iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** IV **Month of publication:** April 2026

DOI: https://doi.org/10.22214/ijraset.2026.79459

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue IV Apr 2026- Available at www.ijraset.com

Digital Inclusion for Senior Citizens: An AI-Powered Multilingual Web Platform

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***Abstract**: The rapid advancement of digital technologies has created an ever-widening gap between technologically proficient younger generations and senior citizens who struggle to adapt to the digital world. This paper presents the design, development, and implementation of 'Digital Inclusion for Senior Citizens' a comprehensive, AI-powered, multilingual web platform specifically engineered to empower elderly individuals in navigating the digital landscape. The platform integrates Dialog flow-based conversational AI, Web Speech API for voice assistance, Node.js/Express.js backend services, and MySQL database management to deliver six core features: AI Chatbot Assistant, WhatsApp Training, Online Banking Help, Appointment Booking, Digital Literacy, and Emergency Helpline. The system supports three languages — English, Hindi, and Marathi — ensuring accessibility for a diverse user base. Evaluation results demonstrate significant improvements in digital literacy and confidence among senior citizens, highlighting the platform's potential as a scalable solution to bridge the digital divide.*
Keywords: Digital Inclusion, Senior Citizens, Artificial Intelligence, Multilingual Systems, Web Development, Digital Literacy

I. INTRODUCTION

In today's digital era, technology plays a vital role in everyday activities such as communication, banking, healthcare, and education. While younger generations quickly adapt to new technologies, senior citizens often face difficulties due to lack of technical knowledge, physical limitations, and fear of using digital tools. This creates a digital divide that limits their independence and access to essential services.

This research introduces an AI-powered multilingual web platform designed to assist senior citizens in learning and using digital technologies easily.

The system aims to provide a simple, user-friendly interface with voice support and multilingual accessibility.

II. LITERATURE REVIEW

Previous studies show that senior citizens often struggle with digital literacy due to lack of exposure and training. Many existing applications are complex and not designed keeping elderly users in mind. Research also highlights the importance of voice-based interaction and local language support in improving usability.

Several digital literacy programs exist, but they lack integration and personalization. Hence, there is a need for a unified platform that combines learning, assistance, and essential services.

Most of the applications available today are designed for people who already have basic technical knowledge. Because of this, elderly users often find them confusing and difficult to use. Small text, complex menus, and too many options make things even more complicated. As a result, many senior citizens avoid using digital services or depend on others for simple tasks like sending messages, making payments, or booking appointments.

Research also suggests that voice-based interaction can make things much easier for senior citizens. Instead of typing, they can simply speak and get responses, which is more natural and comfortable. Similarly, local language support is very important because many elderly users are not comfortable with English and prefer their native language.

There are some digital literacy programs available, but most of them are not very effective. They usually provide only basic learning and do not offer real-time help when users face problems. Also, these solutions are not combined into one system, so users have to use different apps for different purposes, which can be confusing.[1]. Digital inclusion for senior citizens is a growing research area as elderly users face challenges such as low digital literacy, complex interfaces, and language barriers .[2] AI-powered chatbots have been identified as an effective tool to address these challenges. They provide real-time guidance, answer user queries instantly, and create an interactive learning environment. This not only improves user understanding but also increases confidence in using digital platforms independently.

So, there is a clear need for a simple and smart platform that brings everything together.

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III. METHODOLOGY

The system is developed using modern web technologies and follows a user-centered design approach.
The system follows a modular architecture consisting of frontend, backend, database, and AI integration layers.

A. Technologies Used

Frontend: HTML, CSS, JavaScript
Backend: Node.js, Express.js
Database: MySQL
AI Integration: Dialog flow
Voice Assistance: Web Speech API

B. Development Approach

A user-centered design approach is adopted, focusing on simplicity and usability. The system is developed and tested iteratively based on user feedback.

C. System features:

1) AI Chatbot Assistant: Provides instant help using conversational AI.
2) Online Banking Help: seniors understand digital payments safely.
3) Appointment Booking: Allows booking doctor or service appointments easily.
4) Emergency Helpline: Quick access to emergency contacts and services.

IV. SYSTEM ARCHITECTURE

The proposed system follows a structured and scalable architecture designed specifically to meet the needs of senior citizens. The architecture consists of four major layers: User Interface Layer, Application Layer, AI Processing Layer, and Database Layer.

