

SOFTWARE FOR SPEECH LANGUAGE THERAPY CLINICAL SERVICES

Miss. Damini Anil Varpe¹, Prof. Miss. Pratiksha R. Lad²

Research Scholar, Department Of Computer Applications, SSBT's COET, Jalgaon Maharashtra, India¹

Professor, Department Of Computer Applications, SSBT's COET, Jalgaon Maharashtra, India²

Abstract: Speech and language disorders are common among individuals and often require appropriate therapeutic interventions, regular evaluation, and continuous monitoring to assess improvement. Conventional approaches to speech therapy management frequently depend on manual documentation and record maintenance, which may result in difficulties with appointment scheduling and inadequate tracking of patient progress. To overcome these limitations, a software-based system is proposed to simplify and organize the management of speech therapy services. The proposed system provides a user-friendly and interactive interface that allows therapists to manage multiple patients efficiently. It facilitates the systematic maintenance of comprehensive information related to therapy sessions, treatment activities, and patient outcomes. Furthermore, integrated analytical features help therapists monitor individual progress and modify therapy strategies according to patient needs. Overall, the system improves communication, facilitates efficient data handling, strengthens progress monitoring, and enables the delivery of more organized, effective, and personalized speech therapy services.

1. INTRODUCTION

Speech and language impairments, such as stuttering, delayed speech development, and communication problems associated with stroke, are experienced by a considerable number of people and often require consistent therapeutic support. Access to conventional in-person speech therapy may be challenging due to factors such as geographical barriers, limited time, and a shortage of specialized professionals. To overcome these difficulties, the present project proposes a web-based platform for managing speech and language therapy, with the aim of making therapeutic services more accessible, organized, and convenient.

The developed platform serves as a centralized system for maintaining patient and therapist information, scheduling appointments, and managing therapy sessions. It also allows users to submit audio and video recordings of their practice activities, through which therapists can assess performance and provide appropriate feedback. Patients can use the platform to perform assigned activities and observe their progress over a period of time. Therapists can create individualized exercises, review patient responses, assess improvement, and recommend suitable modifications to the therapy program. Thus, the proposed system offers an organized, interactive, and accessible approach to speech therapy management while supporting efficient monitoring and individualized patient care.

2. LITERATURE REVIEW

Recent advancements in digital healthcare and tele-rehabilitation have significantly transformed speech-language therapy. Conventional speech therapy relies heavily on physical clinic visits and manual documentation, which creates challenges in scheduling, tracking long-term progress, and maintaining consistent care.

Attwell et al. (2022) conducted a systematic review on online speech therapy systems for childhood speech disorders, emphasizing the potential of digital platforms to bridge geographic and resource gaps. In a subsequent study, Attwell et al. (2023) introduced a reference architecture for computer-based speech therapy applications, highlighting the importance of scalable, secure, and modular software designs for clinical interventions.

Furthermore, the integration of automation and intelligent tools in speech therapy has gained traction. Deka et al. (2024) systematically reviewed AI-based automated tools for individuals with speech sound disorders, demonstrating how automated audio analysis and real-time feedback can assist clinical assessments. Similarly, Sebkhi et al. (2021) developed a multimodal speech capture system that enables continuous monitoring and data collection during rehabilitation.

While existing research highlights the efficacy of standalone speech tools or tele-health interventions, there remains a gap in providing a single, unified, web-based clinical platform that seamlessly combines patient management, session scheduling, interactive multimedia exercises, and analytical progress tracking. The proposed system addresses this gap by providing an end-to-end management platform designed specifically for therapists and patients.

3. METHODOLOGY

The development of the proposed Speech Therapy Management System follows a structured, iterative Software Development Life Cycle (SDLC) based on the Agile Methodology. This ensures modular implementation, continuous testing, and seamless incorporation of clinical feedback.

1. Requirement Analysis & Specification

- **Problem Identification:** Standard clinical practices rely on physical record-keeping and lack systematic digital tracking.
- **Functional Requirements:** User authentication, patient management, exercise assignment, multimedia audio/video submissions, progress reporting, and calendar scheduling.
- **Non-Functional Requirements:** System responsiveness, secure data handling, data privacy, and cloud scalability.

