International Journal of Scientific Research and Engineering Development-– Volume 8 Issue 5, Sep-Oct 2025

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RESEARCH ARTICLE OPEN ACCESS

Smart Digital Notice Board in Web Based Platform with Intelligent Template Mapping

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Abstract:

Traditional notice boards are static, slow to update, and environmentally wasteful, often failing to deliver timely information or emergency alerts. To address these issues, we propose a Smart Digital Notice Board Website, a web-based platform that enables administrators to create, schedule, and publish notices in real time. The system uses intelligent template mapping to automatically convert plain text into professionally designed digital notices. These notices are instantly updated across connected display boards, ensuring dynamic communication without delays. A dedicated emergency alert feature provides both visual and audio signals to grab attention during critical situations. By leveraging the web for accessibility, scalability, and ease of use, this system reduces paper waste, enhances communication efficiency, and significantly improves safety and engagement within institutions and organizations.

Keywords — **Smart Digital Notice Board, Web-based Platform, Real-time Communication, Intelligent Template Mapping, Emergency Alerts, Automated Scheduling, Eco-friendly Solution, loT Integration.**

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INTRODUCTION

Notice boards have long been a primary medium for communication in educational institutions, offices, and public organizations. However, traditional notice boards are static, require manual effort, and often lead to delays in updating information. In emergencies, they completely fail to provide immediate alerts, making them unreliable for fast communication. Additionally, frequent use of paper notices contributes to environmental waste and increases operational costs.

To overcome these drawbacks, we propose a Smart Digital Notice Board Website that provides a centralized, intelligent, and eco-friendly communication platform. Through a secure web portal, administrators can easily create, schedule, and publish notices in real time. An intelligent template-mapping system automatically converts simple text inputs into professionally formatted notices, ensuring consistency and engagement. The notices are then displayed dynamically across connected digital boards with instant synchronization.

A unique highlight of this system is the emergency alert mode, which triggers both visual cues (flashing red screen) and audio signals (alarm sound) to grab immediate attention during critical events. By leveraging modern web technologies, loT-enabled displays, and Al-driven automation, the Smart

Digital Notice Board revolutionizes the way information is disseminated, ensuring speed, accessibility, scalability, and sustainability for institutions and organizations.

Existing System

The existing system for communication in many organizations and educational institutions is based on traditional, paper-based notice boards. This method, which has been widely used for decades, is static, inefficient, and fails to meet the demands of modern communication. The process of updating the boards is manual and time-consuming, as it requires physically creating, printing, and posting notices. This often leads to outdated information being displayed.

A major drawback of this system is its inability to provide urgent communication. During emergencies, the slow, manual process makes it impossible to disseminate information quickly. Furthermore, the continuous use of paper for announcements is not a sustainable practice and contributes to significant environmental waste. The static nature of these notices also offers poor engagement, as they lack the dynamic and visual appeal needed to capture the attention of a modern audience. Your project, the Smart Digital Notice Board, aims to directly address these issues by replacing the outdated manual system with a dynamic, efficient, and eco-friendly digital solution.

Analysis of Existing Systems

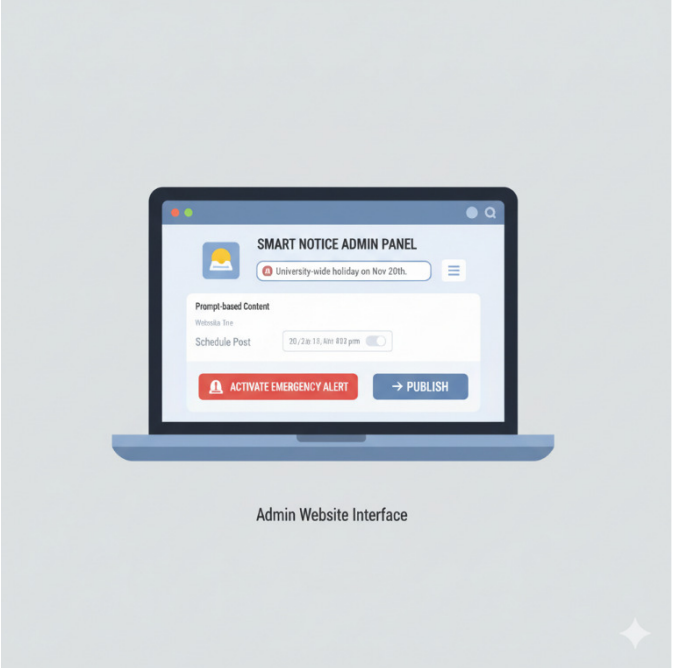
Previous research has explored the use of different technologies to move beyond traditional notice boards. Existing digital signage solutions have +-demonstrated the ability to display dynamic content, but they are often complex and expensive, making them unsuitable for many environments, such as educational institutions. Content Management Systems (CMS) and web technologies have shown significant strengths in managing and displaying dynamic content, while real-time protocols like WebSockets enable the instant updates necessary for an effective communication system.

