



SMART DIGITAL NOTICE BOARDS: REVOLUTIONIZING ORGANIZATIONAL COMMUNICATION

Mathe Ramakrishna^{*1}, Thurbilli Karthik²

^{*1}Director-Computer Center, Tezpur University, Assam, India.

²YP2, ICAR-CTRI, Rajahmundry, Andhra Pradesh, India.

Article History: Received: 27 Sept 2024, Revised: 22 Oct 2024, Accepted: 11 Dec 2024, Published: 15 Dec 2024

***Corresponding author**

Mathe Ramakrishna

Abstract

The shift from traditional paper-based notice boards to digital systems marks a significant milestone in organizational communication. Smart digital notice boards leverage web-based and Internet of Things (IoT) technologies to deliver real-time updates, interactive multimedia content, and enhanced user engagement. These systems offer substantial benefits, including improved sustainability through reduced paper consumption, cost efficiency, and increased accessibility. Despite their widespread applicability across sectors such as education, business, and public administration, challenges remain. These include high initial setup costs, dependency on electricity and internet connectivity, and ongoing technical maintenance. Additionally, the reliance on Original Equipment Manufacturer (OEM) proprietorship often imposes substantial costs on users, posing a barrier to widespread adoption. This paper explores the transformative impact of smart digital notice boards, their implementation processes, and strategies to mitigate associated challenges, ultimately paving the way for a more connected and efficient communication landscape.

Keywords: Digital notice boards, IoT technologies, Organizational communication, Sustainability, Cost efficiency, OEM proprietorship.

Introduction

In an era where communication is increasingly digital, traditional methods such as paper-based notice boards are becoming less effective and inefficient. With rapid technological advancement, digital notice boards have emerged as modern and efficient solutions for communication across various sectors, including educational institutions, businesses, and public spaces. These systems enable real-time updates, cost-effective content management, and easy information access while reducing reliance on physical resources.

Smart digital notice boards display notices, announcements, event schedules, and other critical information via electronic screens that can be easily updated and customized through web-based platforms. Unlike traditional boards requiring physical maintenance, digital systems offer flexibility and dynamic content delivery, incorporating text, images, videos, and animations to engage the audience.

The shift toward digital notice boards significantly changes how information is managed and disseminated. Role-based access ensures that only authorized users can update or modify content, and real-time updates keep information current and relevant. This paper explores the

benefits, limitations, and impact of digital notice boards on organizational communication.

Literature Review

The adoption and evolution of digital signage have been explored extensively, with studies spanning over a decade, offering insights into its applications, challenges, and future directions.

Kent and Hensel (2010) analysed how digital signage influences shopper behaviour. Their findings demonstrate the ability of dynamic displays to affect purchasing decisions by creating engaging shopping environments. This early work underscores the potential of digital signage as a powerful tool for consumer engagement and sales growth [1].

In the same year, Dennis et al. (2010) provided cross-national insights into shoppers' experiences with digital signage. Their qualitative study revealed the variability in consumer responses based on cultural and regional differences, emphasizing the importance of localized content strategies and customized implementations tailored to specific market demographics [2].

Burke (2009) earlier explored the behavioural effects of digital signage in retail settings. The study highlights the role of dynamic and real-time communication channels in capturing consumer attention and enhancing engagement, laying the groundwork for further research into its applications in retail and beyond [3].

A decade later, Babkin and Burkhanov (2020) reviewed the integration of digital signage technologies in retail marketing activities. They identified several benefits, such as cost efficiency and real-time updates, alongside challenges like high initial costs and technical maintenance. Their recommendations for overcoming these barriers provide actionable strategies for enhancing the adoption and utility of digital signage systems [4].

Lee et al. (2021) introduced a Digital Signage User Satisfaction Model, focusing on the dual effects of technological complexity on user experience. Their research emphasizes the need for balancing technological sophistication with ease of use to ensure widespread acceptance in retail environments [5].

Most recently, the Springer Lecture Notes in Networks and Systems (2023) presented advancements in smart digital signage, integrating artificial intelligence and IoT technologies. This study proposed a transformative model that enhances interactivity and communication efficiency, reflecting the increasing focus on leveraging technology for personalized and context-aware messaging [6].