2. System Architecture & Design

The platform adopts a decoupled Client-Server Architecture to ensure high availability, maintainability, and scalability:

- **Frontend Layer:** Developed using React.js paired with modern styling libraries (Bootstrap/Tailwind CSS) for a dynamic and responsive user interface. Graphical progress reports are rendered using Chart.js / Recharts, while appointment scheduling is driven by FullCalendar.js.
- **Backend Layer:** Built using Spring Boot, exposing RESTful APIs for business logic implementation, secure access control, and seamless interaction with the database layer.
- **Database Layer:** Uses PostgreSQL / MySQL for structured relational data (patient profiles, schedules, therapist feedback) and MongoDB for flexible handling of unstructured multimedia assets (audio/video recording metadata).

3. Workflows and Implementation

- **Therapist Workflow:** Therapists create customized exercise modules, schedule patient sessions, review submitted audio/video practice recordings, and evaluate progress using automated trend charts.
- **Patient Workflow:** Patients access assigned activities remotely, submit recorded speech exercises, track their personal progress over time, and manage session bookings.

4. System Integration & Testing

- Unit testing of API endpoints using Spring Boot testing frameworks.
- Integration testing between frontend UI components and backend REST APIs.
- Cross-browser responsiveness and performance validation for seamless multi-device usage.

4. MODELING AND ANALYSIS

The Speech Therapy Management System is developed using an Agile development approach, allowing the system to be modified and enhanced continuously according to user requirements. The development process begins with a detailed requirement analysis to identify key issues associated with conventional therapy management. These issues include restricted access to therapy services, scattered patient information, difficulties in appointment scheduling, and limited mechanisms for evaluating and recording patient progress.

A client-server architecture is adopted to provide better system scalability, reliability, and performance. The user interface is developed using React.js along with Bootstrap or Tailwind CSS, enabling the application to provide a responsive and easy-to-use environment for both patients and therapists. Chart.js or Recharts is incorporated to present patient progress through graphical representations. For appointment planning and scheduling, FullCalendar.js is used to provide an organized calendar-based management system.

The server-side application is developed with Spring Boot, which supports API development, secure data processing, and implementation of the application's core business functions. PostgreSQL or MySQL can be utilized as the main relational database for storing structured information. MongoDB may also be incorporated when the system needs to manage flexible or unstructured information, such as multimedia-related data.

