Design and Implementation of a Centralised Database System for Doctor Profiles with Digital Signage Integration at UTAR Hospital

By

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A REPORT

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ABSTRACT

This project focuses on the area of Health Informatics, specifically addressing the inefficiencies in managing and presenting doctor profiles within UTAR Hospital. The traditional method of maintaining doctor information across multiple platforms often leads to data duplication, inconsistency, and inefficient dissemination to the public. To resolve this, the project proposes the design and implementation of a centralized database system integrated with a digital signage interface.

The system was developed using the Frappe Framework, which provides a robust backend for database management via user-friendly forms called Doctypes. This enabled hospital administrative staff to insert, update, or delete doctor profiles without needing technical knowledge. Each profile contains multilingual details including name, qualifications, specialization, and contact information.

The methodology involved three major stages: (1) designing the database and Doctype structures, (2) developing a responsive doctor profile web page for digital signage using HTML, CSS, and JavaScript, and (3) hosting the display system on a local network accessible via IP address.

System testing confirmed that the solution met all requirements, including real-time profile updates, slideshow presentation, and secure local access. The novelty of this project lies in its integration of a database-driven web interface directly into the hospital's digital signage system, without third-party tools or APIs. This approach ensures data consistency, low maintenance, and real-time updates across all displays.

This project concludes with a fully functional and scalable system, improving both internal data management and external communication with patients and visitors.

Area of Study (Maximum 2): Healthcare Informatics

Keywords (Maximum 5): Centralized Database, Digital Signage, Doctor Profiles, Web Interface, Hospital Digital Systems

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CHAPTER 1 INTRODUCTION

1.1 Problem Statement and Motivation

In today's rapidly evolving healthcare environment, timely access to accurate information is not just a convenience but it is also a critical requirement for delivering high-quality and efficient patient care. Hospitals are under increasing pressure to digitalize their operations and enhance communication across departments and with the public. However, despite these advances, many healthcare institutions still face challenges related to data fragmentation and inconsistent information management. UTAR Hospital is no exception. At present, the hospital's doctor profiles, which include essential details such as name, specialization, academic qualifications, clinic schedule, and contact information, are stored in various formats and maintained across separate systems. This lack of centralization leads to several operational inefficiencies, including redundant data entry, inconsistency in information displayed across platforms, and delays in updating or retrieving doctor-related information.

Currently, UTAR Hospital utilizes different systems for internal administration and external displays such as digital signage. Administrative data, including comprehensive doctor profiles, is typically maintained in the hospital's internal management system or ERP system. Meanwhile, digital signage located in the hospital lobby or waiting areas displays selected doctor information specifically the doctor's name, qualifications, and medical specialization to help guide and inform patients. However, these systems are often updated independently, and in some cases, manually. This disjointed approach creates a high risk of discrepancies between what hospital staff see internally and what patients see publicly. For instance, if a doctor's specialization is updated or a new doctor joins the hospital, the signage content may not reflect this change immediately. Such delays can lead to patient confusion, miscommunication at the reception counter, and potential reputational concerns if outdated or inaccurate information remains visible. Furthermore, this fragmented system places additional burdens on hospital staff, who must perform repetitive updates across multiple platforms, increasing the administrative workload and the risk of human error.

As hospitals move toward digital transformation and automation, there is a growing demand for systems that ensure seamless, real-time communication of critical information. One key opportunity lies in the implementation of a centralized doctor profile management system that integrates directly with both the hospital's internal database and external platforms like digital signage. A unified system of this nature would ensure that all changes made to doctor profiles are instantly and automatically reflected across all channels. This approach not only improves data consistency and reduces the possibility of errors, but it also saves time and effort by eliminating the need for redundant manual updates.

Moreover, such a centralized system enhances the user experience for both hospital staff and patients. Staff would have a more efficient workflow with a single point of data entry and access, while patients benefit from up-to-date and accurate information displayed in a clear and engaging format via digital signage. In high-traffic areas of the hospital, where patients often rely on signage to find their way or check a doctor's availability, the benefits of having accurate, real-time information cannot be overstated.

This project was initiated in response to a specific request from UTAR Hospital's administrative and IT departments, who recognized the urgent need for an integrated solution to improve doctor profile management. The hospital's leadership emphasized their intention to modernize operational systems as part of a broader strategy to align with current healthcare digitalization trends. The motivation behind this project, therefore, is both practical and strategic: to reduce the administrative burden on hospital staff, improve the accuracy and accessibility of doctor-related information, and enhance the overall patient experience. By bridging the gap between data management and public-facing communication, this project supports UTAR Hospital's commitment to innovation and service excellence.

1.2 Objective

The primary objective of this project is to design and implement a centralized database system for managing doctor profiles at UTAR Hospital, with seamless integration to digital signage. The specific objectives are as follows:

1. Design and develop a centralized database system for maintaining accurate, up-to-date information on doctor profiles, including name, specialization, qualifications, contact details, availability, and professional summaries.
    - This ensures consistent information across all systems, avoiding data duplication and discrepancies.

2. Design and implement a visual layout for digital signage that displays doctor profiles in an accessible, readable, and appealing format.
    - The digital signage will support slideshow transitions and dynamic updates to reflect real-time changes.
3. Develop a data retrieval method (via website/API) to extract doctor profile data and distribute it to the digital signage system and potentially to external web platforms.
    - This ensures flexible and scalable data integration with other hospital IT systems.

1.3 Project Scope

This project focuses on designing, developing, and implementing a centralized doctor profile management system for UTAR Hospital, using the Frappe framework. The main goal is to compile all relevant doctor information such as name, qualifications, and medical specialization into one organized platform selected by the hospital. Instead of building a system from scratch, the project leverages Frappe's existing system, allowing hospital administrative staff to easily manage doctor data through structured forms, known as Doctypes. These Doctypes serve as the backbone for managing the database, enabling the admin team to add and update information without needing coding expertise.

A key outcome of the project is the creation of a doctor profile web page designed specifically for digital signage. The hospital's digital signage system allows administrators to easily upload external content via URLs. Once the doctor profile web page is created and hosted within the hospital's private network, the signage system can fetch and display the page in real-time without complex integration. The system's private nature ensures that the doctor profile web page is secure and accessible only within the hospital environment.

The non-functional scope of the project includes maintaining data accuracy with centralized updates, minimizing the chances of human error, and ensuring ease of use for hospital staff. The digital signage interface will be designed to be clean and easy to read for hospital visitors, aligning with the hospital's goal of providing clear and up-to-date information in an accessible and visually appealing format.

1.4 Contribution

This project contributes meaningfully to UTAR Hospital’s ongoing digital transformation initiatives by introducing a centralized database system specifically designed for managing doctor profiles. The primary contribution lies in streamlining the management of essential doctor information, such as name, qualifications, and medical specializations, which are currently handled separately across different platforms. By centralizing this data, the project ensures consistency, accuracy, and timely updates across both internal systems and public-facing digital signage displays.

One of the core outcomes is the integration of this centralized system with the hospital’s digital signage, allowing real-time synchronization of doctor profiles displayed in key areas such as the lobby and waiting rooms. Although the signage is non-interactive, the accurate presentation of doctor information improves visibility and communication with patients and visitors. It eliminates the risk of outdated or inconsistent data, reduces manual update efforts, and enhances overall transparency.

Furthermore, this project supports UTAR Hospital's operational goals by reducing administrative overhead and aligning with data governance standards, such as those outlined in the Personal Data Protection Act (PDPA). While the system does not offer interactive functionalities like appointment booking, it lays the groundwork for future digital enhancements and serves as a replicable model for other healthcare institutions aiming to improve the clarity and reliability of public-facing medical information.

1.5 Report Organization

This report is systematically structured into seven chapters to present a clear and comprehensive narrative of the project titled "Design and Implementation of a Centralised Database System for Doctor Profiles with Digital Signage Integration at UTAR Hospital." Each chapter focuses on a specific aspect of the project, starting from the foundational context to final evaluations and recommendations.

Chapter 1, the Introduction, begins by outlining the problem statement and the motivation behind this project, which emerged from the need to streamline and centralize the doctor profile management process at UTAR Hospital. It presents the project's objectives, which include designing a centralized database system for doctor information, developing a dedicated web page intended specifically for digital signage display, and ensuring that doctor profiles are presented in an organized and readable format for public viewing. The scope of the project is defined in terms of functionality and boundaries, emphasizing the use of the Frappe framework and deployment within a secure private hospital network. This chapter also highlights the contributions of the project in terms of improving user accessibility through a visual signage system, enhancing administrative efficiency through centralized data control, and enabling real-time, automated profile display without manual updates.

Chapter 2 is the Literature Review, which investigates related studies in three main areas: digital signage systems in healthcare, web-based interface design, and centralized profile or data management in medical institutions. A total of five key studies are reviewed, with each section discussing the strengths and limitations of the previous works. The selected studies provide context for understanding existing solutions and their shortcomings. This chapter concludes with a comparison that identifies how the proposed project addresses gaps left by prior implementations and highlights the novelty of integrating centralized backend management with real-time digital display in a hospital setting.

In Chapter 3, System Methodology/Approach, the development strategies and workflows adopted throughout the project are described. This chapter introduces the general methodology used to ensure an organized implementation process, including the breakdown of project tasks and timeline. A high-level system flowchart is also provided to visualize the operational logic of how data flows from input via the backend interface to output on the digital signage. This chapter serves as a bridge between the theoretical foundation and the practical system development.

Chapter 4 focuses on System Design and provides detailed diagrams and descriptions of the system's architecture. It includes a system architecture diagram that outlines the relationship between different components, followed by use case diagrams and activity diagrams to represent user interactions and internal processes. Additionally, this chapter features conceptual, logical, and physical ERDs to illustrate the data structure of the centralized database system. The doctor profile web page design is also presented, with explanations of UI choices, wireframes, and how the layout is optimized for digital signage readability. Finally, flowcharts illustrate the complete data journey, from insertion into the database to display on-screen.

In Chapter 5, System Implementation, the practical development and deployment aspects of the project are presented. This includes software setup procedures such as configuring the

Frappe environment, creating new Doctypes, and setting up the signage-compatible web page. Screenshots and examples of system operations, including how to insert, update, and manage data entries, are provided to demonstrate usability. The chapter also addresses implementation issues and challenges, such as styling limitations or the signage system's reliance on URL access within a private network, before concluding with a reflection on the overall deployment experience.

Chapter 6, titled System Evaluation and Discussion, discusses the performance of the system based on testing and feedback. Performance metrics such as data consistency, signage readability, and administrative ease of use are analyzed. The chapter describes the testing setup used to simulate hospital use and presents the observed results. It further elaborates on the challenges encountered during testing and development, such as content formatting for multilingual names or real-time updating through local IP hosting. An evaluation is then conducted against the initial objectives to determine the extent of their fulfillment, and the chapter ends with concluding remarks on the overall system reliability and usability.

Lastly, Chapter 7 provides the Conclusion and Recommendations. It summarizes the entire project, reaffirming its contribution to improving hospital information dissemination through a centralized, efficient, and scalable doctor profile management system. The chapter also offers suggestions for future enhancements, such as adding search or filter features, integrating with hospital scheduling systems, or expanding the system to include additional departments. These recommendations aim to ensure the long-term sustainability and continued improvement of the solution developed in this project.

CHAPTER 2 LITERATURE REVIEW

2.1 Digital Signage Integration: A study on patients' perception of signage system in a tertiary care teaching hospital

As highlighted in hospital wayfinding and patient experiences, effective signage systems are important for enhancing patient navigation and satisfaction within hospital environments. Signage has a significant role in guiding patients, visitors and staff through complex hospital layouts for easier navigation and reducing anxiety with unfamiliar settings. Research [1] has consistently demonstrated that the well-designed signage improves patient confidence and comfort, highlight the importance of clear and effective communication within healthcare facilities.

This study builds upon this body of knowledge by examining patients' perceptions of a signage system in a tertiary care teaching hospital, highlighting the role of signage in not only aiding navigation but also enhancing the overall hospital experience. Reducing confusion and making critical areas such as emergency areas more accessible are significant impacts on patient satisfaction that can be achieved through effective signage. However, the study [1] also identifies several limitations in the existing signage systems including issues with visibility, readability and language inclusivity. These limitations can lead to decreased patient satisfaction and increased difficulty in navigation especially those with lower literacy levels or first-time visitors.

Signage systems with high visibility and readability including bilingual signs and universally recognised symbols are more effective in diverse patient populations. For example, signs that incorporate both English and local languages like Telugu can enhance understand and navigation for non-English speaking patients. Despite these advances, challenges remain in ensuring that signage is strategically placed and designed consistently to meet the needs of all patients.

This study [1] further contributes to the literature by providing practical recommendations for improving signage systems. These include strategic placement of signs in high-traffic areas, use of universal symbols and consistent design elements across all signage. Additionally, the integration of digital signage solutions such as interactive kiosks is suggested to provide real-time updates and assist patients in locating departments more effectively. These recommendations are to solve the identified weaknesses in current systems and enhance the overall effectiveness of hospital signage.

In conclusion, the study emphasises the critical role of effective signage in improving patient navigation and satisfaction within hospital environments. The study highlights the need for continuous evaluation and enhancement of signage systems to meet diverse patient needs and improve hospital efficiency. The proposed solutions including digital signage and universal symbols, offer valuable insights for future developments in hospital wayfinding systems.

2.1.1 Strengths

Effective signage systems significantly improve hospital navigation and patient satisfaction in tertiary care teaching hospitals highlighted in the study [1]. They found that the clear and visible signage reduces the anxiety of navigating complex hospital layouts and also enhances confidence among patients and visitors. The use of universally recognizable symbols further helps diverse populations to ensure inclusion for patients from different linguistic and cultural backgrounds. Additionally, bilingual signage has been seen to improve wayfinding, especially in hospitals serving multilingual communities as the bridge of the gap for non-native speakers.

