reduces the digital divide by turning voice into safe, precise computer actions. While accessibility is the primary driver, Proxi is equally intended for general users who want faster, lower-friction workflows so it benefits both disabled and non-disabled users.

1.2 Goals of the Project

- G-1 (Latency)** Spoken system responses for common commands shall begin within ≤ 2.0 s from end-of-speech in a quiet environment.
- G-2 (Recognition Accuracy)** Command recognition accuracy for supported language(s) in quiet environment shall be $\geq 90\%$ intent-level accuracy.
- G-3 (Task Coverage)** Users from the primary user group shall complete $\geq 80\%$ of a predefined core task suite (open app/file, browse, compose, save, schedule) using voice or keyboard.
- G-4 (Effectiveness)** Compared to baseline (traditional input for same users), Proxi shall improve task completion rate by $\geq 20\%$.
- G-5 (Satisfaction)** Accessibility-focused usability tests shall yield 4.0/5.0 satisfaction score.
- G-6 (Stretch Goals)** Voice recognition improvements, offline capabilities, multimodal interaction support, personalized profiles, enhanced accessibility

2 Stakeholders

2.1 Client

The clients for this project are the SFWRENG 4G06A Capstone teaching team at McMaster University (course Instructor and assigned Teaching Assistants), serving as the product owners on behalf of the department. Their mandate is to ensure the solution meets accessibility, usability, and engineering quality standards appropriate for a capstone deliverable and potential real-world piloting within academic environments. They provide domain expectations (accessibility best practices, privacy/compliance constraints in academic settings) and approve scope and milestones.

2.2 Customer

Our customers are the end-users and organizations that will deploy Proxi to enable inclusive and more efficient computer use:

- **Educational institutions** (libraries, computer labs, accessibility services) seeking hands-free or low-friction access to standard desktops and web apps
- **Healthcare and community organizations** supporting users with motor/vision/ hearing challenges
- **General consumers and power users** who prefer faster, voice-first or mixed- modality workflows

2.3 Other Stakeholders

Other stakeholders include any person or group with interest beyond the client and the customer:

- **Team Proxi (development team):** responsible for requirements, design, implementation, testing, and deployment artefacts
- **Course Staff (Instructor & TA):** guidance, assessment, feedback, and approvals
- **Accessibility Advisors (if engaged):** best practices for WCAG/AT compatibility

- **Pilot participants:** individuals who will use the system during user studies and provide feedback

2.4 Hands-On Users of the Project

Primary hands-on users who will directly interact with Proxi:

- **Accessibility-focused users:** People with motor impairments or temporary/situational limitations needing hands-free or simplified control
- **General users/power users:** Users seeking faster workflows via voice/text commands with optional keyboard/mouse confirmation

2.5 Personas

- **P1: Amrita (72) - Elderly User:** Amrita is a retired teacher who uses her desktop to check emails, pay bills, and video call her family. She struggles with small buttons, complicated menus, and remembering multi-step actions, which makes her anxious about using technology. She needs a way to perform common tasks more easily and with clear guidance to feel confident online.
- **P2: Leo (21) - User with Motor Disability:** Leo is a computer science student who finds it difficult to use a keyboard or mouse due to a motor impairment. He needs to read PDFs, take notes, and switch between different apps for his coursework. He requires a way to interact with his computer hands-free and complete his work without relying on physical input.
- **P3: Ari (28) - Power User:** Ari works with spreadsheets, emails, and web tools throughout the day and often repeats the same steps over and over. Switching between programs slows him down, and remembering different commands and shortcuts is frustrating. He needs a more efficient way to complete multi-step tasks and manage his work without constant interruptions.

2.6 Priorities Assigned to Users

The **highest priority** users for this project are **accessibility-focused** users, including elderly users like Amrita and users with motor impairments like

Leo, as the main goal is to improve computer access and usability for people who face physical challenges or find current systems difficult to use. Their needs guide the core features and design decisions of the project. **Power users** like Ari are the **secondary priority** because, while they do not face accessibility barriers, their focus on speed and efficiency helps shape advanced features that make the system useful to a wider audience. Prioritizing these groups ensures the solution is both inclusive for those who need accessibility support and valuable for everyday users seeking more efficient workflows.