Limitations

Digital notice boards, though innovative, face several challenges:

1. **High Initial Setup Costs:** Studies (e.g., Babkin & Burkhanov, 2020) highlight the significant financial investment required for procuring hardware, software, and installation. This cost can deter smaller organizations from adopting digital signage.
2. **Dependence on Electricity and Internet Connectivity:** Digital signage systems rely heavily on consistent power supply and internet access for real-time updates. Any disruptions can lead to downtime, rendering the system ineffective.
3. **Technical Maintenance:** Regular maintenance is essential to ensure smooth operation. Issues like software glitches, hardware malfunctions, or compatibility problems can lead to increased costs and operational inefficiencies.
4. **Technological Complexity:** As Lee et al. (2021) point out, while advanced features like IoT and AI enhance functionality, they also introduce complexities that may overwhelm users, especially in non-technical environments.
5. **Content Management Challenges:** Keeping content fresh, engaging, and relevant requires dedicated resources and expertise. Without effective content strategies, the potential of digital signage to engage audiences is diminished.

6. **OEM Proprietorship and Licensing Costs:** Many digital signage solutions are proprietary, meaning users must rely on specific Original Equipment Manufacturers (OEMs) for hardware and software. This dependency can lead to increased costs and limited flexibility.

Methodology

The development process of smart digital notice boards involves the following key steps:

- **Design and Planning:**

Utilizing HTML, CSS, and JavaScript for front-end design, along with PHP and MySQL for back-end development, to create a robust and user-friendly interface.

- **Real-Time Updates**

Leveraging Ajax and jQuery to facilitate seamless, real-time updates of notice content.

- **Role-Based Access**

Implementing a secure system that assigns role-based permissions to administrators, educators, and employees for effective and controlled content management.

- **User Feedback Integration**

Incorporating feedback mechanisms like surveys to continually refine system functionality and user experience.

Proposed System

The proposed smart digital notice board system seeks to enhance accessibility and engagement while automating the notice dissemination process. Key features include:

- **Role-Based Access**

Assigns specific roles, such as Admin, Department Heads, Teachers, and Students, to control permissions for creating, updating, and deleting content.

- **Online Management**

Streamlines the management of notices through a user-friendly, web-based platform.

- **Mobile Accessibility**

Ensures notices can be accessed remotely via smartphones, providing convenience for users.

- **Time and Resource Efficiency**

Reduces manual labour and associated costs, improving overall operational efficiency.

Workflow

- **User Login**

Users log in using role-specific credentials to ensure secure access.

- **Role Verification**

The system verifies the user's role to grant appropriate access permissions.

- **Content Management**

Authorized users create, update, or delete notices through the platform.

- **Display Notices**

All updates are instantly reflected on connected digital screens.

- **Mobile Access**

Users can view notices on their smartphones, enabling remote accessibility.

- **Notifications**

Important updates are communicated via email or mobile alerts to ensure users stay informed.

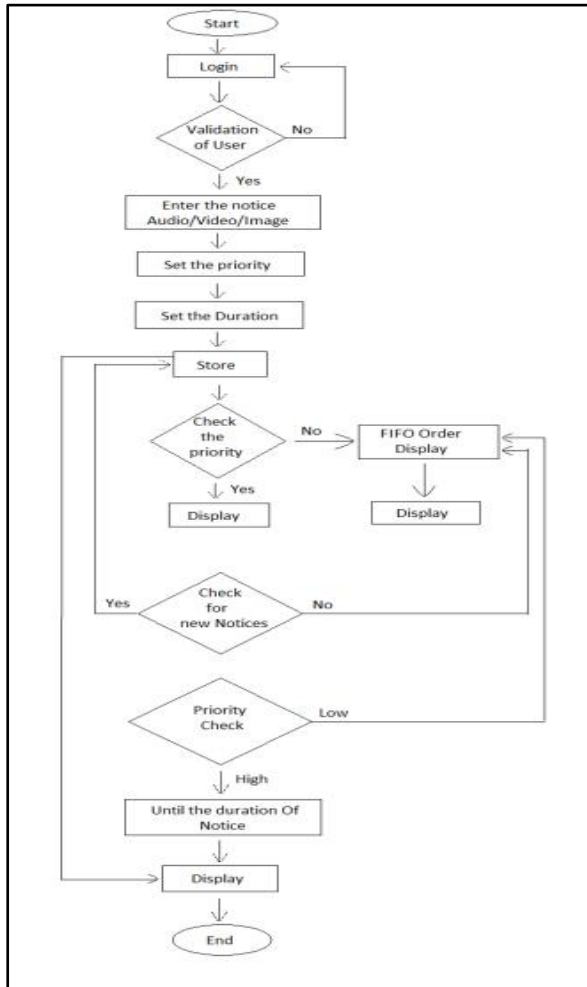


Figure 1 Proposed System

Implementation

We designed a web server to host an application that turns any television with an HDMI port into a digital signage device using a Raspberry Pi. Here's how it works:

1. **Digital Signage Transformation:** The Raspberry Pi connects to the TV via HDMI, effectively converting it into a digital signage system.
2. **Seamless Connectivity:** The device uses network connectivity to fetch and display content from the web server, ensuring efficient communication and updates.
3. **Real-Time Notifications:** The application automatically refreshes whenever a new notification is pushed by the user, ensuring timely updates.