2.1.2 Weaknesses

Other than advantages, traditional signage systems face several problems. The study [1] identified some common issues such as inadequate visibility and inconsistent placement of signs which often reduce the effectiveness of navigation. The study also noted that existing systems fail to fulfil all demographic needs when the individuals have lower literacy levels or are non-native language speakers. Moreover, many signs lack uniformity in design leading to confusion and reduced usability. These limitations emphasise the need for improvements that align signage systems with the diverse and dynamic needs of hospital users.

2.2 Digital Signage Integration: Healthcare Signage Design: A Review on Recommendations for Effective Signing Systems

Effective signage in healthcare facilities plays a pivotal role in improving patient experiences, operational efficiency, and overall wayfinding within hospitals. Several studies have emphasised that well-designed signage systems reduce confusion, enhance navigation, and minimise stress for patients, visitors, and healthcare workers. The literature on healthcare signage and wayfinding broadly focuses on the development of guidelines for improving the quality and effectiveness of signage systems, highlighting key areas like text formatting, the use of symbols, colour schemes, and signage placement.

One of the primary frameworks used to inform signage design comes from the Department of Health in England, which developed a manual of best practices. This manual synthesizes various studies and expert opinions to create foundational guidelines for signage systems. Many studies support the notion that a combination of clear typography, properly placed directional arrows, and standardized symbols can significantly improve the ability of users to navigate complex hospital environments. For example, research has demonstrated that using large, sans-serif fonts with adequate spacing increases legibility, particularly for older adults and individuals with visual impairments [2].

In addition to text and typography, the literature underscores the importance of information hierarchy. Prioritizing critical wayfinding information—such as emergency room directions or restroom locations—ensures that users can quickly locate essential services. Studies also highlight the value of using simple, clear language to communicate with diverse populations, especially in multicultural or multilingual environments [3]. Symbols and pictograms are another key focus in the literature, with several studies showing that universally recognised icons, such as wheelchair symbols or restroom signs, enhance user comprehension without requiring language fluency.

Colour coding has been widely researched as an effective way to organize and differentiate areas within healthcare facilities. Studies show that assigning different colours to departments or service areas can improve navigation by offering users an intuitive guide based on visual cues. Similarly, the literature emphasises the need for proper sign placement, with recommendations to position signs at eye level and at decision points, such as hallway intersections, where users need directional guidance [3].

Several studies also highlight the negative impact of poor signage systems. Hospitals with inadequate or unclear signage often experience higher rates of patient disorientation, leading to frustration and wasted resources as staff are frequently interrupted to provide directions. Research indicates that incorporating user feedback in the design of signage systems can help tailor these systems to meet the diverse needs of patients, including those with disabilities. For example, the inclusion of Braille for visually impaired users and the adherence to standards like the Americans with Disabilities Act (ADA) ensures that signage is inclusive and accessible.

Overall, the literature on healthcare signage design emphasises a multi-faceted approach that combines user-centred design, inclusivity, and adherence to regulatory standards. By addressing these aspects, healthcare facilities can create more effective signage systems that not only improve wayfinding but also contribute to better patient satisfaction and safety outcomes.

2.2.1 Strengths

The study [3] provides a comprehensive framework for healthcare signage design by integrating user-centred design principles with practical guidelines. It highlights critical elements such as typography, colour coding, and signage placement, which have been empirically shown to enhance navigation within healthcare facilities. A particular strength of this study is its emphasis on inclusivity, recommending features such as Braille and universally recognised symbols to cater to diverse patient populations. The integration of colour schemes for departmental differentiation and strategic placement of signs at decision points offers actionable insights for hospital administrators seeking to optimise wayfinding systems. Additionally, the study's focus on incorporating user feedback ensures that its recommendations are grounded in real-world usability concerns, making it highly applicable to modern healthcare environments.

2.2.2 Weaknesses

Despite its valuable insights, the study [3] has some limitations that warrant consideration. While the recommendations are well-founded, they are largely based on general guidelines and may not address the specific challenges faced by individual healthcare facilities, such as spatial constraints or budget limitations. The study also assumes that all hospitals have the resources to implement comprehensive signage solutions, which may not be feasible in resource-limited settings. Another notable gap is the limited discussion on the integration of digital technologies, such as interactive signage or real-time navigation aids, which are becoming increasingly prevalent in modern hospitals. Furthermore, while the study acknowledges the importance of multicultural and multilingual considerations, it lacks detailed examples of how to address these complexities in regions with highly diverse patient demographics.

2.3 Enhance Web Interaction: A Literature Review: Website Design and User Engagement

The increasing significance of website design has been acknowledged as internet usage grows rapidly, transforming websites into essential communication tools between businesses and consumers. The importance of effective design in improving user engagement has been emphasised in several studies, highlighting how poor design leads to user frustration and high bounce rates, while good design fosters user retention and interaction. Despite the abundance of studies, a clear gap remains in understanding which specific elements contribute most to effective website design. Usability is often considered a key factor, though definitions of usability vary across research, with different studies focusing on navigation, readability, loading speed, and other elements. For example, Nielsen [5] connects usability to ease of learning and user efficiency, whereas Palmer [6] emphasises content interactivity and download time.

The review of literature has identified several core website design elements that contribute to user engagement, with navigation, graphical representation, organisation, content utility, purpose, simplicity, and readability standing out as the most critical factors. Each of these elements plays a unique role in improving the user experience. For instance, navigation affects how easily users can move around a site, with clear menus and pathways enhancing ease of use, as seen on websites like Wikipedia. Graphical representation, including the use of visuals, colours, and multimedia, engages users visually, which is a prominent feature on sites like the BBC. Organisation ensures that information is structured logically, such as product categories on e-commerce platforms like eBay, making it easier for users to locate relevant content.

While these seven elements surpass the 30% threshold of relevance in the studies reviewed, other factors like loading speed, security, and interactivity, though noteworthy, fell below this threshold. Despite this, they remain essential to user satisfaction. Websites that load quickly, such as Google’s search results, or prioritize security, such as banking sites, still retain users and build trust. Furthermore, interactivity, such as user comments on platforms like YouTube, contributes to greater user engagement by encouraging participation.

In conclusion, the literature consistently underscores the importance of these design elements in engaging users, though there are overlaps between some factors, such as organisation enhancing navigation, or graphical representation contributing to a website’s overall purpose. Future research should aim to refine the distinctions between these elements while also exploring new challenges, such as ensuring mobile compatibility and integrating social media, which are increasingly relevant in modern website design. As websites continue to evolve, cross-platform functionality will be key to sustaining user engagement across a variety of devices.

2.3.1 Strengths

The study [4] on website design and user engagement highlights several strengths in its approach. One of the primary strengths is the identification of key design elements that contribute to effective user engagement, such as navigation, organisation, graphical representation, and readability. These factors have been consistently supported by research, with practical examples from well-known websites like Wikipedia, BBC, and eBay. The study [4] does an excellent job in connecting usability with user retention and interaction, particularly highlighting the importance of factors like loading speed and security. Additionally, the inclusion of future research directions, such as mobile compatibility and social media integration, demonstrates an awareness of emerging trends in web design.

2.3.2 Weaknesses

Despite its strengths, the study [4] has certain weaknesses that can be addressed. First, it lacks a critical analysis of the studies it references, particularly in relation to the specific methodologies and contexts in which the research was conducted. For instance, while the review mentions the 30% threshold of relevance for certain design elements, it does not critically assess whether this threshold is valid or if other factors might have been overlooked. Additionally, the study could have elaborated more on how the identified elements interact with one another, such as how the design's graphical representation affects navigation or organisation, which would make the findings more integrated and comprehensive.

2.4 Enhance Web Interactivity: Web Visual Design Principle Used in Public Universities

University websites serve as vital hubs for providing services and information to various user groups, including students, staff, alumni, and researchers. The increasing reliance on these websites introduces new challenges in design, primarily centred around usability and visual aesthetics. The first impression of a website plays a critical role in shaping user perception, with visual elements like fonts and graphics significantly enhancing both usability and performance. For instance, a well-structured homepage with clear navigation can positively influence a user’s experience, making it easier to access information. In the context of public universities, web design responsibilities often fall to the ICT department, particularly the Infostructure Unit, which focuses on the visual aesthetics of the site while the content remains pre-determined.

In web visual design, two primary principles emerge: classical aesthetics and expressive aesthetics. Classical aesthetics prioritize simplicity, symmetry, and clarity, creating clean and orderly designs that enhance usability. A university website adhering to this principle might feature symmetrical layouts, clear fonts, and minimal distractions, enabling users to find the information they need with ease. On the other hand, expressive aesthetics emphasise creativity and originality, utilizing innovative designs, such as animations or unique colour schemes, to engage users. These elements add a layer of dynamism to the website, capturing attention and enhancing user interaction.

Incorporating these principles effectively can significantly impact user engagement. The visual appeal of a website is crucial in drawing attention, with techniques like large images, icons, and organized layouts playing a central role in retaining users. Moreover, the overall pleasantness and usability of a site are key to ensuring a seamless user experience, where functional links and intuitive navigation are essential. Clarity in design, particularly with readable fonts and appropriate colour contrasts, further enhances accessibility. Additionally, neatness and consistency across the website—through organized content and uniform headers and footers—help establish familiarity and ease of use for users.

While classical aesthetics form the foundation of most public university websites, many incorporate elements of expressive aesthetics to boost engagement. Innovative features like interactive animations or original colour schemes provide a distinctive look, even within standardized templates. This balance between simplicity and creativity ensures that public university websites remain both functional and appealing, meeting the needs of diverse user groups while also engaging them with visually attractive designs.

2.4.1 Strengths

The study [7] effectively presents the importance of web visual design principles, focusing on classical and expressive aesthetics. It successfully highlights how these principles can enhance usability, user engagement, and overall user experience on public university websites. The examples provided, such as the use of symmetrical layouts, readable fonts, and interactive animations, illustrate how these design elements play a crucial role in making university websites both functional and visually appealing. This connection to real-world applications makes the review informative and relevant to your project.

2.4.2 Weaknesses

While the study [7] provides a solid foundation in web visual design principles, it lacks a detailed critique of the sources cited. There is little discussion on how these principles compare to other web design studies or their limitations in certain contexts, such as accessibility for diverse user groups. Additionally, the study [7] could benefit from a deeper analysis of the challenges in balancing classical and expressive aesthetics, as well as how these challenges might be overcome when designing websites for public universities or other complex institutions like hospitals.

2.5 Centralised Doctor Profile: Impact of a Centralised Database System on RT QA Management at a Large Healthcare Network: Five Years' Experience

The study [8] on quality assurance (QA) in radiotherapy emphasises the need for efficient, standardized systems to manage the increasing complexity of QA processes across healthcare networks. Traditionally, QA has been managed through paper-based systems, which have been criticized for their inconsistency, inefficiency, and inability to provide reliable data analysis across different facilities. Research has highlighted the importance of developing centralised systems to improve QA compliance and streamline data management, particularly in large, multi-campus healthcare networks where uniformity is critical for maintaining high standards of care.

Several studies have shown that centralised QA databases can significantly enhance the management of radiotherapy equipment, such as linear accelerators (linacs) and CT units, by standardizing procedures and automating data collection. These systems allow for more accurate, accessible, and consistent data, which are crucial for long-term risk analysis and quality improvements. For example, implementing centralised databases has been associated with improvements in compliance rates, allowing institutions to monitor QA processes more effectively and identify gaps in performance. Furthermore, these systems have been found to reduce the time needed for data analysis and reporting, which is particularly beneficial for year-end QA reviews.

However, the transition to centralised systems is not without challenges. Some studies have reported resistance from QA personnel due to increased data entry times and the learning curve associated with new technology. Despite this, the overall feedback from users tends to be positive, with many recognizing the long-term benefits of improved data retrieval, analysis capabilities, and enhanced QA oversight.

The study [8] in question aligns with this body of research, exploring the implementation of a centralised QA database across multiple campuses and assessing its impact over five years. It examines how the system improved QA compliance, reduced inefficiencies in data management, and was received by the medical physicists involved. This research builds on previous findings by providing empirical evidence of the practical benefits and challenges of a centralised QA system in a large healthcare network, contributing to the growing consensus that such systems are essential for modern radiotherapy QA management.

2.5.1 Strengths

The study [8] successfully highlights key trends in radiotherapy QA, particularly the role of centralised systems in improving data management and compliance. The clear connection to existing research strengthens the review, and the inclusion of both benefits and challenges gives a well-rounded perspective. Furthermore, the inclusion of real-world examples and empirical evidence from previous studies enhances the review's relevance, grounding it in practical applications.

2.5.2 Weaknesses

The study [8] could benefit from a deeper discussion on the limitations or challenges of centralised systems beyond user resistance and learning curves. For example, exploring issues such as system integration, data security, or the initial cost of implementing centralised systems could provide a more comprehensive analysis. Additionally, while the study acknowledges the positive impact on QA processes, a comparison with other management systems such as decentralized or hybrid models could provide a more nuanced perspective.

2.6 Comparison of Previous Study with Proposed Solution

The previous studies have highlighted the importance of effective signage and digital systems in enhancing hospital operations, patient satisfaction and overall usability. One of study above research on patients' perception of signage systems in tertiary care hospitals shows that clear, visible and bilingual signage systems help improve navigation and reduce anxiety. However, these systems face challenges such as inconsistent placement, lack of inclusivity for individuals with lower literacy levels and limited uniformity in design. Furthermore, there are other studies that recommend user-centred design principles including strategic signage placement and the use of Braille or universally recognizable symbols but often overlook the digital integration and real-time updates that are important in modern healthcare environments.

In contrast, the proposed solution in this project solves the problem identified in these studies. The project bridges the gap between traditional and modern systems by focusing on integrating centralised doctor profiles with digital signage and a user-friendly web interface. The proposed solution ensures that the digital signage and web interface have real-time updates and dynamic content that is different from other static signage systems. Furthermore, the integration of the centralised database ensures the consistency and integrity of information across all hospital departments, reducing manual effort and redundancy highlighted as inefficiencies in previous studies.