Key Technological Components

The literature also focuses on specific technologies that can be integrated into a smart notice board system:

- **AI and Natural Language Processing (NLP)**: Research has shown how AI and NLP can be used for intelligent template mapping, which automates the process of matching user prompts to suitable templates. This capability simplifies content creation and reduces manual effort.

- **Real-time Communication**: Studies on digital signage systems and real-time communication protocols confirm the effectiveness of technologies that provide instant updates, which is crucial for information sharing.



Admin Website Interface

Proposed System

The proposed Smart Digital Notice Board system operates on a powerful three-part architecture designed to facilitate **dynamic, real-time communication**. It fundamentally shifts an organization's internal announcements from a slow, paper-based method to an instant, digital one. This enhanced system is built around the synchronized functioning of the **Admin Website**, the **Intelligent Backend**, and the **Dynamic Display Board**,

ensuring information is delivered efficiently, instantly, and securely.

System Components

The Admin Website: Core Implementation and Functionality

The Admin Website is the sophisticated control layer of the Smart Digital Notice Board system, strategically designed to overcome the accessibility and rigidity inherent in paper-based communication. Moving beyond a dedicated mobile application, the web-based interface ensures platform independence and remote accessibility, allowing authorized administrators to manage content and trigger alerts from any web-enabled device globally. The website is structured around three interconnected functional modules, all secured by robust authentication protocols to ensure system integrity.

Functional Modules and Process Automation

The Content Creation and Prompt-Based Input Module

This module is the heart of the content generation process, designed for maximum ease-of-use. It employs a prompt-based input mechanism, requiring the administrator only to input the raw textual message (the prompt). This approach eliminates the traditional burden of manual graphic design or complex layout formatting. Once the text is entered, the website packages this raw data, along with essential metadata (such as the content category and user ID), and securely transmits it to the Intelligent Backend for AI processing. This direct, standardized input is crucial for facilitating the downstream AI-based template mapping process.

The Scheduling and Publishing Module

This module governs the temporal control of all announcements, automating the distribution process entirely. It offers two distinct publishing streams:

- Instant Publishing: The immediate publication option ensures real-time updates. Upon clicking 'Publish,' the command is instantly forwarded, triggering the backend's synchronization mechanism to push the new notice to the display boards without delay.
- Automated Scheduling: For non-urgent announcements, the administrator can pre-select a specific date and time for publication. This time-stamped command is stored in the backend database, ensuring the system automatically pushes the notice at the precise moment, effectively eliminating the risk of human error associated with manual updates.

The Emergency Alert Module (Critical Safety Function)

This module represents the system's most critical safety feature. It is designed for single-click activation to ensure the fastest possible response during critical events. Upon activation, the website generates a high-priority command flag that immediately bypasses the regular content queue in the backend. This priority flag instructs the system to halt normal content display and instantly trigger the visual and audio alert mechanisms on all connected display boards. The secure access control enforced by the website is paramount for this module, ensuring that the emergency function cannot be misused by unauthorized personnel.

Technical Integration and Security

The website maintains a constant, secure connection with the Intelligent Backend. All data movement relies on secure HTTPS protocols for data transfer and utilizes WebSockets for maintaining persistent, low-latency connections necessary for real-time synchronization. Furthermore, comprehensive User Authentication and Authorization are implemented on the website. Each administrator requires verified credentials, and their access level dictates which functions (e.g., publishing rights vs. emergency trigger rights) they can utilize. This multi-layered security approach ensures that the entire communication chain, starting from the admin interface, remains reliable, traceable, and protected against unauthorized interference.

The Intelligent Backend: AI Processing and Real-Time Synchronization Core

The Intelligent Backend represents the critical processing and management layer of the Smart Digital Notice Board system. It functions as the middleware, bridging the high-level administrative commands from the Admin Website with the real-time display requirements of the Dynamic Display Board. This component is defined by its integration of Artificial Intelligence for automated content formatting and its reliance on robust protocols for instantaneous communication.