4. **Admin Features:** Administrators can recall previously deployed notifications for review or modification.
5. **Scheduling Flexibility:** Notifications can be scheduled with start and expiration times, offering precise control over their display duration.
6. **Cost-Effective Solution:** The system is independent of proprietary OEM hardware and software, eliminating the need for expensive investments in dedicated management tools.

This solution is a reliable and affordable option for creating dynamic, up-to-date digital signage systems.

Screens

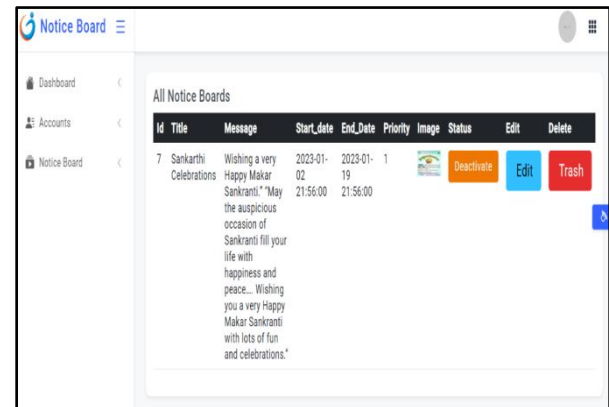


Figure 2 Admin Dashboard

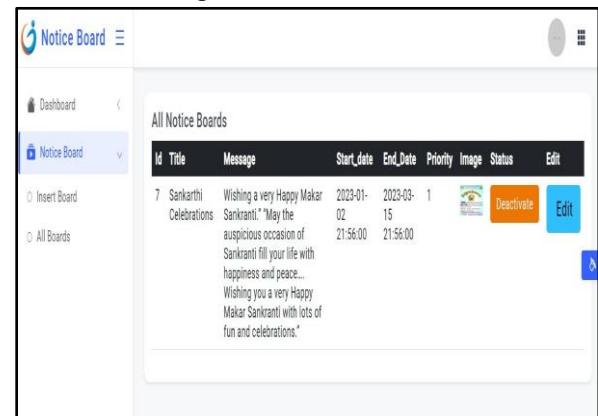


Figure 3 Operator Notice Board



Figure 4 Operator Notice Board

Results and Discussion

The adoption of digital notice boards improves communication in multiple sectors:

- **Education:** Real-time updates benefit students and staff with quick access to schedules and announcements.
- **Corporate:** Enhances internal communication, streamlines training processes, and disseminates feedback effectively.
- **Public Spaces:** Provides timely information like directions, alerts, and news to visitors. Interactive features such as touch screens and QR codes further enhance engagement, while real-time updates ensure information remains relevant.

Conclusion

Smart digital notice boards revolutionize communication by offering real-time updates, cost-effective management, and environmental sustainability. Despite challenges like initial setup costs and reliance on reliable infrastructure, their benefits outweigh the limitations. Future advancements in AI and machine learning may further enhance their functionality, making them indispensable tools for modern communication needs.

References

1. Kent M, Hensel P. The effect of digital signage on shoppers' behavior. *J Retail Consum Serv.* 2010;17(4):334-344. doi: 10.1016/j.jretconser.2010.03.010.
2. Dennis C, Newman A, Michon R, Brakus JJ, Wright LT. Shoppers' experiences of digital signage—a cross-national qualitative study. *J Mark Manag.* 2010;26(11-12):1045-1062. doi: 10.1080/0267257X.2010.508977.
3. Burke RR. Behavioral effects of digital signage. *J Advert Res.* 2009;49(2):180-185. doi: 10.2501/S0021849909090192.
4. Babkin AV, Burkhanov AV. Using digital signage technologies in retail marketing activities. *Proceedings of the 2020 International Conference on Control, Robotics, and Intelligent Systems; 2020 Oct 21-23; St. Petersburg, Russia.* New York: Association for Computing Machinery; 2020. p. 1-6. doi: 10.1145/3446434.3446476.
5. Lee M-A, Lee S, Ko E. Digital signage user satisfaction model: The dual effect of technological complexity. *Asia Mark J.* 2021;23(1):1-20. Available from: <https://doi.org/10.36538/amj.23.1.1>.
6. Springer Lecture Notes in Networks and Systems. Smart signage: Toward a transformative model that effectively integrates AI. *Springer Lecture Notes in Networks and Systems.* 2023;225:283-300.