Additionally, this project combines the strengths of both physical signage and general web design principles to provide a unified system. The use of digital signage resolves issues of visibility and provides patients with actionable information such as doctor schedules and availability. The proposed web interface enhances accessibility by allowing users to filter, search and view doctor profiles seamlessly from any device, and overcome usability challenges identified in previous website design and user engagement research.

Ultimately, the proposed solution offers an approach that builds on the insights and limitations of previous studies. Integrating digital signage, centralized data management, and a responsive web interface provides a scalable, efficient, and inclusive system tailored to the evolving needs of modern healthcare facilities.

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

3.1 Methodologies and General Work Procedures

This project adopts the Agile methodology to ensure flexibility and adaptability throughout the development process. Agile allows for iterative progress and frequent evaluations, which is ideal for a system that may require continuous updates based on technical adjustments and visual feedback. The development begins with requirement analysis to understand the system's scope and objectives. Based on these requirements, a centralized database for doctor profiles is designed and implemented using the Frappe framework, which supports structured data storage, easy management, and retrieval.

Once the database is set up, the project focuses on designing a web page specifically tailored for digital signage purposes. This web page is connected directly to the centralized database and formatted to display doctor profiles clearly on digital screens within the hospital environment. The display is accessed via a static IP address over the private hospital network, ensuring real-time profile updates without the need for external API integration. The design emphasizes readability, layout consistency, and visual appeal for public viewers. Regular testing is conducted at each stage to identify and address any technical issues, and adjustments are made based on feedback from internal users to improve visual clarity and data accuracy on the signage system.

3.2 Overall System Flowchart

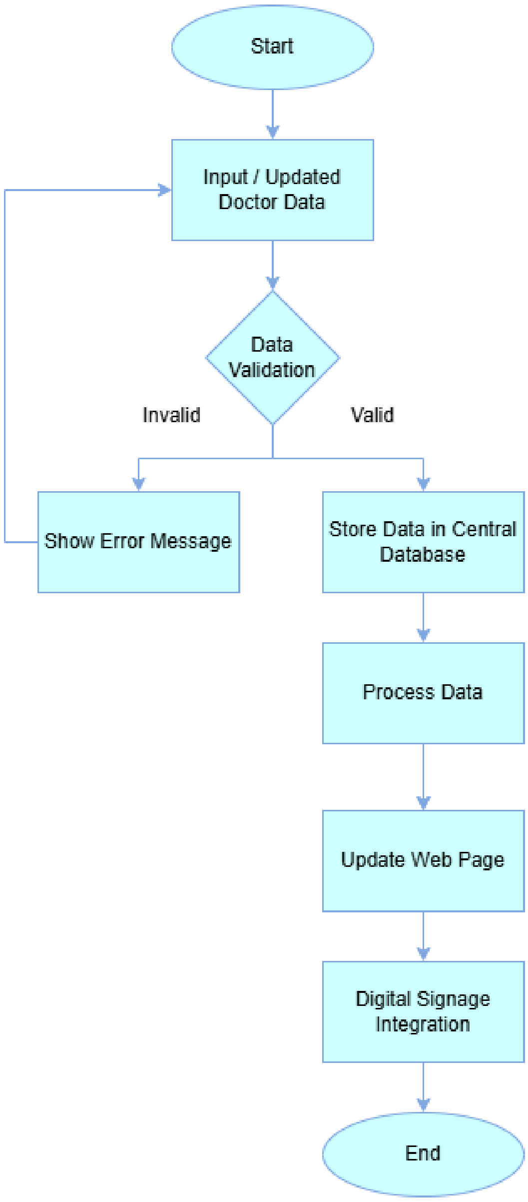


Figure 3.2.1 Overall System Flowchart

The system begins with the user initiating the process to input or update doctor profile data. Once the data is entered, it undergoes a validation step to ensure all required fields are accurate and formatted correctly. If the data is found to be invalid, the system displays an appropriate error message and redirects the user back to the input or update form for correction. This loop ensures only valid data progresses to the next stage.

When the data passes validation, it is then stored securely in the centralized database developed using the Frappe framework. This centralized database serves as the main repository for all doctor profiles, allowing for organized management and streamlined access to information.

Following successful storage, the system processes the data to prepare it for display. This involves formatting and extracting relevant fields such as name, department, specialty, and photo. The processed data is then used to update a dedicated web page that is specifically designed for digital signage purposes.

The updated web page is linked directly to the digital signage display via a static IP address, allowing real-time integration. This ensures that any changes made in the database are automatically reflected on the signage screens throughout the hospital. The system ends once the updated profile data is successfully displayed on the digital signage system.

CHAPTER 4 SYSTEM DESIGN

4.1 System Design Diagram

4.1.1 System Architecture Diagram

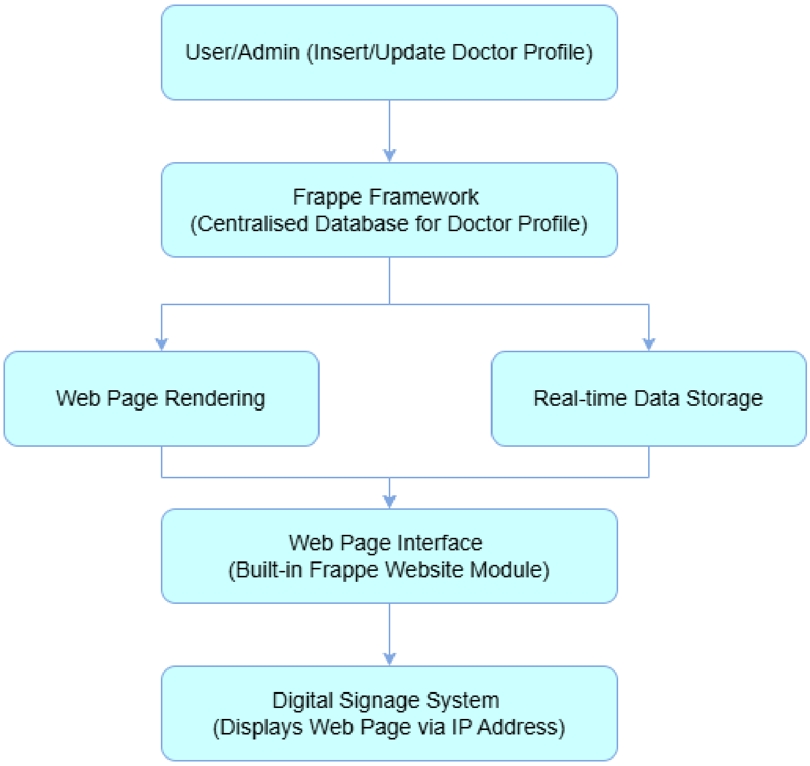


Figure 4.1.1 System Architecture Diagram

The architecture of the system is designed to ensure centralized data management and seamless real-time display of doctor profile information. At the core of the architecture is the Frappe framework, which acts as both the backend engine and the centralized database. This framework enables the structured storage and management of doctor profile data through built-in modules and interface tools. The doctor profiles are inserted and updated directly into the Frappe system through its Data Import function, supporting efficient data control and centralized maintenance. As data changes are made in the Frappe system, they are reflected immediately in the linked components.

The web page acts as the main interface for displaying the doctor profiles. It is built using the Frappe website module, which directly connects to the centralized database. This allows the latest doctor profile information to be presented immediately. To display this web page on the digital signage, the system simply accesses the same webpage using the IP address, enabling real-time display without external middleware. This architecture promotes efficiency, reduces complexity, and ensures that both the web view and the digital signage always reflect the most up-to-date doctor profile data from the centralized database.

4.1.2 Use Case Diagram and Description

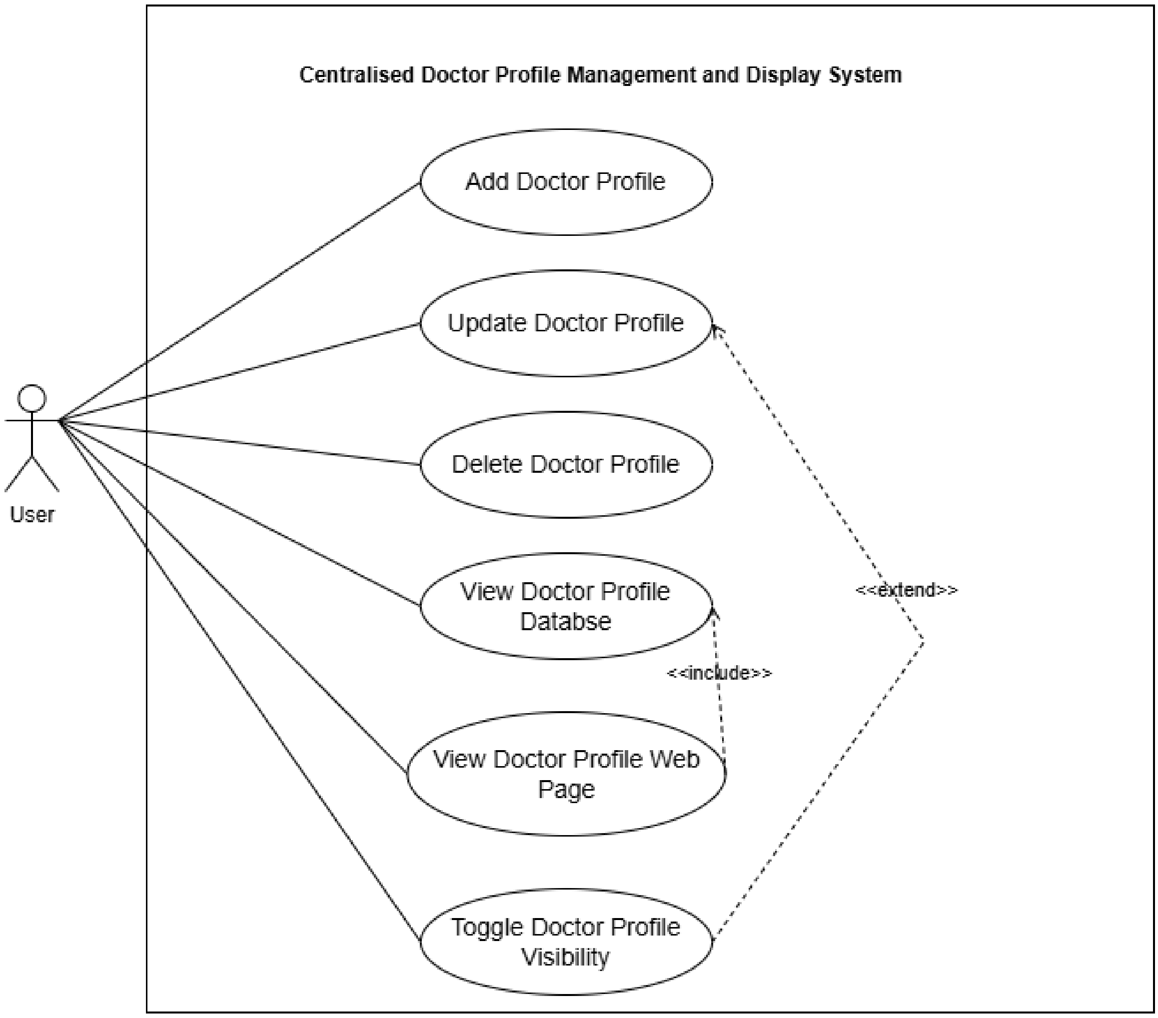


Figure 4.1.2 Use Case Diagram

The use case diagram for the doctor profile management and display system represents the interactions between the user like hospital administrator and the various functions within the system. The system, named Centralised Doctor Profile Management and Display System, enables the user to perform essential operations such as adding, updating, and deleting doctor profiles, as well as viewing the database of doctor profiles. The diagram also includes the ability to manage the visibility of doctor profiles in the digital signage system.

The primary use cases are Add Doctor Profile, Update Doctor Profile, Delete Doctor Profile, and View Doctor Profile Database, which all allow the user to manage doctor information effectively. View Doctor Profile Web Page enables the user to display doctor's information on the digital signage system to access. Additionally, there is the use case Toggle Profile Visibility, which allows the user to toggle the current status of a doctor's profile between "active" and "inactive." This functionality is optional and extends the Update Doctor Profile use case, as it provides additional behaviour that can be triggered when a profile's visibility needs to be changed.

The relationships between the use cases are clearly defined with extend and include relationships. For example, the Toggle Profile Visibility use case extends the Update Doctor Profile use case, meaning the toggling action is an optional behaviour added to the doctor profile update process. Additionally, the View Doctor Profile Web Page includes the View Doctor Profile Database use case, as the web page requires access to the database in order to display accurate and updated doctor information. These relationships reflect how different use cases are interdependent, with some functionality being added or required by others to provide a comprehensive solution for managing doctor profiles within the system.

