

Project Proposal

Software Engineering CS-360

Guftaar

Zubaan ki taaqat, dil ka sakoon

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1.0 Overview

1.1. Purpose, Scope and Objectives

1.1.1. Background

Stuttering is defined as a disruption in the fluency of verbal expression, which is characterized by involuntary, audible or silent, repetitions or prolongations in the utterance of short speech elements, namely: sounds, syllables, and words of one syllable. These disruptions occur frequently or are marked in character and are not readily controllable.

Stuttering can have negative effects on health, well-being, quality of life (QoL), and self-identity in the person who stutters (PWS). Moreover, stuttering has also shown to cause feelings of isolation, negative mood, and symptoms of distress and low self-esteem. PWS have linked stuttering to living with a chronic disease, given the constant stress and frustration associated with day-to-day communication for persons who stutter. As a result, there has been a growing global concern about stuttering with 1% of the global population suffering through mentioned effects. Recent studies, conducted in the United States, show an increase in the number of speech language pathology (SLP) students and also a positive shift of attitude towards PWS mitigating concerns of stigmatization.

Although global support for PWS is increasing professionally through certified speech therapy centers, socially through self-help and advocacy groups, and academically through clinical education and SLP training, such support is restricted to developed countries. We aim to tackle this problem in the context of Pakistan, where lack of awareness, stigmatization and discrimination, and lack of speech therapy centers is prevalent. A recent study conducted in Punjab reveals that a staggering 77.5% of healthcare professionals do not know anyone who receives SLP services. To contextualize the significance of this result, it is important to understand the prevalence of stuttering in Pakistan. A study conducted for the internally displaced population of North Waziristan revealed that 11% of the participants suffered from stammering. Given the limited demographic scope of this study, we can expect this number to be more significant for the general population of Pakistan. To make matters worse for Pakistan, in 2010, there were only 7 qualified speech language therapists. The situation might not be as dire as 2010, especially after contributions from the Speech and Hearing Association of Pakistan (SHAP),

Ziauddin College of Speech Language Therapy (ZCSLT), and other higher education institutions which recognized and offered graduate and doctoral specializations for SLP. Nonetheless, there is nowhere near adequate resources, expertise, and awareness to cope with the needs of the PWS population of Pakistan.

1.1.2. Purpose

In light of the impact a communication deficit can create in the lives of those affected, this project is meant to serve as a technological intervention for young adults that supports speech and language therapy in the form of a web application. The platform is intended to empower those struggling with articulation with an opportunity to manage their fluency through an interactive, easy to use interface that provides resources in the form of exercises, progress tracking, live sessions as well as a way to connect with certified instructors for individual training, and course sign ups.

In the study of existing literature, and through PWS interaction, the need for a holistic technological support system was validated as a necessary shift from traditional speech therapy in the country. Conventional support was quoted to be expensive, ranging PKR 2000-5000 per session, outdated, prone to relapse (80% occurrence) and laborious for all parties involved. Resources also appeared scattered, progress unregulated and access to certified help difficult to reach. Subsequently, a tech-enabled platform where end users could find a host of resources to assist their personal speech improvement journey, and access existing support mechanisms in the form of experienced professionals is an essential layer of help currently absent in the local market. Guftaar is a project meant to accomplish just that.

1.1.3. Scope

Guftaar is intended to be an English language m-Health web application catering to PWS (people who stutter), with virtual multi-feature treatment support, detailed in the following section. The application is meant to be an online platform providing at-home self management and professional assistance to those diagnosed, with instructional training sourced from established speech therapists, and peer-to-peer support via online and blog interactions. Guftaar end users include both affectees and coaches, whose roles and app involvement is explained in the table below.

End-User	Function
PWS	Access guided training, course material and auditory support with progress measures, community support via live sessions and certified medical help with in-app incentive mechanisms
Coaches	Connect with PWS according to availability to deliver virtual support via online sessions and facilitate speech therapy via feedback logging and progress monitoring
Administrator	Manage existing resources, profiles and content hosted on the application along with maintaining the application database and monitoring in-app activity

Table 1: System Users

1.1.4. Target User Group

Guftaar is intended for homogenous use across all age groups, however, a conscious focus remains on young adults adept at independently managing their condition to help streamline, automate and guide the treatment process to be more informed, supportive and effective. This user group is assumed to have a strong grasp over the English language, and access to digital tools like a desktop computer to access the site. Previous experience with speech and language therapy is not required but familiarity with important terminology common across disfluency treatment is recommended.