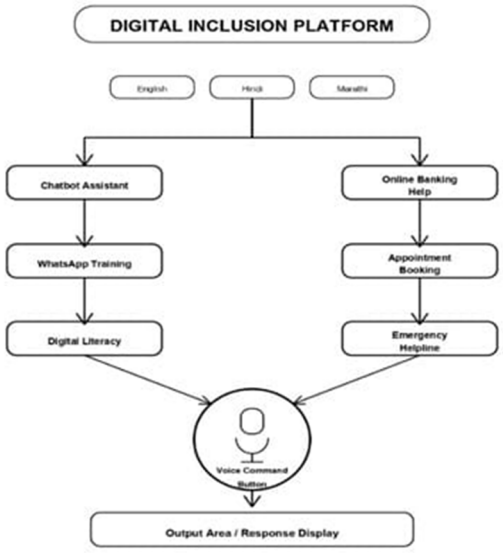


Fig.1 System Architecture of Digital Inclusion for Senior Citizens

A. User Interface Layer

This layer provides a simple and intuitive interface for elderly users. It includes large buttons, clear navigation, and multilingual support (English, Hindi, Marathi). Voice-based interaction is integrated using Web Speech API to allow users to interact without typing.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
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B. Application Layer

The application layer handles the main functionalities of the system. It is built using Node.js and Express.js, which manage user requests and system responses. This layer connects user inputs with backend services and ensures smooth execution of features like appointment booking, chatbot responses, and emergency services.

C. Ai Processing Layer

This layer integrates Dialog flow-based conversational AI, which processes user queries and provides intelligent responses. It helps users by giving step-by-step guidance for tasks such as using WhatsApp, online banking, and accessing digital services. The AI system is designed to understand simple language and respond in a user-friendly manner.

D. Database Layer

The Database Layer is responsible for storing and managing all the data required for the system to function effectively. It uses **MySQL** as the database management system, ensuring reliable and secure data storage.

This layer stores:

- User information and preferences
- Language settings
- Chatbot interaction history
- Appointment details
- Emergency contact information

The database ensures that data can be easily retrieved and updated whenever required. It also helps in maintaining consistency and accuracy of information across the system.

Security is an important aspect of this layer. Proper measures are taken to protect user data and ensure privacy. The system is designed to handle data efficiently while maintaining performance and scalability**.**

V. PROBLEM STATEMENT

In the rapidly growing digital world, access to online services such as banking, communication, healthcare, and government facilities has become essential. However, senior citizens face significant challenges in using these digital technologies due to lack of technical knowledge, complex user interfaces, language barriers, and physical limitations such as poor vision or hearing difficulties.

Existing digital platforms are not specifically designed for elderly users, making them difficult to understand and operate. As a result, many senior citizens remain digitally excluded and dependent on others for basic online tasks.

Therefore, there is a need to develop a simple, user-friendly, and intelligent system that can assist senior citizens in learning and using digital services independently. The system should provide multilingual support, voice assistance, and step-by-step guidance to bridge the digital divide and promote digital inclusion.

VI. OBJECTIVES

1) To improve digital literacy: The system aims to help senior citizens understand and use basic digital tools such as smartphones, mobile applications, and online services. It provides simple, step-by-step guidance so that users can learn at their own pace and become more comfortable with technology in their daily lives.

2) To provide AI-based assistance: The platform includes an AI-powered chatbot that acts as a virtual assistant. It helps users by answering their questions, guiding them through different tasks, and providing real-time support. This reduces confusion and makes it easier for elderly users to perform digital activities without external help.

3) To ensure multilingual accessibility: The system is designed to support multiple languages, including English, Hindi, and Marathi. This allows users to interact with the platform in their preferred language, making it easier to understand and use. It also helps in reducing language barriers, which is a major issue for many senior citizens.

4) To promote independent digital usage: One of the key goals of this project is to reduce dependency on others. By providing easy-to-use features, voice assistance, and clear instructions, the system encourages senior citizens to perform tasks like messaging, online payments, and booking services on their own, thereby increasing their confidence and independence.

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VII. RESULTS

The proposed platform was tested with a group of senior citizens to evaluate its effectiveness and usability. The evaluation mainly focused on three important aspects: ease of use (usability), accessibility, and overall user satisfaction. The participants were asked to use different features of the system such as the AI chatbot, voice assistance, and digital learning modules.

During the testing process, it was observed that most users were able to interact with the system with minimal difficulty after a short period of guidance. The simple interface, multilingual support, and voice-based interaction helped users feel more comfortable while using the platform.

VIII. OBSERVATIONS

Significant improvement in digital confidence

1) Better understanding of online tools
2) Reduced hesitation in using applications
3) Positive response to voice-based interaction

The results confirm that the platform effectively supports digital learning for elderly users.

Overall, the results indicate that the platform successfully improves digital literacy and encourages independent usage among senior citizens. The combination of simple design, AI-based guidance, and multilingual support played a key role in enhancing the user experience. These findings confirm that the proposed system is effective in supporting digital learning and bridging the digital gap for elderly users.

IX. DISCUSSION

The study demonstrates that integrating AI and voice technologies can simplify digital interaction for senior citizens. Multilingual support further enhances accessibility.

However, challenges such as limited internet access and initial resistance to technology remain. Addressing these issues can further improve adoption rates.