4.1.3 Activity Diagram

Add Doctor Profile

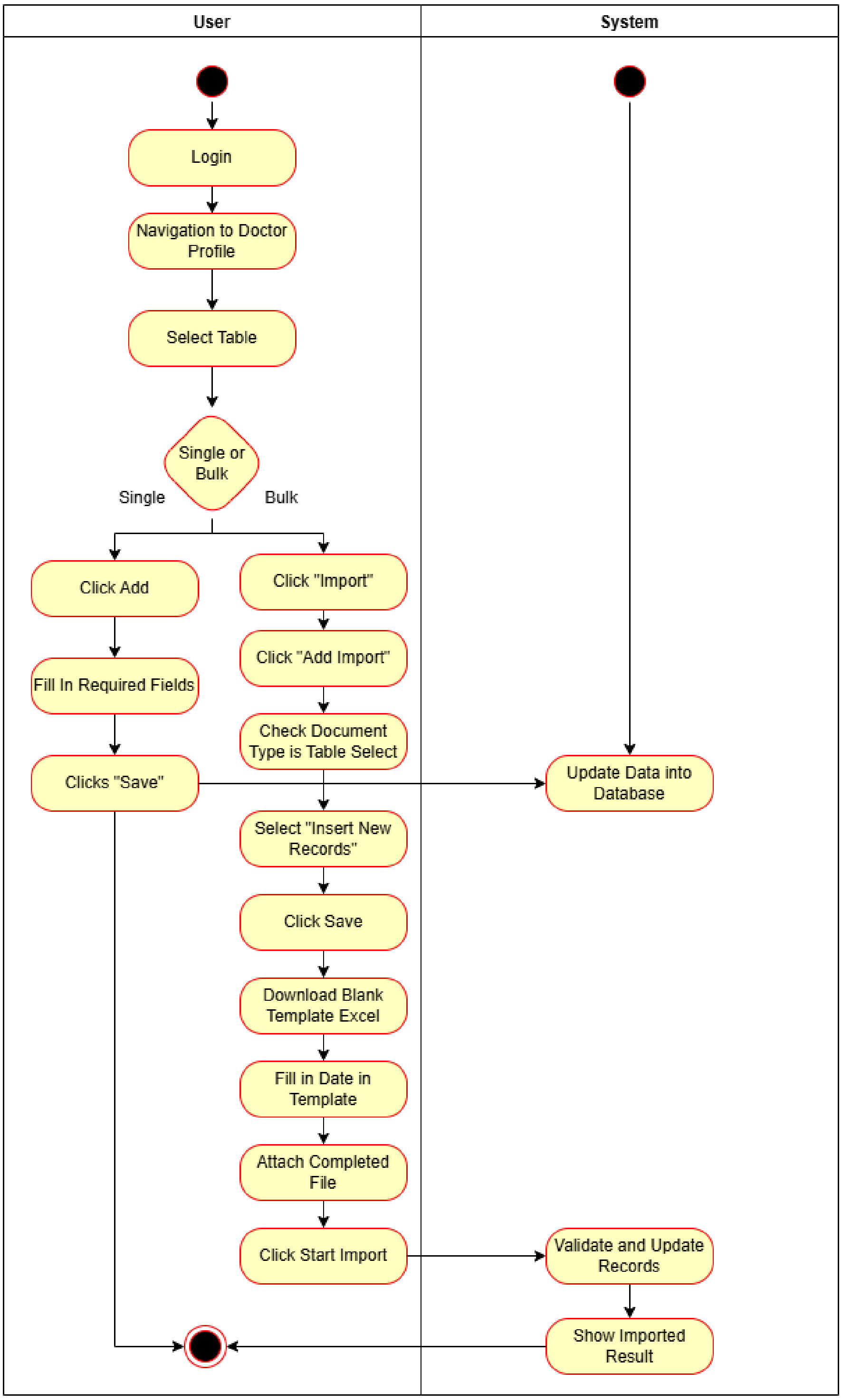


Figure 4.1.3.1 Add Doctor Profile Activity Diagram

The process of adding a doctor profile is a fundamental function of the centralized doctor profile management system. It begins with the user logging into the system and navigating to the Doctor Profile section from the dashboard. Once inside the module, the user is prompted to select the specific table corresponding to the type of doctor data they wish to add, such as basic information, qualifications, or specialties. The user can then decide whether to add data using the single-entry method or perform a bulk import for efficiency when dealing with large datasets.

For the single-entry method, the user simply clicks on the "Add" button available within the selected table view. This opens a form interface where the user manually fills in all required fields with accurate doctor information. The system may include validation rules to ensure the data format is correct and complete before allowing submission. After completing the form, the user clicks the "Save" button to store the new doctor profile into the database. This method is typically used for adding individual records when only a few new entries are needed.

In contrast, the bulk import method is more suitable when multiple doctor profiles need to be inserted at once. The process begins with the user clicking on the “Import” option from the list view of the table, followed by selecting “Add Data Import.” The system will then require the user to confirm that the Document Type matches the appropriate table that the data should be inserted into. After this, the user sets the import type to “Insert New Records” and clicks the “Save” button to confirm the import setup. The system provides an option to download a blank Excel template, which is specifically structured to match the fields of the selected table. The user downloads this template and fills it with the required data for multiple doctor profiles. Once completed, the Excel file is reattached to the import form. The user is encouraged to carefully review the data and validate it before initiating the import. Upon clicking the “Start Import” button, the system processes the file, verifies the input for any errors, and inserts the valid records into the central database. The process concludes with a confirmation message once the import is successfully completed, ensuring a streamlined workflow for mass data entry.

Update Doctor Profile

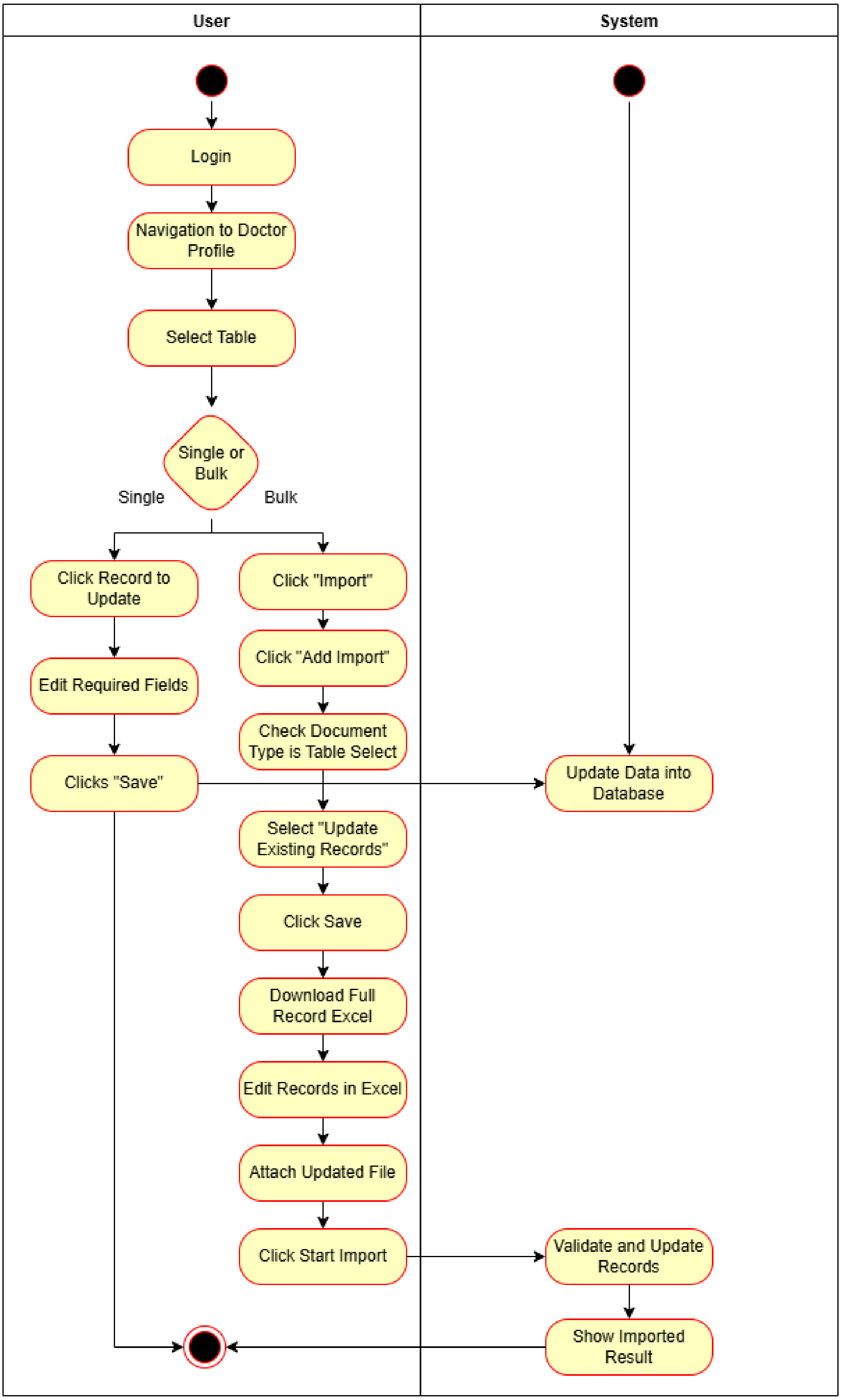


Figure 4.1.3.2 Update Doctor Profile Activity Diagram

The process of updating a doctor profile is essential for ensuring that the centralized system always contains the most current and accurate information. The update operation also begins with the user logging into the system and accessing the Doctor Profile section from the main dashboard. Once inside, the user selects the relevant table that contains the data to be updated, such as the table for doctor details, specialties, or working hours. As with the add process, the system provides two distinct paths for updating records: single update and bulk update.

In the single update method, the user navigates through the list of available records and selects the specific doctor entry that requires modification. Upon selecting the desired row, the system presents a form populated with the existing information. The user edits the necessary fields such as updating the contact number, adjusting working hours, or correcting a specialty name and clicks the “Save” button. The system then updates the database with the revised information. This method is ideal for performing quick updates to individual records and offers precise control over each field.

For more extensive updates, the bulk update method is employed. The process starts by selecting “Import” from the list view, then choosing “Add Data Import.” At this stage, the user must verify that the selected Document Type correctly matches the table intended for update. The user then selects “Update Existing Records” as the import type and saves the configuration. To proceed, the system offers an option to export the full data template which is an Excel file containing all existing records in the selected table. The user downloads this file and performs the required modifications directly in the spreadsheet. Care must be taken to maintain the correct structure and to ensure that the primary key or unique identifier fields remain unchanged, as they are used by the system to match and update existing records.

Once the updates are completed in the Excel file, the user reattaches it in the import section and initiates the import process. The system then validates the contents of the file to ensure data integrity. If all records are valid, the system proceeds to update the corresponding entries in the database. Upon completion, the user receives a notification that the import has been successfully executed. This bulk update method provides an efficient solution for making widespread changes, particularly during organizational updates or data synchronization efforts.

Delete Doctor Profile

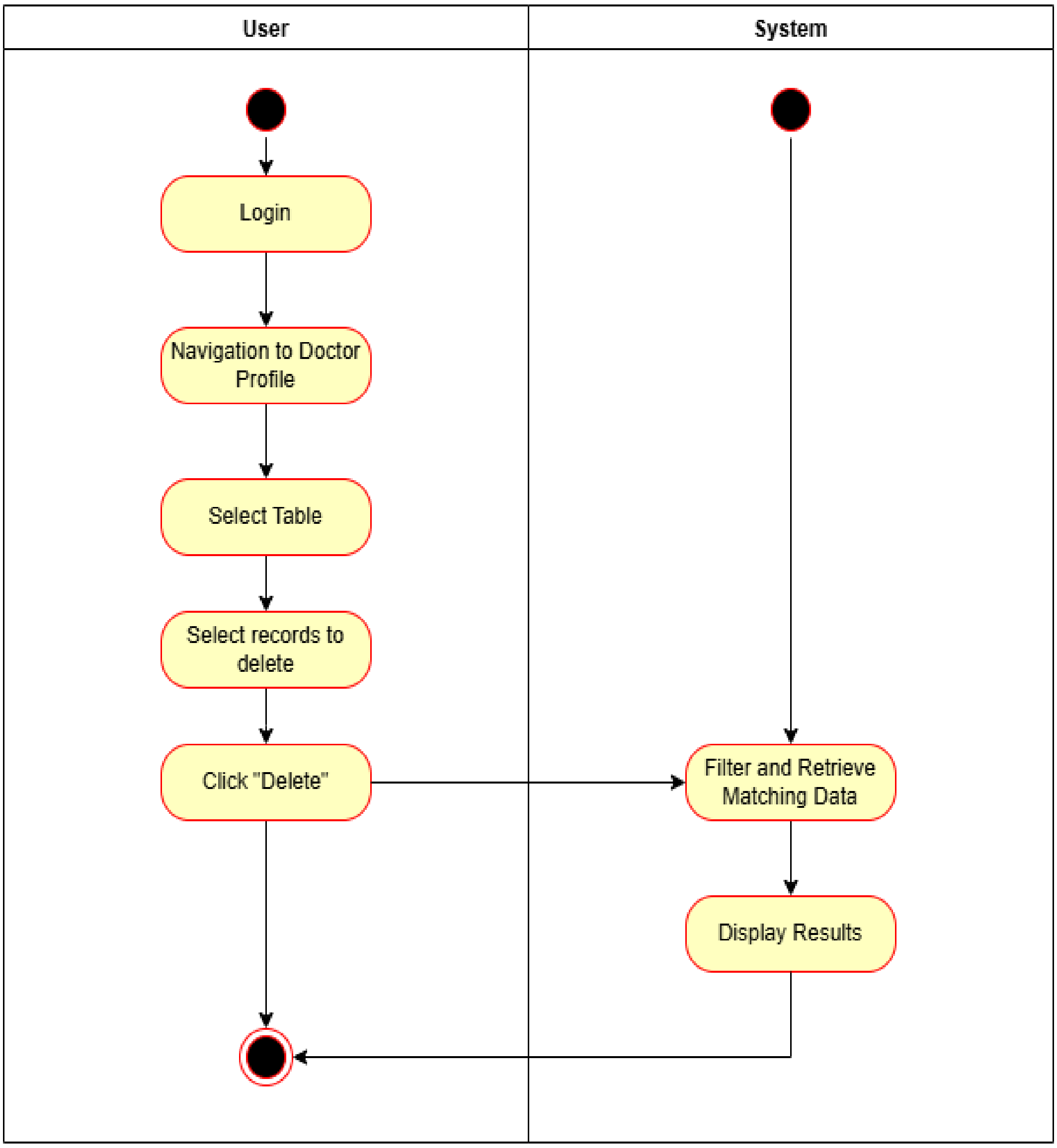


Figure 4.1.3.3 Delete Doctor Profile Activity Diagram

The "Delete Doctor Profile" activity serves as an administrative function for removing outdated, duplicate, or incorrect doctor records from the system. The process begins with user authentication, ensuring that only authorized personnel have access to perform deletion tasks. After logging in, the user navigates to the Doctor Profile section and selects the corresponding table that holds the records targeted for deletion. Using either search or list navigation tools, the user identifies the specific doctor entry to be removed. Upon selection, the system typically prompts the user to confirm the delete action in order to prevent unintentional loss of critical data. Once the confirmation is provided, the selected profile is permanently removed from the system, and the interface updates to reflect the deletion. While this activity does not support bulk deletions directly through the UI, administrators may use import templates to mass-clear data by setting deletion flags or overriding records if permitted by the system's policies. This activity is crucial for maintaining data hygiene and ensuring that the hospital's digital infrastructure reflects only active and relevant personnel records. Furthermore, routine cleanup using this function helps prevent data congestion and reduces administrative confusion caused by outdated profiles.