Younger users like children and adolescents are encouraged to engage with the application in collaboration with guardians to extract maximum use and efficacy. Application features are intentionally kept simple, easy to follow and interactive for all age brackets to derive benefit. Early stage intervention, i.e. for children and toddlers, is deemed to be specialized, nuanced and beyond the scope of this application which is meant to provide an all-encompassing and

generalized m-Health solution given a base exposure to treatment options or preliminary experience in managing speech difficulty.

1.2. Project Description

1.2.1. Project Goals and Objectives

The application is intended to provide a multi-front technological support system for PWS, guided by the following product goals, identified in keeping with user needs and desires. Guftaar hosts a breadth of features, extrapolated on the basis of these objectives, as explored below.

1. Self Management Assistance:

The application is intended to empower users to independently be able to self regulate their speech therapy, take ownership of training and make meaningful progress towards fluent and confident speech, through instructional exercises, guides and techniques detailed in the application.

2. Sustained User Motivation:

Guftaar should facilitate a user's continuous and long term journey to fluency, with in-app progress tracking, incentive structures in the form of credit to encourage habit building, and easy to use exercises so sustained usage can be encouraged, and the application remains a regular feature in the treatment trajectory of a PWS.

3. Community and Peer-to-Peer Support

The application must also provide an essential layer of community support to all PWS who use it – in doing so, we would like users to feel seen, heard and encouraged by those they can relate to. This is achieved via regular blog posts, and opportunities to join live P2P led sessions as a way to ensure user engagement.

4. Credible Resource Sharing

Guftaar should provide certified, and professional help to the users who engage with it, by onboarding coaches who can provide individual treatment plans, and cater to unique contexts that across-the-board support techniques cannot replace. This is accomplished via a library of licensed courses, and facilitated coach interaction via appointment booking.

1.2.2. Features and Services

Table 2 highlights the facilities our system intends to provide to fulfill our aforementioned goals and objectives. These services have been broadly categorized based on the three user groups who will be using this portal. Taking assistance from online tutorials and any relevant built in libraries of JavaScript, we will implement these functionalities ourselves. Features like scheduling a session will be handled by external open-source APIs such as Calendly.

Clients	<ol style="list-style-type: none">1. Register/Log in/ Update Password: New users can provide their details and sign up to our portal. Existing users can log in with their previously set username and password. Users will also have an option to update their password.
	<ol style="list-style-type: none">2. Daily Tasks and Activities: Daily short practice exercises for the user to complete within a day's time. Example activities include: Syllable counting, breathing exercises, fluency exercises.
	<ol style="list-style-type: none">3. Daily Task Streak: Maintain a streak for all clients on the completion of their daily tasks. Users with a month's streak can access a premium course free of any cost.
	<ol style="list-style-type: none">4. Speech Techniques: Tips on how to articulate words and sentences clients generally struggle with. Will also include audio guided practice.
	<ol style="list-style-type: none">5. Quick Practice: Read out and record a sentence/short paragraph shown on the screen. System will grade the client's attempt through metrics such as the time taken and assign scores.
	<ol style="list-style-type: none">6. Client Progress Charts: Performance feedback based on quick practice scores, daily task completion and feedback from instructors. Clients will have the option to share their progress with their coaches.
	<ol style="list-style-type: none">7. Instructor Evaluation: Clients can provide feedback on coaches they have had sessions with on how satisfied they are with the help being provided.
	<ol style="list-style-type: none">8. Daily Log: Clients can log their daily personal review by assessing how their stuttering was throughout the day: No stuttering, extremely mild, moderate, frequent, or severe.

	<p>9. Quote of the Day: Clients can view daily positive affirmations once they login which can help with negative thought patterns.</p>
	<p>10. Schedule a Session: Be able to view coach profiles to select one for a one-on-one session. Pick any available time slot for the meeting from the coach's calendar.</p>
	<p>11. Meeting Reminder: Once a session has been scheduled, clients will have a countdown for the meeting showing on the portal: '<i>Meeting with coach starts in XX:YY:ZZ</i>'</p>
	<p>12. Blog Page: Access informative articles and blog posts categorized into different groups (stuttering, treatment, motivation, information etc)</p>
	<p>13. Buy Courses: View descriptions, add to shopping cart and buy premium courses.</p>
Coaches	<p>14. Meeting Availability: Mark available time slots for sessions with clients.</p>
	<p>15. Add Client Notes: To keep a record of client progress and make notes visible only to the coach summarizing client profiles.</p>
	<p>16. View Client Profiles: View progress charts for only those clients who have agreed to sharing their personal reports with coaches.</p>
Admin	<p>17. Add Coach: Create profiles for new coaches and assign a username.</p>
	<p>18. Manage the Blogs Page: Add/Remove/Edit blog posts.</p>
	<p>19. Review Coach Feedback: View coach evaluation notes submitted by clients. Option to send a review report to each coach.</p>