2.7 User Participation

Estimated participation during the project will primarily involve end users and the development team. Accessibility-focused users are expected to participate for about 1 hour per week through remote or in-lab sessions focused on usability testing, feedback, and formative evaluations. General users and power users will contribute roughly 1 hour per week by taking part in efficiency and performance testing of new features. Additionally, the development team will dedicate around 8–10 hours per week to designing, building, testing, and refining the system based on user feedback and project milestones.

2.8 Maintenance Users and Service Technicians

The primary maintenance users for this project will be the development team. During the capstone project, they will be responsible for identifying and fixing issues, releasing updates and patches, and ensuring that the system continues to function as expected throughout development. They will also create and maintain documentation such as installation guides and user manuals to support future use and potential handoff of the project after completion.

3 Mandated Constraints

3.1 Solution Constraints

Insert your content here.

3.2 Implementation Environment of the Current System

Insert your content here.

3.3 Partner or Collaborative Applications

Insert your content here.

3.4 Off-the-Shelf Software

Insert your content here.

3.5 Anticipated Workplace Environment

Insert your content here.

3.6 Schedule Constraints

Insert your content here.

3.7 Budget Constraints

Insert your content here.

3.8 Enterprise Constraints

Insert your content here.

4 Naming Conventions and Terminology

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

MCP (Model Context Protocol) A contract with which an AI agent can find and invoke a toolset to accomplish specific tasks.

MCP Server A local server that implements the MCP to allow AI agents to discover and use the available tools.

MCP Client An AI agent that connects to the MCP server to use the provided tools.

AI Agent A software (LLM) that uses artificial intelligence to perform tasks.

LLM (Large Language Model) A type of AI model that can understand and generate human language.

Token A unit of text used in LLMs to process and generate language.

Sandbox A secure environment in which code can be run and tested without affecting the rest of the system.

Action A single execution of a tool with validated parameters.

Plan An ordered sequence of actions to fulfill a user intent.

Command An instruction given by the user to the AI agent.

Permission Scope Level of access that is given to the AI agent for completing actions.

Confirmation Gate A approval prompt given to the user by the AI before completing risky actions.

TTS (Text-to-Speech) Tool that converts written text into spoken words.

STT (Speech-to-Text) Tool that converts spoken words into written text.

Audit Log A record of all actions taken by the AI agent.

Accessibility It is usable by people with a wide range of abilities/disabilities.

User Interface (UI) The visual elements of the software (frontend) in which a user will engage with the system.

PII (Personally Identifiable Information) Any data that could identify a specific individual.

POLP (Principle of Least Privilege) A security concept in which the AI agent will have minimum levels of access necessary to perform certain tasks.

OS Automation Tools Software on one's computer that gives the AI agent the ability to control and engage with their OS.

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

APP.1 The interface should look simple and familiar, like a normal desktop tool with a small status bar that shows when the system is listening, thinking, or ready.

APP.2 Main actions such as listen, stop, undo, and confirm should be clearly visible as buttons on the main screen.

APP.3 The screen should not feel crowded; only the most important options should be shown, and advanced options hidden in a simple menu.

APP.4 Text and buttons should be large and easy to read or click, especially for new or elderly users.

APP.5 A light and dark theme toggle should be available so users can choose what is most comfortable for them.

10.2 Style Requirements

STY.1 Labels and messages should use short, plain language with no technical hard language.

STY.2 When the system speaks, the text should also appear on screen as captions.

STY.3 Icons should stay consistent and have a short text label underneath to avoid confusion.

11 Usability and Humanity Requirements

11.1 Ease of Use Requirements

- **EOU.R.1** The system shall be easy for new users to start using. Basic tasks like opening an application or reading a file should require only one simple command or button press.
- **EOU.R.2** The system shall have an intuitive interface that does not overwhelm users. Main actions such as listen, stop, undo, and confirm must be clearly visible and easy to access.
- **EOU.R.3** After a short introduction, users should be able to complete most everyday tasks without assistance, and tasks should become faster with practice.