<u>View Doctor Profile</u>

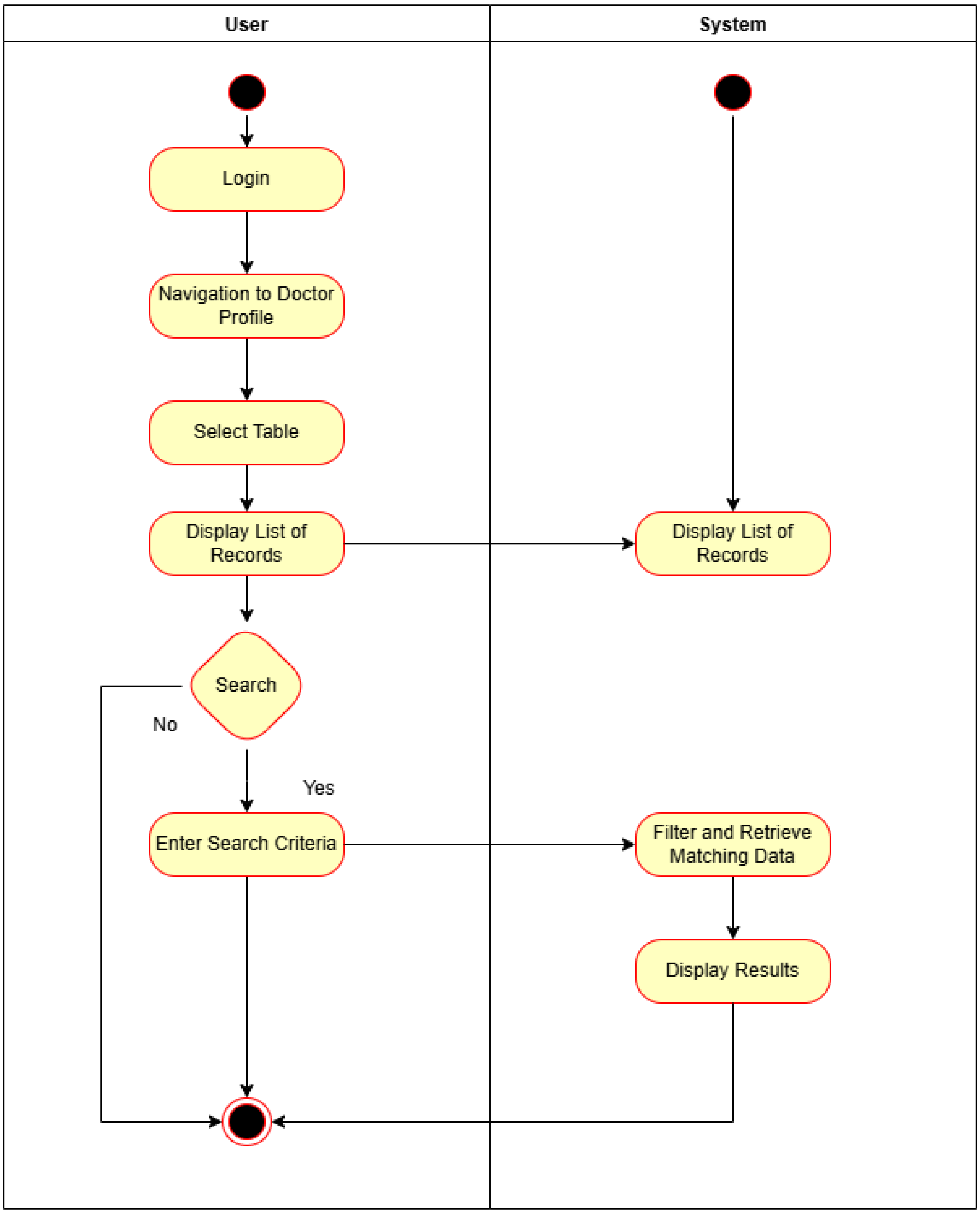


Figure 4.1.3.4 View Doctor Profile Activity Diagram

The "View Doctor Profile" activity enables users to retrieve and examine doctor data stored within the centralized database. This function is essential for administrative personnel, hospital management, and technical staff who need to verify or display information for operational, communication, or digital signage purposes. The activity begins with the user logging into the system and navigating to the Doctor Profile module. Once in the appropriate section, the user selects the relevant table that holds the data to be viewed. The system presents a list view by default, displaying key fields such as Doctor ID, name, and contact. Users may also switch to a report view, which reveals more comprehensive details including full profile fields. To enhance usability, the platform provides tools such as column filtering, search-by-keyword, and pick-column customization to allow users to tailor the display based on specific needs. For example, an administrator may search for a doctor using their name, specialty, or registration number. This search triggers an internal query that retrieves and displays the matching records. The activity is designed to be read-only, ensuring that users can browse data without altering it unless they proceed to the update function. This viewing capability also underpins other modules of the system, including public-facing webpages and digital signage integration, by ensuring that accurate data can be fetched and displayed dynamically from the same source of truth.

4.2 Entity Relationship Diagrams (ERD)

4.2.1 Conceptual ERD

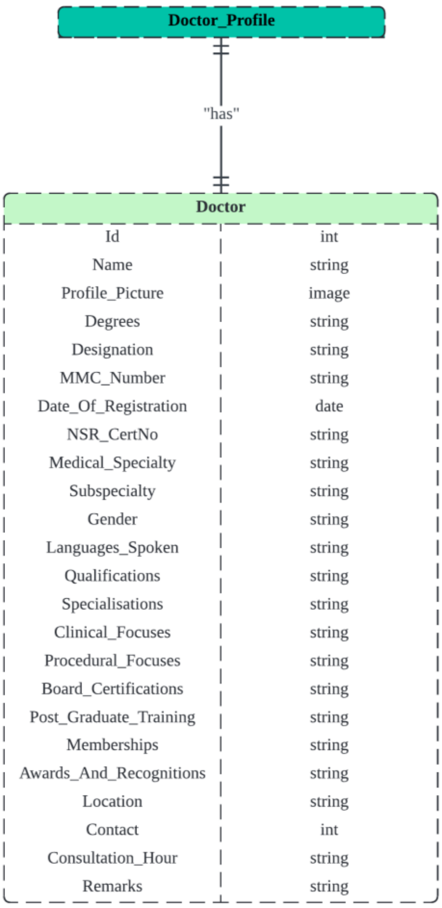


Figure 4.2.1 Conceptual ERD

The Conceptual Entity-Relationship Diagram (ERD) for this project focuses on modeling the essential entity: Doctor_Profile, which represents the core data component of the system. At this stage, the design captures high-level entities and their relationships without diving into technical implementation details. The Doctor_Profile entity includes critical identifying attributes such as Doctor_ID, Name, and Profile_Picture, providing a unique identity and visual representation for each doctor. It also encompasses professional details like Degrees, Designation, MMC_Number, NSR_CertNo, Medical_Specialty, and Subspecialty, which are necessary for showcasing a doctor's credentials and areas of expertise. Personal and communicative attributes such as Gender, Languages_Spoken, Location, and Contact are also represented to allow for better patient-doctor matching and communication. Furthermore, the profile includes additional informative fields like Qualifications, Specialisations, Clinical_Focuses, Procedural_Focuses, Board_Certifications, Post_Graduate_Training, Memberships, Awards_And_Recognitions, Consultation_Hour, and Remarks. These attributes help provide a well-rounded and informative view of each doctor for both patients and hospital administration. Since this is a conceptual model, it avoids database-specific constraints and is mainly used to define what kind of information the system must store about each doctor.

4.2.2 Logical ERD

Figure 4.2.2 Logical ERD

The Logical Entity-Relationship Diagram (ERD) refines the conceptual model by organizing data into structured relational tables, defining primary and foreign keys, and clarifying how the entities relate to each other. In this logical design, the central table is the Doctor table, which stores fundamental personal and contact information such as doctor_id (Primary Key), name, profile_picture, gender, contact, location, consultation_hours, and remarks. The Doctor table is linked through one-to-many relationships to four additional tables that categorize the doctor's detailed professional data. The Specialization table captures a doctor's medical_specialty, specialisations, and subspecialty, connected via the doctor_id as a Foreign Key. The Clinical_Focus table stores clinical_focuses and procedural_focuses, again mapped to the respective doctor. The Professional_Information table includes educational and professional attributes such as designation, degrees, qualifications, post_graduate_training, memberships, and awards_and_recognitions. Lastly, the Medical_Certification table records regulatory and certification data including mmc_no, nsr_certno, date_of_registration, and board_certifications. This logical break down allows for better data normalization, avoiding redundancy while maintaining relational integrity. Each table serves to modularize the information, making the database structure more scalable and manageable during implementation.

4.2.3 Physical ERD

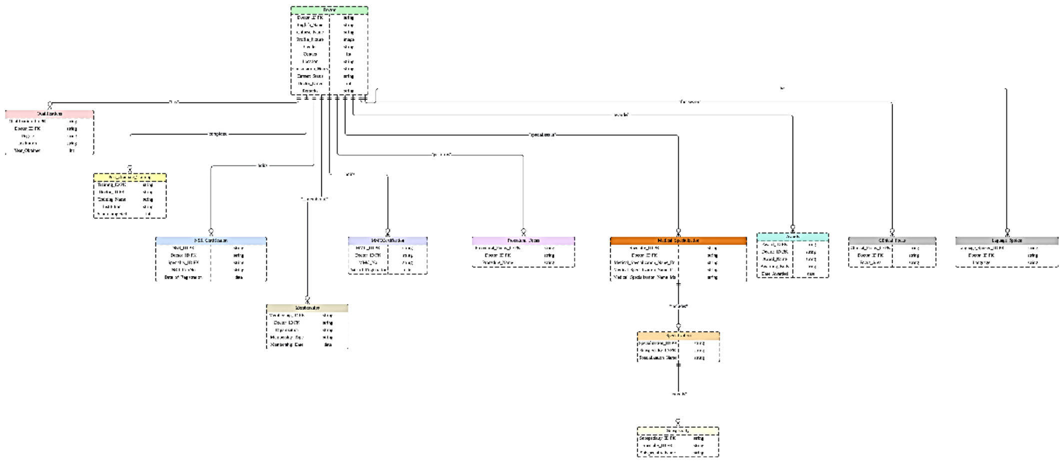


Figure 4.2.3 Physical ERD

The Physical Entity-Relationship Diagram (ERD) represents the final and implementable structure of the database system, where all entities, attributes, data types, and relationships are fully defined in preparation for deployment in the Frappe framework. This level of detail ensures that the system is optimized for performance, integrity, and scalability. At its core is the Doctor table, which holds the primary data such as doctor_id, name, profile_picture, gender, contact, location, consultation_hours, and remarks. The database is normalized into 13 interrelated tables to prevent redundancy and support a more maintainable structure. Each table represents a specific category of the doctor's background or professional profile. The Doctor entity is linked to Qualifications, Post_Graduate_Training, NSR_Certification, MMC_Certification, Memberships, Awards, Procedural_Focus, Clinical_Focus, Language_Spoken, and Medical_Specialization, using one-to-many or many-to-many relationships as appropriate. The Medical_Specialization table further extends into a separate

Subspecialty table to capture more detailed classification. Foreign key constraints ensure referential integrity between the Doctor table and its associated child tables. These design decisions allow the system to handle complex doctor profiles while remaining efficient and scalable, supporting real-time data updates and seamless integration with the web interface and digital signage display system.

4.3 Doctor Profile Web Page Design (UI Design)

4.3.1 Web Page UI Design and Layout Choices

The design of the doctor profile display was based on preferences communicated by UTAR Hospital, which initially requested a layout showing one doctor per screen. To provide greater flexibility, additional layout options were developed to display 2, 4, or 8 doctor profiles per page. Each of these layouts was implemented as a separate web page to allow the hospital to select the most suitable format depending on the location, screen size, and context of the digital signage. All layout designs were kept consistent in terms of font style, color scheme, and use of hospital branding elements. The fonts were selected to ensure readability from a distance, while the background image and overall structure followed the hospital's visual identity to maintain a professional and unified appearance. Each doctor profile includes key information such as the doctor's name, photo, specialization, and qualifications, arranged clearly to optimize visibility.

The doctor profile data displayed on each web page is dynamically retrieved using a SQL query, which filters doctors based on their current_status. Only those with an active status are shown, ensuring the information remains up to date without manual filtering. The query also includes JOIN operations to fetch related data from the specialization and qualifications tables, while using GROUP_CONCAT to display multiple qualifications in a single line. Although the web layout was implemented, the order in which doctor profiles appear on the page was determined by the hospital. This order was enforced in the SQL query using an ORDER BY clause, ensuring that the digital signage presents doctors in the hospital's preferred sequence. Overall, the implementation of the design and logic exactly as required, ensuring consistency across different layouts and accurate display of doctor information.