Table 2: System Features

1.2.3. Data Processing/Analysis

Our web application collects user app usage data per the clients' consent and keeps track of the activities each client has completed (quick practice scores, daily task completion etc). Based on that, the portal will generate progress reports and charts and analyze whether the clients have been consistent with their daily practice (to maintain the streak). This data remains privileged - only a partial view is provided to coaches, in terms of users' medical history, and progress summary, so as to effectively inform their guidance, while administrators can access this information for management purposes. Considering the limitations and scope of our project, we will not be employing speech processing techniques to analyze the audios recorded by the clients as part of their *Quick Practice* tasks, but analysis such as those based on audio duration will be incorporated for feedback.

1.3. Team Profile

Emaan Atique
ID: 24100028
Email: 24100028@lums.edu.pk
Interests and strengths: <ul style="list-style-type: none">● Programming● Presentation● Documentation● Management and Organization



Table 3.1: Team Profile

Saad Sher Alam
ID: 24100161
Email: 24100161@lums.edu.pk
Interests and strengths: <ul style="list-style-type: none">● Programming● Presentation● Documentation● Management and Organization



Table 3.2: Team Profile

Emaan Bilal	
ID: 24100040	
Email: 24100040@lums.edu.pk	
Interests and strengths:	

- Design
- Presentation
- Documentation
- Management and Organization

Table 3.3: Team Profile

Harris Ahmad	
ID: 24100315	
Email: 24100315@lums.edu.pk	
Interests and strengths:	

- Programming
- Presentation
- Documentation
- Management and Organization
- Mentorship

Table 3.4: Team Profile

<p>Bakhtawar Ahtisham</p>	
<p>ID: 24100301</p>	
<p>Email: 24100301@lums.edu.pk</p>	
<p>Interests and strengths:</p> <ul style="list-style-type: none"> ● Design ● Presentation ● Documentation ● Management and Organization 	

Table 3.5: Team Profile

<p>Romessa Shah Jahan</p>	
<p>ID: 24100008</p>	
<p>Email: 24100008@lums.edu.pk</p>	
<p>Interests and strengths:</p> <ul style="list-style-type: none"> ● Design ● Presentation ● Documentation ● Management and Organization 	

Table 3.6: Team Profile

1.3.1. Expertise in a specific tool

Our team members have extensively worked with code hosting platforms such as GitHub for project collaboration, planning and management tools such as Trello for task tracking, project organization, Slack for organizational communication with our advisors as well as web hosting platforms such as AWS.

1.4. Assumptions and Constraints

1.4.1. Assumptions

- Guftaar caters to speech therapy for English. As a result, it is assumed that any client is fluent in English.
- Guftaar is a digital service, therefore it is assumed that clients have access to the Internet.
- Guftaar is a web-service, therefore it is assumed that navigation of the web and interaction with web pages will not be a hurdle for the client.
- Guftaar only allocates a single account per client.
- Since Guftaar supports live interactive sessions, it is assumed that all clients have agreed to a disciplinary and ethical code of conduct and that the integrity of the service is maintained at all times.

1.4.2. Constraints

- **Schedule:** The project is constrained by a deadline with a development period of roughly three months. As a result, Guftaar might not be able to fully incorporate automated interactive activities which include hosting the application on multiple servers. Functionalities that require single server deployment will be incorporated.
- **Budget:** For production and development purposes, Guftaar utilizes cost-free platforms such as Firebase or Pocketbase. For deployment, subscriptions for softwares to be reused, hosting platforms, and other services will be taken into account.
- **Resources:** Some services for Guftaar require speech-language pathologists and certified speech therapists/coaches. To make a fully-functional version of Guftaar, we will be utilizing open-source data for these services, such as courses and activities provided by already established speech therapy institutions. On the other hand, other features are completely automated with response and feedback integration and won't require third-party data.