11.2 Personalization and Internationalization Requirements

- **PER.R.1** The system shall adapt to a user’s speech patterns over time to improve recognition accuracy.
- **PER.R.2** The system shall support Canadian English standards for language, date, and time formatting and allow future translation if needed.

11.3 Learning Requirements

- **LEA.R.1** The system shall have a short learning curve, allowing new users to understand and use basic commands within 30 minutes.
- **LEA.R.2** The system shall provide a list of example commands or a “what can I say” option to help users learn available features quickly.

11.4 Understandability and Politeness Requirements

- **UAP.R.1** The system shall use simple and clear language for all text and messages, avoiding technical jargon.
- **UAP.R.2** The system shall confirm actions that could change or delete important files or settings before executing them.
- **UAP.R.3** Error messages shall be polite, explain the issue in plain language, and suggest a next step to fix it.

11.5 Accessibility Requirements

- **ACC.R.1** The system shall allow all actions, including setup and exit, to be performed using voice commands without requiring a keyboard or mouse.
- **ACC.R.2** The system shall comply with recognized accessibility standards such as **WCAG 2.2** and the **Accessibility for Ontarians with Disabilities Act (AODA)**. All interface elements must provide captions for spoken responses, support text scaling, and ensure sufficient color contrast to assist users with visual impairments.

12 Performance Requirements

12.1 Speed and Latency Requirements

- **SAL.R.1** The system shall begin responding to a voice command within 2 seconds under normal conditions.
- **SAL.R.2** Common actions, such as opening an application or navigating files, shall complete within 3 seconds on standard hardware.

12.2 Safety-Critical Requirements

- **SAF.R.1** Any action that changes files or system settings shall require user confirmation before execution.
- **SAF.R.2** The system shall allow users to undo or roll back critical actions in a single step to prevent accidental changes.

12.3 Precision or Accuracy Requirements

- **POA.R.1** The system shall correctly recognize at least 90% of supported voice commands in a quiet environment.
- **POA.R.2** In a moderately noisy environment, the system shall maintain at least 80% command recognition accuracy.

12.4 Robustness or Fault-Tolerance Requirements

- **ROFT.R.1** The system shall log and report input errors without crashing or losing user data.
- **ROFT.R.2** The system shall continue running even if it receives an invalid or incomplete command.

12.5 Capacity Requirements

- **CAP.R.1** The system shall support continuous operation for at least 4 hours without performance degradation.
- **CAP.R.2** CPU usage shall remain under 30% during normal operation on standard hardware.

12.6 Scalability or Extensibility Requirements

- **SOE.R.1** The system shall allow new features or modules to be added without major changes to existing functionality.
- **SOE.R.2** Any new feature or skill shall load and become available for use within 200 milliseconds.

12.7 Longevity Requirements

- **LON.R.1** The system shall retain all user settings and personalization data after updates.
- **LON.R.2** The system shall allow rollback to a previous version within 60 seconds if an update fails.

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

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14 Maintainability and Support Requirements

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14.2 Supportability Requirements

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14.3 Adaptability Requirements

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15 Security Requirements

15.1 Access Requirements

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15.2 Integrity Requirements

Insert your content here.

15.3 Privacy Requirements

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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

- **OI.1** The integration of the MCP (Model Context Protocol) for controlling system-level functions is still in progress, and further testing is needed to ensure reliable and safe execution of commands across different applications.
- **OI.2** The system's compatibility and consistent performance across different operating systems (such as Windows, macOS, and Linux) have not yet been fully tested or confirmed.
- **OI.3** Ensuring that user commands do not unintentionally trigger harmful or unauthorized actions on the device is still under investigation and requires additional safety checks and permission handling.

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

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20 New Problems

20.1 Effects on the Current Environment

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

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21 Tasks

21.1 Project Planning

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22 Migration to the New Product

22.1 Requirements for Migration to the New Product

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

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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?