Figure 4.3.1.1 One Doctor UI

Figure 4.3.1.2 Two Doctor UI

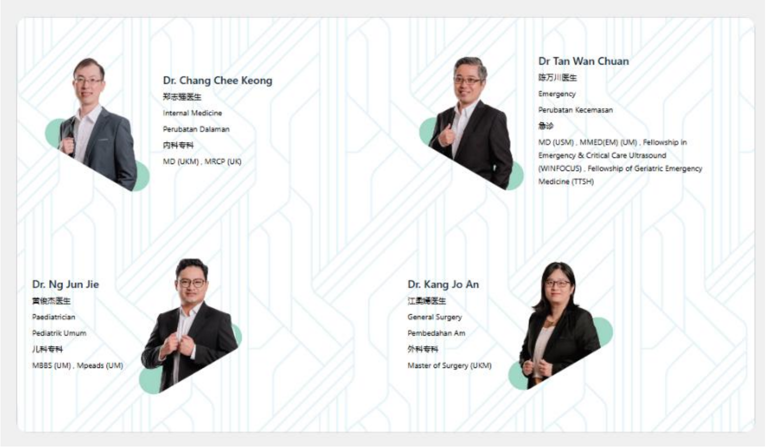


Figure 4.3.1.3 Four Doctor UI

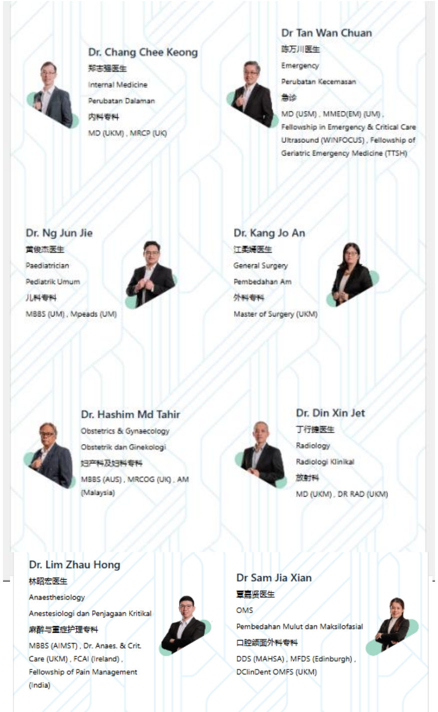


Figure 4.3.1.4 Eight Doctor UI

4.3.2 Wireframe of Digital Signage Display

The layout of the doctor profile display within the digital signage was ultimately determined by the hospital, not the developer. Based on the information provided, the wireframe consists of a vertical screen divided into two main areas: the left 1/4 portion is reserved for other static content such as hospital branding or general announcements, while the right 3/4 portion is split further. Within this right section, the upper 2/5 is allocated to display the doctor profile webpage, and the lower 3/5 is used for additional content such as promotional visuals or schedules. This layout ensures that the doctor information remains visible and prominent without occupying the entire screen. The wireframe and placement were designed to fit into this structure as requested by the hospital, allowing for better content organization on the digital signage.

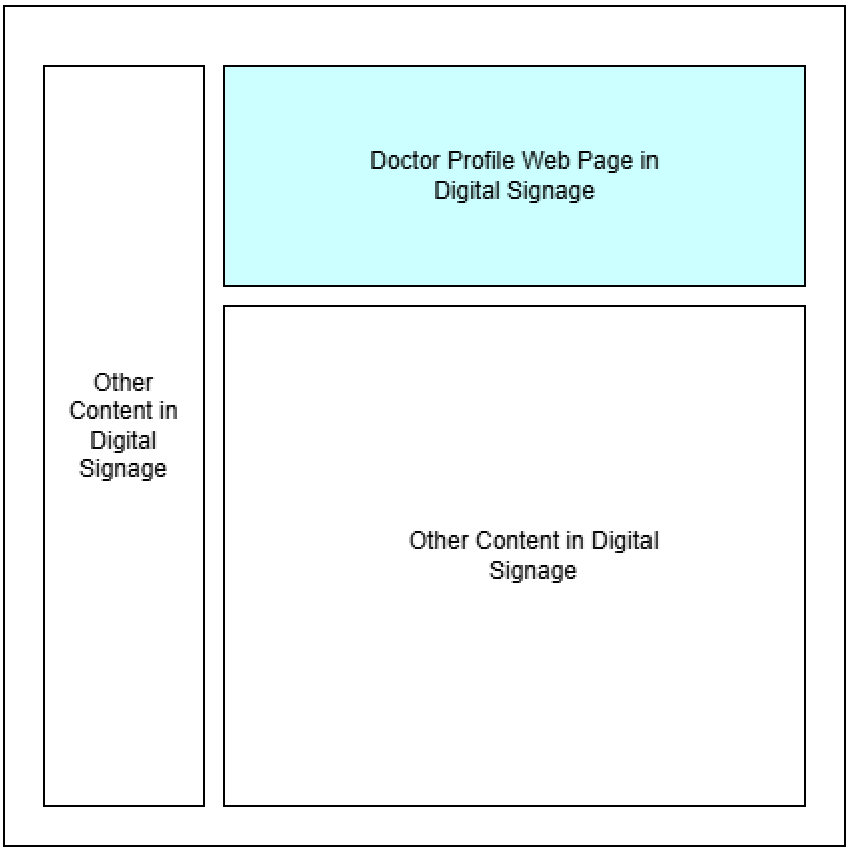


Figure 4.3.2 Wireframe of Digital Signage Display

4.4 Detailed System Flowchart

4.4.1 Centralised Database System Flowchart

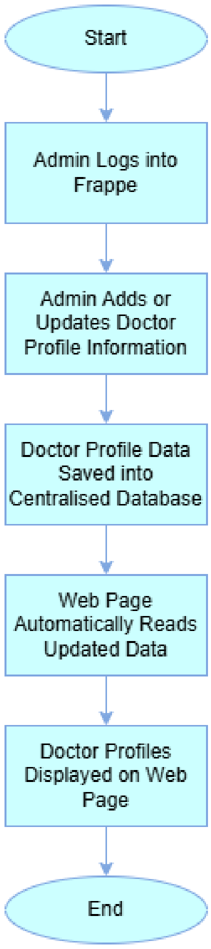


Figure 4.4.1 Centralized Database System Flowchart

The centralized database system is designed to simplify the process of managing doctor profile data within the hospital environment. The process begins when an administrator logs into the Frappe, where they are granted access to add, edit, or delete doctor profile information. This includes key details such as the doctor's name, qualifications, specialization, and photo. The goal is to centralize all doctor-related information into one secure and consistent database, preventing data fragmentation across departments.

Once the administrator updates or inserts new information, the data is stored directly in the Frappe database. This centralized approach ensures that any updates made through the backend are immediately reflected across all connected components.

Since the system is integrated, there is no need for a manual sync or duplicate entry in multiple locations. This streamlined data handling helps reduce human error and ensures that information presented to patients and staff remains accurate and up to date.

Finally, the doctor profile webpage automatically reads the data from the centralized database and renders it in real-time. This integration between the database and the web page eliminates the need for file uploads or HTML rewrites when content changes. Instead, the web page is designed to dynamically pull and display the data, ensuring that any doctor profile changes made in the Frappe are instantly available for display on the web page and ultimately on digital signage. This automation enhances operational efficiency and reduces the workload for hospital IT staff.

4.4.2 Digital Signage Display Flowchart

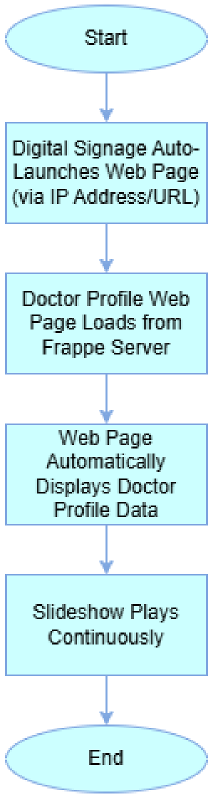


Figure 4.4.2 Digital Signage Display Flowchart

The digital signage display flowchart outlines the simplified yet effective process by which doctor profile information is displayed on screens within UTAR Hospital. The flow begins with the digital signage system automatically launching a web page through a direct IP address or URL. This process is designed to be automatic so that staff do not need to manually refresh or manage the system. Once launched, the signage system acts as a web browser, retrieving content directly from the hosted Frappe server where the doctor profile web pages are stored and managed.

When the page is loaded, it dynamically pulls the latest doctor profile data from the centralised database. This ensures that all information displayed on the screen is accurate and up to date, reflecting any recent changes made by hospital administrators. The design of the web page is responsive and customized to fit the layout approved by the hospital, supporting different formats such as displaying 1, 2, 4, or 8 doctors per screen, depending on preference and screen size.

The final stage in the flow involves the automatic and continuous display of the doctor profiles in a slideshow or rotation. This looping mechanism ensures consistent visibility of all profiles without user intervention. Overall, the flow is streamlined and user-friendly, with the hospital having full control over how and where the content is placed on the signage screen. The digital signage display flowchart highlights a practical and efficient implementation of real-time data presentation using simple web-based integration.

CHAPTER 5 SYSTEM IMPLEMENTATION

5.1 Software Setup

1. Frappe Framework

- Used to build the centralized database system for doctor profiles.
- Provides backend functionality, data models, and web interface handling.
- Allows easy data entry, storage, and retrieval through its form-based system.

2. Digital Signage System

- Displays the doctor profile web page on screens in public hospital areas.
- Launches a web page automatically using a fixed IP address or URL.
- Plays the doctor profile slideshow continuously without manual input.

3. Hosting Environment

- Hosts the Frappe system and doctor profile web page.
- Runs on a local or virtual server environment.
- Ensures accessibility of the web page for digital signage and internal use.

5.2 Setting and Configuration

The Frappe Framework forms the core of the centralized doctor profile system. It is installed and configured within a controlled environment to manage backend operations such as data storage, web page generation, and user access. In this project, Frappe is used to create and manage the doctor profile database, define the structure of the web page, and provide the interface through which the data is displayed. The configuration also includes setting up the necessary doctypes, website routes, and scripts to ensure that the doctor data is shown correctly when accessed from the front end.

The Digital Signage System is designed to present the doctor profile web page on hospital display screens. These digital signage displays are configured to automatically open the web page via its IP address or URL, pulling live data directly from the Frappe system. The display cycles through the doctor profiles continuously using a slideshow format. This setup ensures that the content is dynamic, up-to-date, and presented in a clean and readable layout, based on the hospital's design preferences.

The Hosting Environment is a virtual machine (VM), which acts as the server hosting the Frappe Framework and doctor profile web page. The VM is configured to run continuously, making the web page accessible at all times via a local IP address. Key setup steps include allocating sufficient RAM and CPU to the VM, ensuring network access within the hospital, and keeping the environment stable for 24/7 uptime. Hosting the system on a virtual machine provides flexibility and control, allowing the hospital to easily manage and scale the infrastructure as needed while keeping the system secure and isolated.

5.3 System Operation (with Screenshot)

<u>Database</u>

The system offers hospital staff the ability to manage doctor profile data through a centralized database interface built on the Frappe Framework.

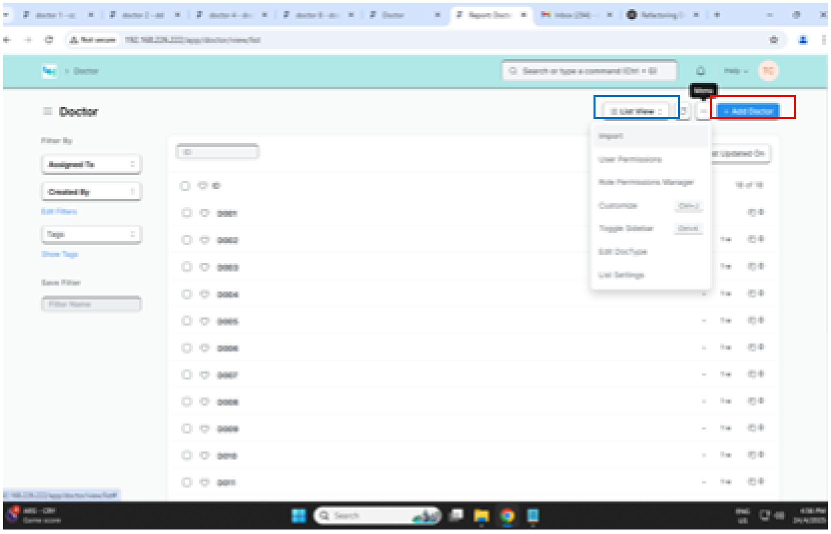


Figure 5.3.1 Add Doctor Button

To insert new doctor information individually, users must navigate to the List View of the desired table and click the 'Add Doctor' button.

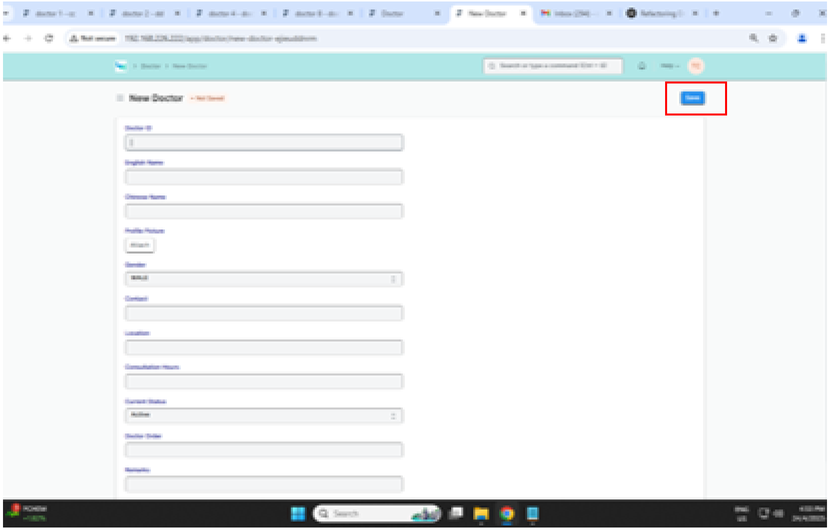


Figure 5.3.2 New Doctor Form

After filling in all the required fields, clicking 'Save' will add the new doctor record to the system.