Advanced Data Processing and AI Integration

The backend's primary responsibility is transforming the raw input from the Admin Website into publishable, visually appealing notices. This is achieved through the Intelligent Template Mapping module.Intelligent Template Mapping (AI/NLP): Upon securely receiving the raw text prompt and metadata from the website, the system employs Artificial Intelligence (AI) and Natural Language Processing (NLP) techniques to analyze the content's context and purpose. This analysis automatically maps the raw user input to the most suitable professional template. For instance, a safety announcement will be paired with a distinct template, while a casual event notice receives a different aesthetic. This automation is critical as it eliminates the need for manual design and ensures that all notices are visually engaging and adhere to institutional branding standards.Template Generation and Formatting: Once the appropriate template is selected, the backend merges the user's text with the chosen design structure. It then generates the final, formatted digital notice, which is optimized for instant display on the digital screens.

Real-Time Communication and Prioritization

The backend ensures that the system delivers its core promise of instant updates and enhanced safety through sophisticated communication protocols. Real-Time Synchronization: To facilitate instantaneous information delivery, the backend utilizes real-time protocols such as WebSockets. These protocols maintain a persistent, low-latency connection with the IoT-enabled display boards. This connection allows the backend to actively push new or updated content to the display units the moment it is finalized, effectively eliminating the delays associated with polling or manual refresh cycles.

Emergency Alert Prioritization: A key safety function is the backend's ability to handle priority traffic. It is programmed to recognize the high-priority command flag sent by the Admin Website's emergency trigger. Upon receiving this flag, the backend immediately interrupts the regular content queue and prioritizes the transmission of the visual and audio alert command to all connected display boards, ensuring immediate response during critical situations.

Data Management and Security Architecture

The backend serves as the secure repository for all operational data, guaranteeing the reliability and integrity of the system.

- Data Storage and Scheduling: All content, scheduling commands, and template configurations are securely stored and managed here. The backend actively monitors the schedule database, ensuring that automatically scheduled notices are pushed to the displays at the precise pre-determined moment.

- Security and Scalability: The backend is responsible for enforcing data security protocols, safeguarding the sensitive information stored within the system. Furthermore, its architecture is designed for scalability , allowing the system to easily accommodate a growing number of Admin Website users and IoT-enabled display boards across multiple buildings or institutions without compromising performance. The Intelligent Backend is, therefore, not merely a data relay; it is an intelligent engine that automates content design, enforces real-time distribution, and safeguards the communication process.

The Dynamic Display Board: Real-Time Output, Safety, and Sustainability Hub

The Dynamic Display Board represents the pivotal output component of the Smart Digital Notice Board system, effectively retiring the outdated era of static, paper-based communication. Functionally, it is an IoT-enabled digital display (such as an LED or LCD screen) that leverages a secure, persistent connection with the Intelligent Backend to deliver information instantly and reliably to the public audience. Its architecture is built not only for displaying data but also for prioritizing safety and promoting eco-friendly practices.

Advanced Real-Time Content Synchronization

The core function of the display board is its instantaneous synchronization capability. Unlike traditional systems that require manual effort, the display board is programmed to receive data via real-time protocols (like WebSockets) utilized by the Backend. This enables a push mechanism where the moment a notice is formatted or updated on the Admin Website, it is immediately rendered on the screen without any audience interaction or refreshing required. This continuous synchronization ensures that the audience never views outdated information, a critical advantage over paper boards that often carry irrelevant or expired notices. Furthermore, the board is optimized to display visually appealing notices with complex formatting and graphics, dramatically increasing the visibility and engagement of announcements.

Critical Safety and Priority Alert System

The most vital functional role of the Dynamic Display Board is its integration as a safety hub within the organization. This feature is crucial for maintaining an effective communication infrastructure during critical events:

- High-Priority Interruption: The display board is engineered to recognize and prioritize the dedicated emergency alert command sent from the Backend. Upon receiving this high-priority signal, the board instantly interrupts the current content feed, overriding scheduled notices or advertisements to ensure the emergency message is shown without fail.