1.4.3. Software to be Reused

- Firebase or Supabase (A paid subscription might be required if Guftaar needs to scale).
- YouTube or Vimeo's API will be used to stream demo lecture videos (if we end up uploading them).
- We will be using the ES6 convention of JavaScript and JSX to ensure a modern architecture is supported. This can lead to a lack of backwards compatibility with older versions of JavaScript and supported software. Our application will make use of the REST API and CRUD conventions.
- Calendly's open source API will be used to book one-to-one coaching sessions with the instructors.
- GitHub will be used as a version control management software to keep track of all new features being incorporated into the application.

1.4.4. Customer Software

Depending on the architecture of the web application (serverless or not), the following softwares will be used:

- Firebase (Serverless)
- Heroku. In the event of deploying it for commercial use, a paid subscription will be required.

1.4.5. Performance Issues

Our web application will render multimedia-enriched components that would most certainly result in performance issues due to extreme server load on the website. Instead of using and integrating an HTML component for rendering video elements and to bring down performance issues, we will use services like YouTube or Vimeo for all hosting purposes. To ensure peak website performance, all lecture and demo videos will be under 3-4 minutes (since the sole purpose is to demonstrate the feature of providing clients with insightful courses). Serverless hosting website services such as Firebase have a limited capacity in terms of

database storage, so we will have to limit the file size of the resources being uploaded on the speech therapists' end.

1.5. Project Deliverables

Deliverables include:

- Software Project Proposal
- Requirement Specifications
- Design Specifications
- Development Plan
- Test plan
- Demo + source code
- Final document
- Final presentations

1.6.Budget Summary

Item	Hours	Budget
Project Proposal	20	\$633.6
Proposal Presentation	16	\$506.88
SRS Document	30	\$950.4
Design Specifications and development plan	40	\$1267.2
Development	360	\$11,404.8
QA Plan & Testing	72	\$2,280.96
Final project report	30	\$950.4
Presentations	16	\$506.88

Table 4: Budget Summary

The budget for each item is according to the per hour rate of \$31.68, established as the conventional base rate for a student web developer. In keeping with the hours required to complete the tasks listed in the table, the total cost of the project can be estimated at around **\$18,501.12**.

2.0 Project Organization

To understand the process of speech and language therapy in terms of the services that we must provide to clients and to gauge the requirements expected of such an all-encompassing platform, our team met with [Michael Williams](#) – founder of [The Pro90d Speech System](#). Our process of designing this platform was further assisted by one of our team member's, Harris Ahmad's, experience with speech therapy, both as a client and an instructor. Therefore, the facilities and services we at Guftaar intend to provide are tailored by the experiences and recommendations of experts to best design a tech-enabled platform for an issue otherwise neglected in Pakistan.

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4.0 Definitions

Term	Definition
Speech Therapy	A type of therapy that helps individuals improve their speech, language, and communication abilities.
Stuttering	A speech impediment characterized by disruptions in the fluency of speech, such as repetitions of sounds, syllables, or words, prolongations of sounds, and interruptions in speech known as blocks.
PWS	Person who stutters
Speech Processing Techniques	A set of methods and algorithms used to analyze, understand, and manipulate speech signals. They involve the use of signal processing, machine learning, and natural language processing techniques to perform tasks such as speech recognition, speech synthesis, speaker identification, and language translation.
Coach	Person trained enough to assist a younger individual improve a specific skillet. In our context, a coach is a Speech Language Pathologist (SLP).
Administrator	Person monitoring and managing the web application at the backend.
Client	Person using the finished product.
Tutorials	Explanation of a subject or a task especially via interactive sessions or videos.
APIs	Application Programming Interface
Calendly	Schedule and book appointments based on an open-source calendar-based platform.
Streak	A prolonged period of success or failure in a particular activity for consecutive days

Premium Courses	Courses for which one has to pay to get access.
Firebase	Cross-application platform to help build and deploy mobile and web applications, provided by Google.
Pocketbase	Cross-application platform to help build and deploy mobile and web applications.
Supabase	Cross-application platform to help build and deploy mobile and web applications.
Serverless	Applications that do not necessitate the use of any server-side code such as ExpressJS (JavaScript).
Heroku	Cloud platform used to host multiple web applications.

Table 5: Definitions