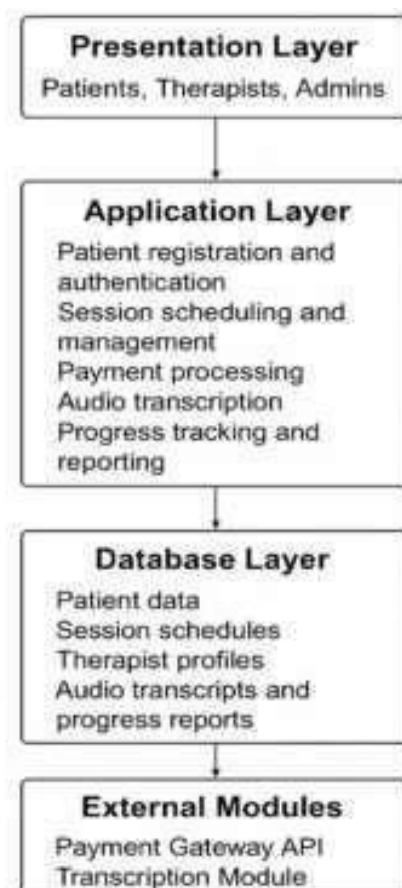


Figure 1: System Architecture

Entity Relationship Diagram

Entity Relationship Diagram - Speech Therapy Management System

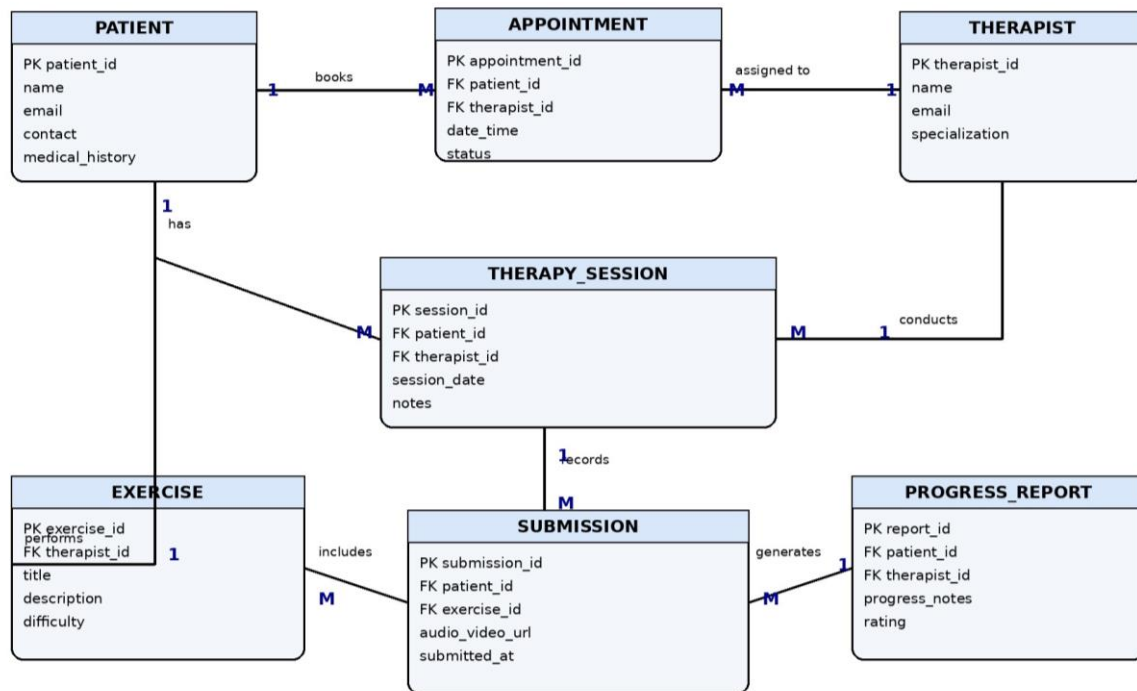


Figure 2: Entity Relationship Diagram

5. BACKGROUND

Speech and language-related difficulties are an important healthcare concern because they can interfere with an individual's ability to communicate effectively and may influence overall quality of life. The rapid development of digital technology has encouraged healthcare providers to adopt technology-based approaches for delivering and managing various services. In conventional speech therapy, difficulties such as limited accessibility, manual documentation, inadequate record organization, and insufficient follow-up can affect the continuity of treatment. These limitations may create additional challenges for individuals who need frequent therapy and regular assessment.

The emergence of web-based applications, analytical techniques, and multimedia technologies has created new opportunities for developing engaging and easily accessible speech therapy solutions. Despite these advancements, several existing applications provide only a limited range of features and do not adequately integrate patient information, therapy activities, communication, and progress assessment. As a result, therapists may face difficulties in coordinating sessions, maintaining patient records, and evaluating treatment outcomes.

To overcome these limitations, the proposed Speech Therapy Management System is designed as a centralized web-based platform for organizing and managing therapy-related activities. The system combines patient management, therapy session scheduling, progress assessment, record maintenance, and communication within a single platform. By integrating these functions, the system aims to improve the efficiency of therapy management, facilitate continuous monitoring, and make speech and language therapy services more organized, accessible, and patient-oriented.

6. DISCUSSION

The Speech Therapy Management System is designed to overcome several limitations associated with conventional therapy methods. It combines essential functions such as patient information management, appointment scheduling, and treatment progress evaluation within one integrated platform, reducing dependence on manual processes and improving

overall efficiency. The system also supports structured therapeutic activities and multimedia-based learning materials to promote effective practice and better treatment outcomes.

Through continuous progress monitoring and analytical reporting, therapists can assess patient performance more effectively and modify therapy plans according to individual requirements. Remote accessibility further increases the availability and convenience of therapy services for patients who may not be able to attend sessions regularly. In addition, the simple and userfriendly design allows both therapists and patients to use the system with ease. Overall, the platform contributes to a more organized, efficient, accessible, and patient-focused approach to speech and language therapy management.

7. RESULTS

The Speech Therapy Management System was successfully developed using modern web technologies, integrating patient management, therapy scheduling, session records, and progress monitoring into a unified platform. The system reduced manual workload, improved data organization, and enhanced therapy efficiency. Therapists could monitor patient progress and provide individualized treatment plans, while patients gained convenient access to exercises, feedback, and remote therapy. The analytical features further supported informed decisionmaking and improved therapy outcomes.