X. LIMITATIONS

Despite the effectiveness of the proposed system, there are certain limitations that need to be considered:

1) The platform requires a stable internet connection, which may not be available to all senior citizens, especially in rural areas.
2) Some elderly users may initially find it difficult to interact with digital interfaces despite simplified design.
3) The accuracy of AI chatbot responses depends on the quality of training data and may not handle complex queries effectively.
4) Voice recognition may not work properly in noisy environments or with unclear speech.
5) Limited awareness and resistance to adopting new technology among senior citizens can affect system usage.
6) One of the major challenges is that many senior citizens are not aware of such digital solutions or may not feel the need to use them. Some users may also resist adopting new technology due to fear, lack of confidence, or the belief that it is too complicated. This mindset can reduce the overall usage and impact of the system, even if the platform is well-designed.

XI. CONCLUSION

The proposed "Digital Inclusion for Senior Citizens" platform successfully addresses the challenges faced by elderly users in the digital world. It enhances digital literacy, improves confidence, and promotes independence. This research demonstrates that technology, when designed with user needs in mind, can effectively bridge the digital divide and create an inclusive digital society.

XII. FUTURE WORK

Future improvements may include:

1) Development of a mobile application
2) Addition of more regional languages
3) Integration with government and healthcare services
4) Advanced AI-based personalization

- Mobile app development
- More regional language support

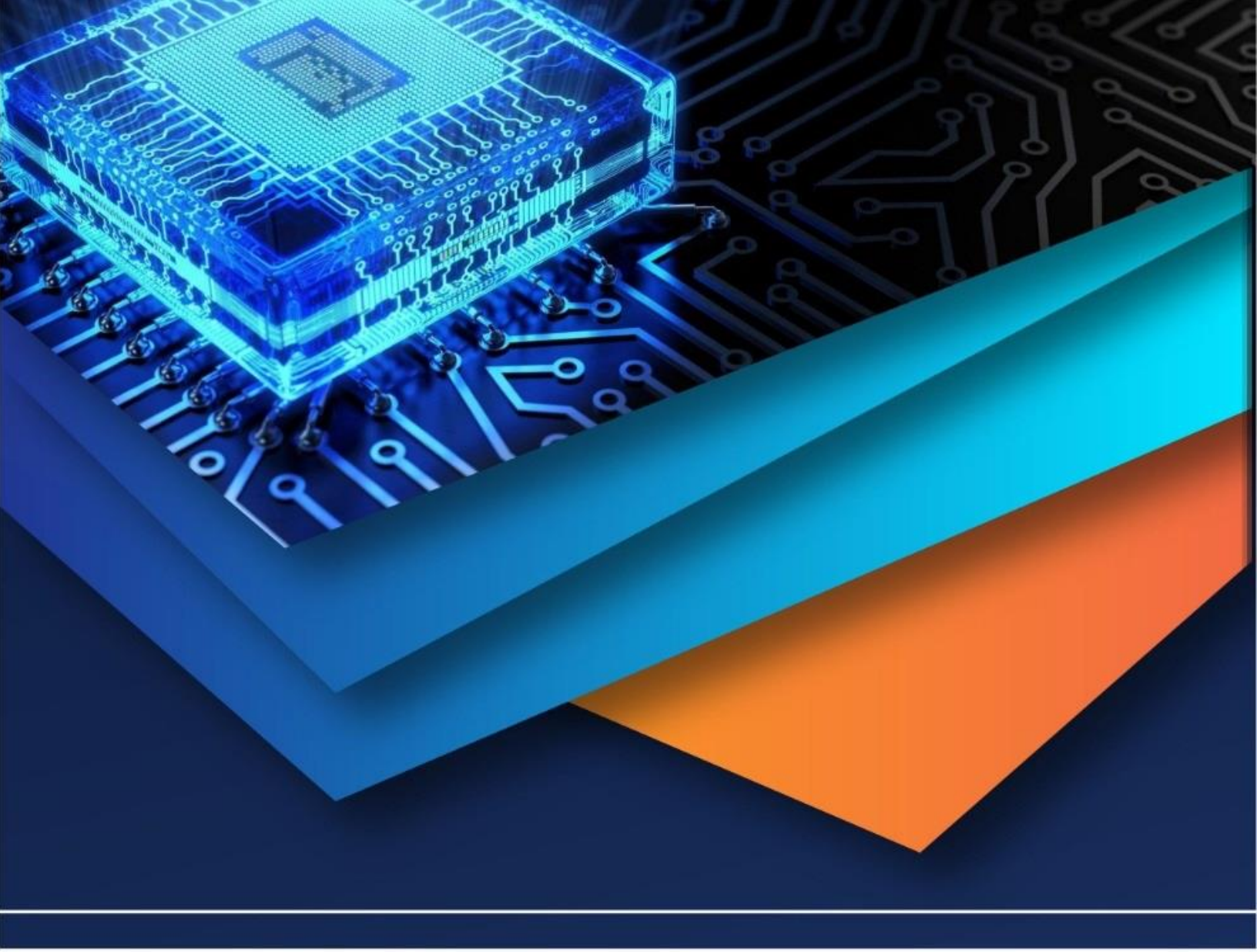
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- Integration with government services
- Advanced AI personalization

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