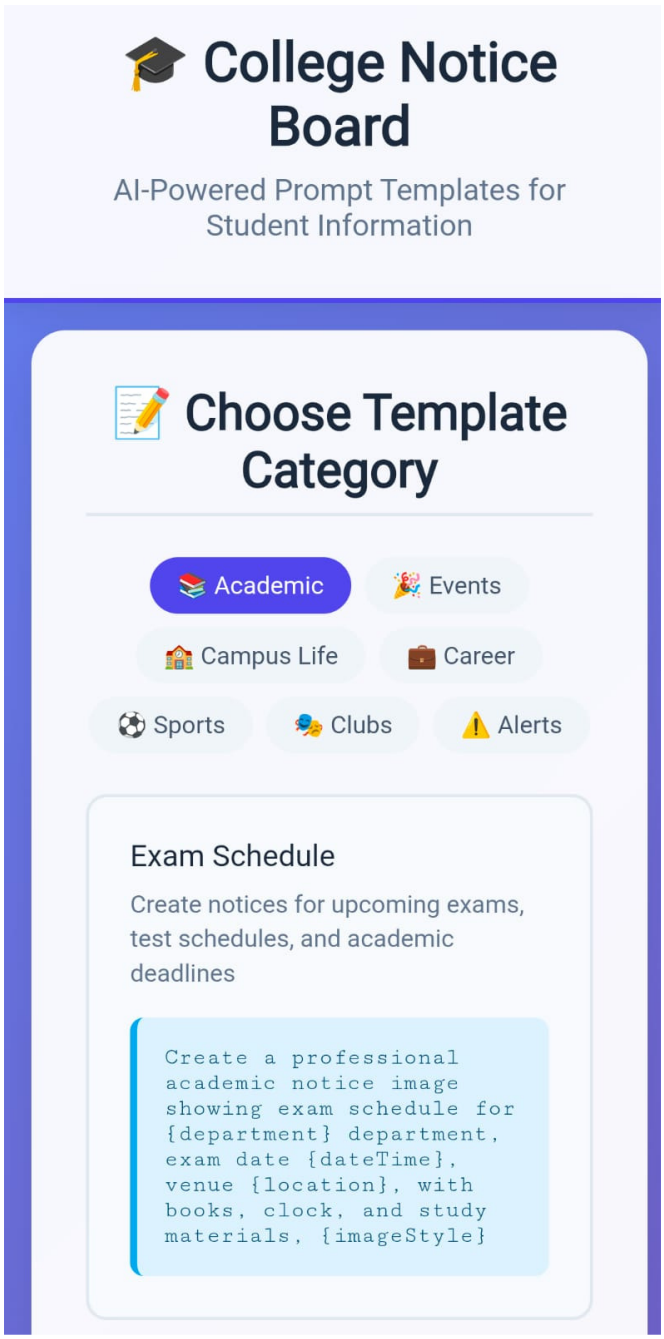
- Dual-Sensory Alert Activation: The system activates a dual-sensory alert system, triggering both prominent visual alerts (such as flashing borders, bold text, or distinct graphics) and audio alerts (like a siren or synthesized voice announcement). This dual approach ensures that the message is immediately conveyed to individuals who may not be looking directly at the screen, guaranteeing rapid and widespread communication across the entire institutional area.