Figure 3: Home page

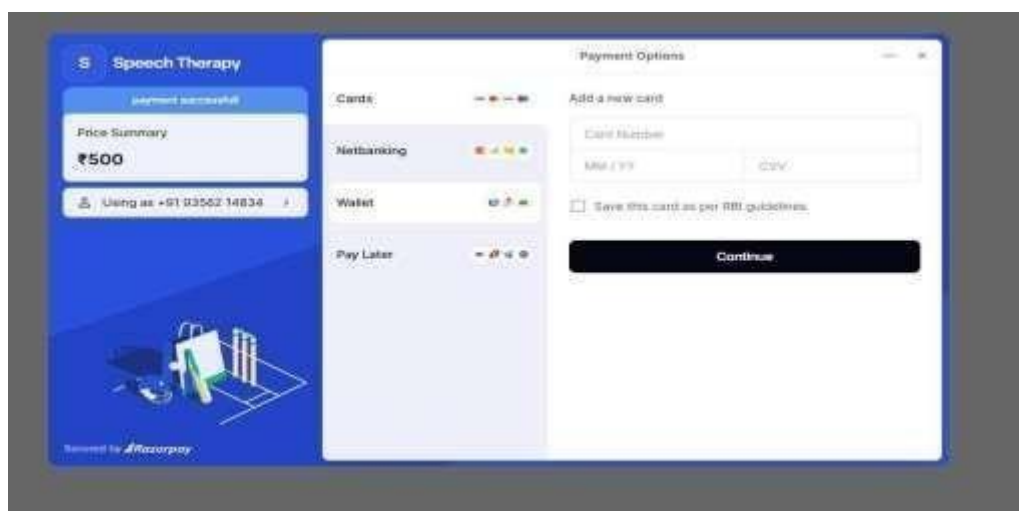


Figure 4: Payment facility

8. FUTURE SCOPE

Future Scope Future systems are likely to combine telepractice, mobile computing, speech recognition, artificial intelligence and cloud-based clinical documentation. Personalized therapy could adapt task difficulty according to patient performance while allowing clinicians to review progress asynchronously. Emerging research is also exploring AI-mediated story-based home practice and multimodal systems that combine speech with articulatory information. These developments may help connect clinic-based therapy with structured home practice, although they remain emerging research areas and require clinical validation. Future development should prioritize multilingual capability, accessibility, explainability, privacy, low-bandwidth operation and clinician configurability. The most useful systems will likely be those designed around clinical workflows rather than systems that attempt to automate therapy completely.

9. CONCLUSION

The Speech Therapy Management System offers an integrated approach to addressing several limitations associated with conventional speech therapy practices. By combining patient information management, appointment scheduling, therapy-session documentation, progress assessment, and communication features within a unified platform, the system can improve the efficiency and accessibility of therapy services. It also facilitates effective interaction between therapists and patients by supporting remote access and enabling therapy plans to be tailored according to individual patient requirements.

The system contributes to better organization of clinical information, systematic monitoring of patient development, and more effective delivery of speech therapy services. Its flexible and scalable design provides opportunities for integration with emerging healthcare technologies in the future. Further development could incorporate dedicated mobile applications, AI-assisted speech assessment, automated progress analysis, and real-time feedback mechanisms, which may help therapists deliver more responsive and personalized interventions.

REFERENCES

- [1]. G. A. Attwell, K. E. Bennin, and B. Tekinerdogan, "A Systematic Review of Online Speech Therapy Systems for Intervention in Childhood Speech Communication Disorders," *Sensors*, vol. 22, no. 24, pp. 9713, 2022.
- [2]. G. A. Attwell, K. E. Bennin, and B. Tekinerdogan, "Reference Architecture Design for Computer-Based Speech Therapy Systems," *Computer Speech Language*, vol. 78, pp. 101465, 2023 *Computer Speech Language*, vol. 78, pp. 101465, 2023.
- [3]. C. Deka, A. Shrivastava, A. K. Abraham, S. Nautiyal, and P. Chauhan, "AI-Based Automated Speech Therapy Tools for Persons with Speech Sound Disorders: A Systematic Literature Review. 2024." *Speech, Language and Hearing*, 2024.
- [4]. Sebkhi, D. Desai, and M. Islam, "A Multimodal Speech Capture System for Speech Rehabilitation and Learning, 2017." *IEEE Transactions on Biomedical Engineering*, vol. 64, no. 11, pp. 2639-2649, 2021.