To update a single record, users can click on the Doctor ID (e.g., D001) from the list view to access the specific entry.

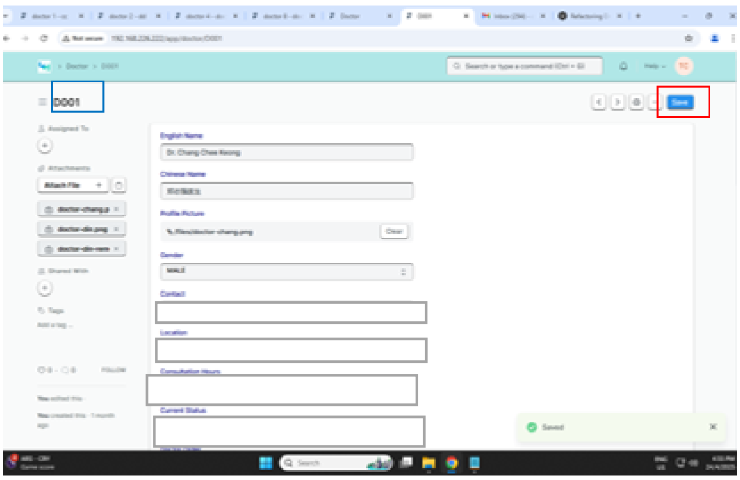


Figure 5.3.3 Update D001 Doctor

The required fields can then be edited directly on the form, followed by clicking the 'Save' button to apply the changes.

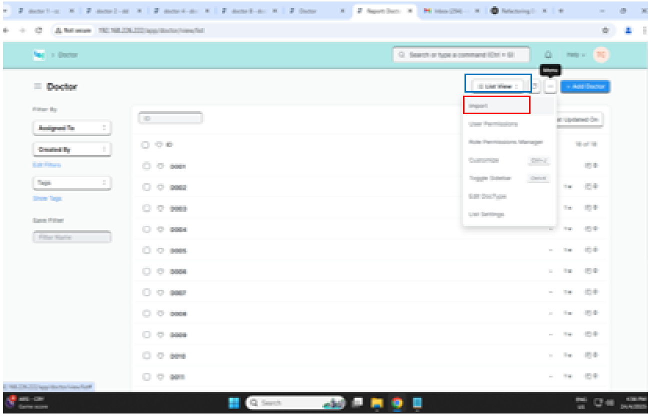


Figure 5.3.4 Find Import for Doctor Table

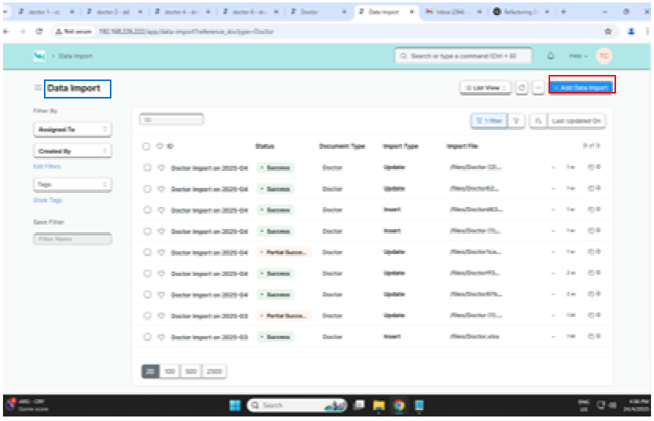


Figure 5.3.5 Add New Import to Doctor Table

For bulk data operations, the system supports importing doctor data via the Data Import Tool. To insert bulk new records, users should access the 'Import' option from the menu and select 'Add Data Import'.

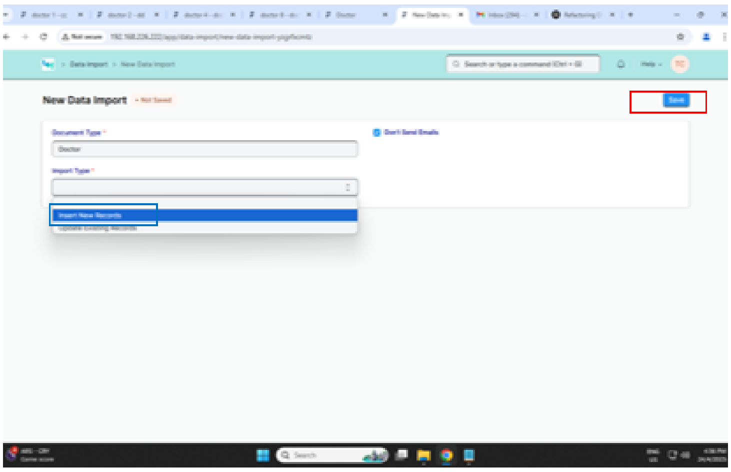


Figure 5.3.6 Insert New Record

It's important to confirm the correct DocType is selected, and that ‘Insert New Records’ is chosen as the import type. Then, save this import record.

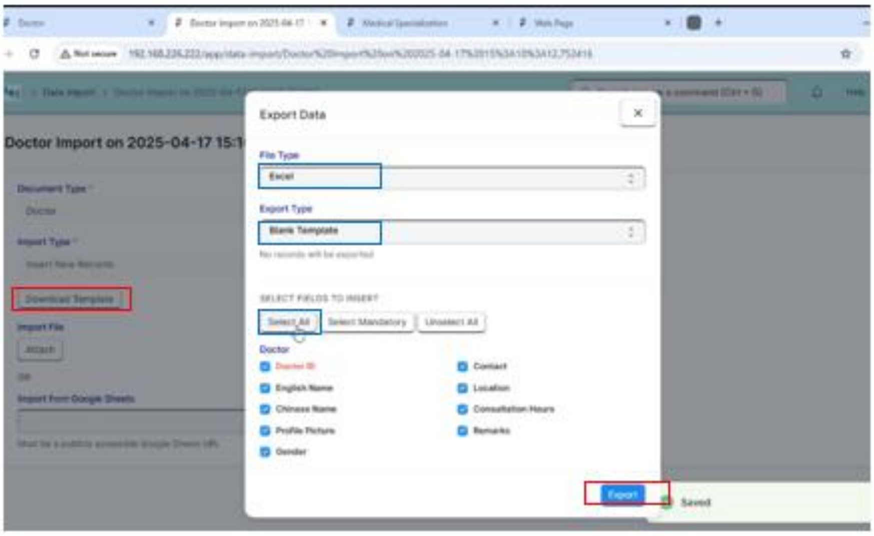


Figure 5.3.7 Download Blank Template

Users then export the blank template and fill the exported blank template with new data.

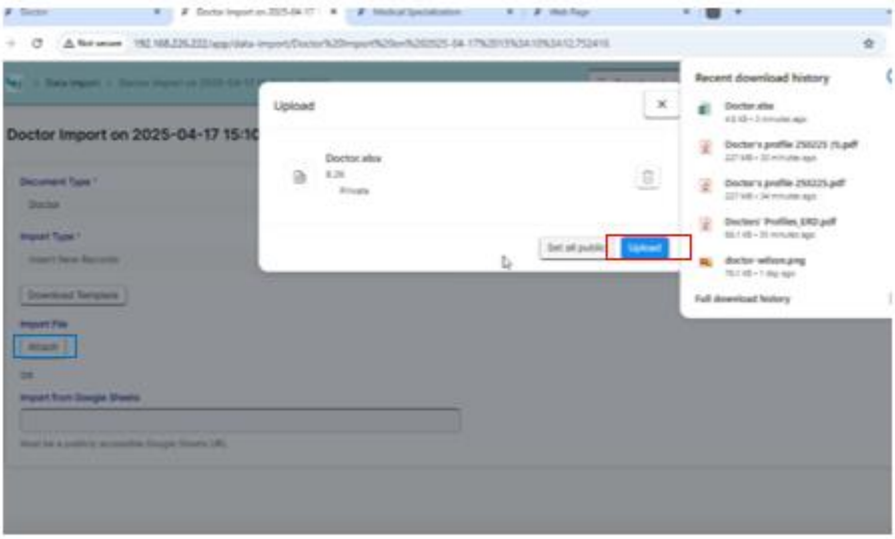


Figure 5.3.8 Attach Complete Insert File

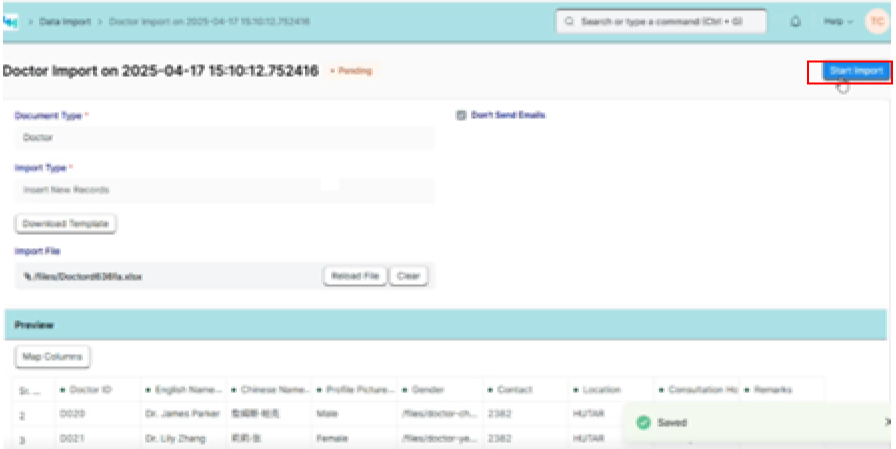


Figure 5.3.9 Start Import Attach File

Then, attach the file before initiating the import.

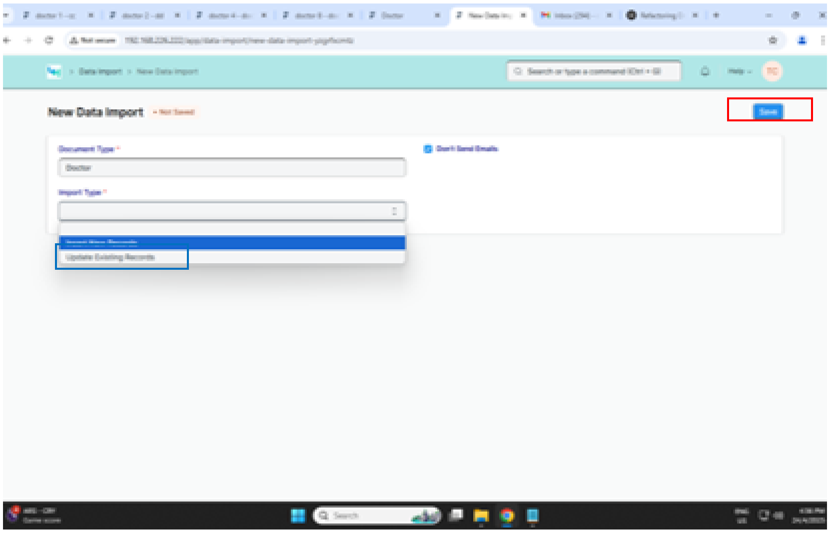


Figure 5.3.10 Update Existing Record

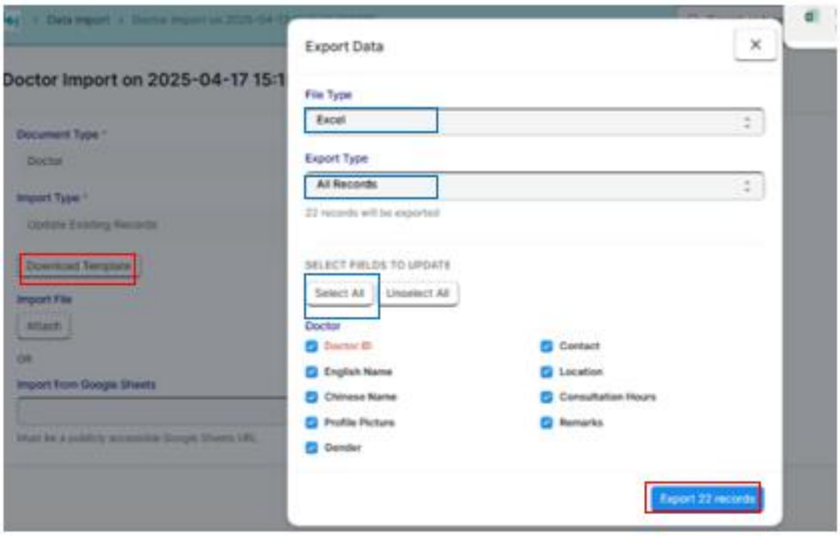


Figure 5.3.11 Download Full Record

Updating bulk records follows a similar process, but with ‘Update Existing Record’ selected as the import type. A full record template is exported, edited, and re-uploaded for update. Users are advised to verify all data is accurate before initiating the import to prevent conflicts or data loss.