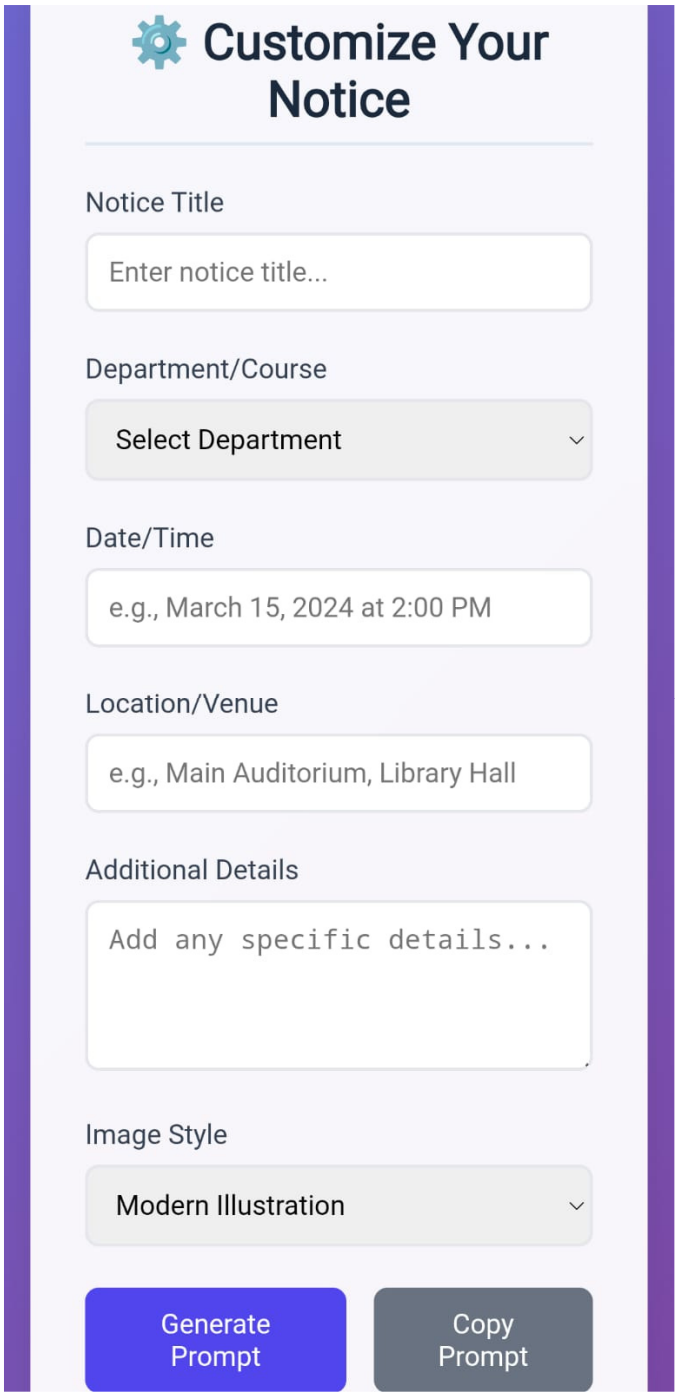
Scalability and Eco-Friendly Architecture

- The implementation of the Dynamic Display Board strongly supports the project's sustainability goals and offers superior scalability.

- Eco-Friendly Output: By operating exclusively with digital displays, the system entirely eliminates the consumption of paper and ink, directly addressing the environmental shortcomings of the traditional system. This commitment to a paperless communication environment significantly reduces waste and promotes the organization's sustainability profile.

- IoT-Enabled Scalability: The display boards are designed as IoT endpoints, meaning they can be easily and affordably deployed across a vast network. Whether an organization requires one display or hundreds across multiple buildings and campuses, the Backend can manage and push unique or unified content streams to all units simultaneously. This scalable architecture makes the system a practical investment for institutions of any size seeking a modern, future-proof communication solution.





Advantages

The Smart Digital Notice Board offers several key benefits that improve upon the traditional system:

- **Real-time & Instant Updates**: It eliminates delays in information sharing, ensuring communication is rapid and immediate.

- **Enhanced Engagement**: The use of visually appealing notices captures attention more effectively than paper-based ones.
- **Effortless Content Creation**: The AI-based mapping simplifies the process of creating content.
- **Improved Safety**: Emergency alerts ensure that urgent communication is delivered immediately, enhancing safety.
- **Eco-Friendly**: The system reduces paper waste and promotes sustainability.
- **Scalable**: The system can be easily implemented across various institutions and organizations.

Conclusion

The Smart Digital Notice Board Website provides an efficient and modern solution for sharing information in educational institutions, organizations, and public places. By moving away from traditional paper-based notice boards, it ensures instant updates, wider accessibility, and eco-friendly communication. The website allows administrators to post, edit, and manage notices easily, while users can conveniently view them anytime and anywhere. This project not only reduces manual effort but also enhances transparency, saves time, and supports a smarter digital environment.

Acknowledgement

"We would like to express our sincere gratitude to everyone who supported us in completing the **Smart Digital Notice Board** project.

First and foremost, we extend our heartfelt thanks to our project guide, for their invaluable guidance, constant support, and insightful suggestions throughout the project's development. Their expertise was instrumental in shaping our work.

We are also grateful to the Computer Science and Engineering Department at our college for providing us with the necessary resources and facilities to carry out this project successfully.

Finally, we wish to thank our friends and family for their unwavering encouragement and moral support. Their belief in our work was a significant source of motivation."

This is a general template. You can modify it to specifically mention individuals by name or include any other organizations that were essential to your project.

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