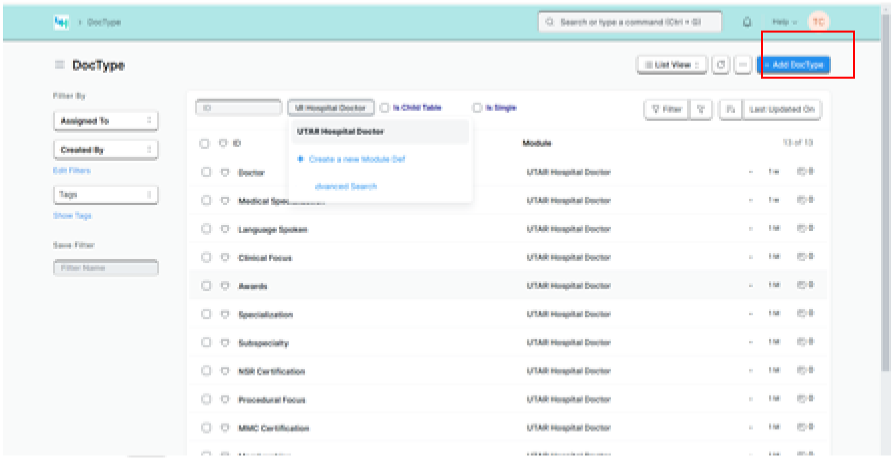


Figure 5.3.12 Add DocType Button

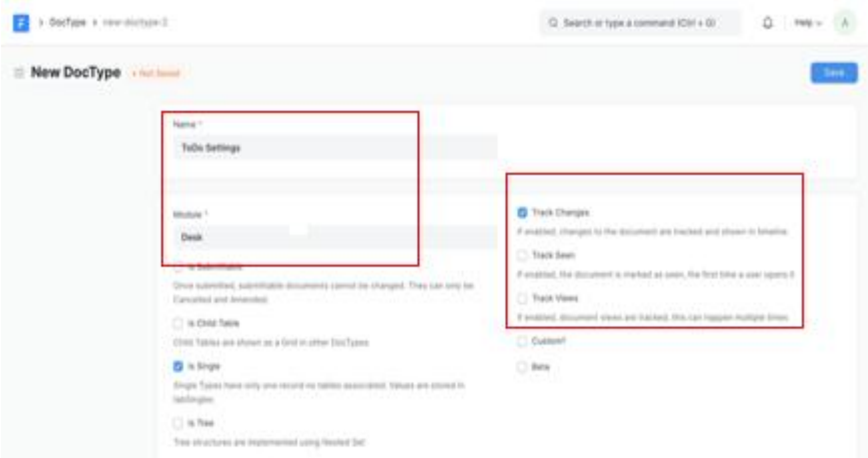
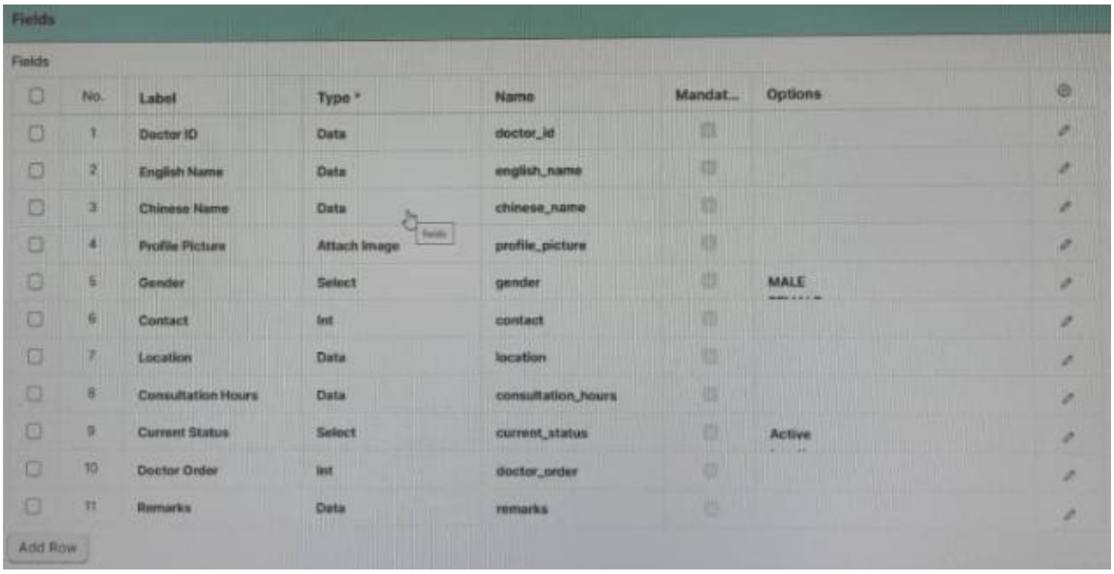


Figure 5.3.13 Doctype First Section

Creating a new table (DocType) is also possible for administrators. From the DocType List, clicking 'Add DocType' allows users to define a new table name, associate it with the correct module (e.g., UTAR Hospital Doctor), and configure settings like Track Changes, Track Seen, and Track Views.



Fields

No.	Label	Type *	Name	Mandat...	Options
1	Doctor ID	Data	doctor_id		
2	English Name	Data	english_name		
3	Chinese Name	Data	chinese_name		
4	Profile Picture	Attach Image	profile_picture		
5	Gender	Select	gender		MALE
6	Contact	Int	contact		
7	Location	Data	location		
8	Consultation Hours	Data	consultation_hours		
9	Current Status	Select	current_status		Active
10	Doctor Order	Int	doctor_order		
11	Remarks	Data	remarks		

Add Row

Figure 1.1 Infographic from Bosch Blog

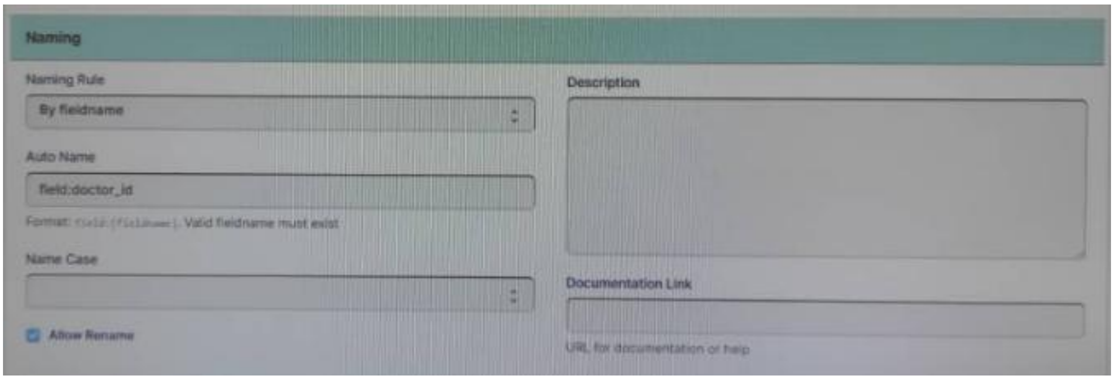


Figure 5.3.15 Doctype Naming

Fields must be defined clearly, and the Auto Name by field setting should be selected to generate unique IDs.

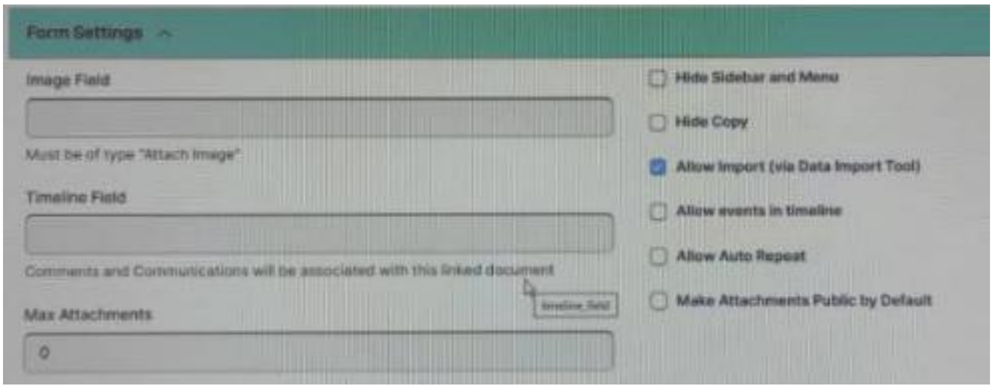


Figure 5.3.16 Doctype Form Setting

Lastly, Allow Import should be enabled for future data operations.

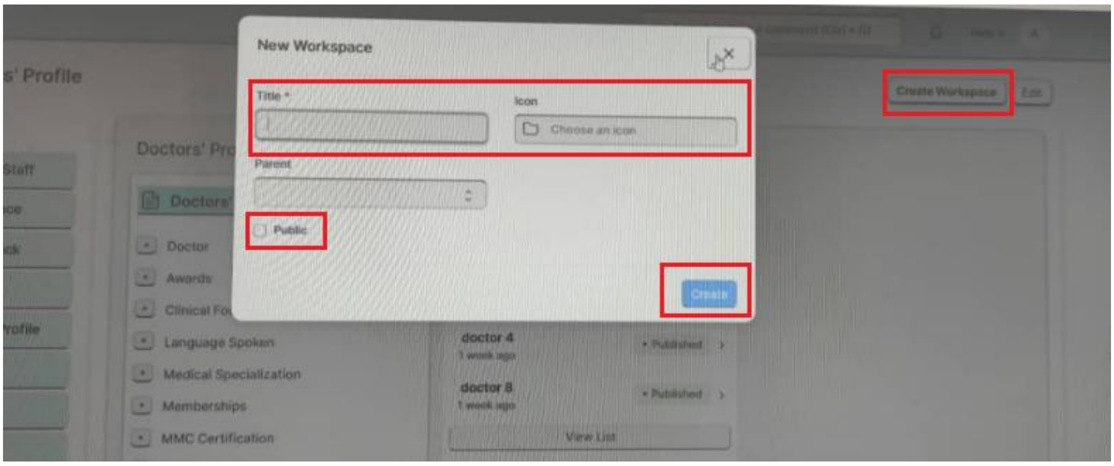


Figure 5.3.17 Create Workspace

Additionally, a new workspace can be created to help organize modules and views for better access. By clicking ‘Create Workspace’, users can assign a title, icon, and set the workspace as public.

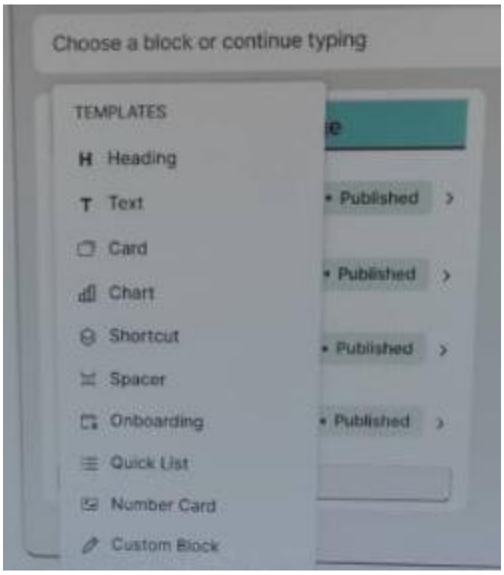


Figure 5.3.18 Choose Template

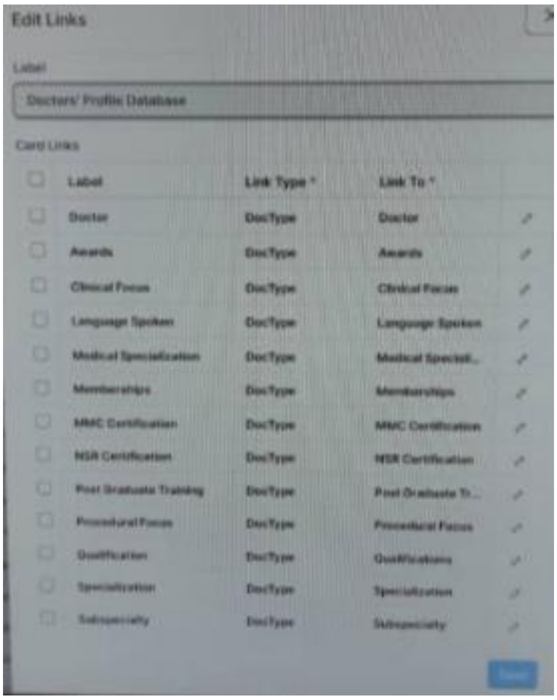


Figure 5.3.19 Fill in Template

A template layout can then be added by clicking the blue circle with the plus icon, selecting a template, and completing the setup before saving.

<u>Website</u>

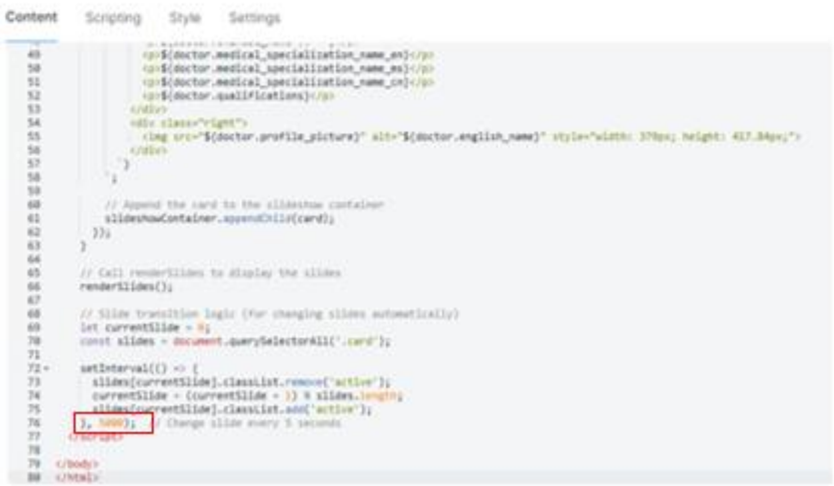


Figure 5.3.20 Slideshow Duration

The slideshow display of doctor profiles can be customized through basic modifications in the website code and the database. To adjust the slideshow duration, users need to locate the duration value (default: 5000) in the JavaScript code and change it to their desired timing in milliseconds. For example, changing 5000 to 8000 will make each slide stay on screen for 8 seconds.

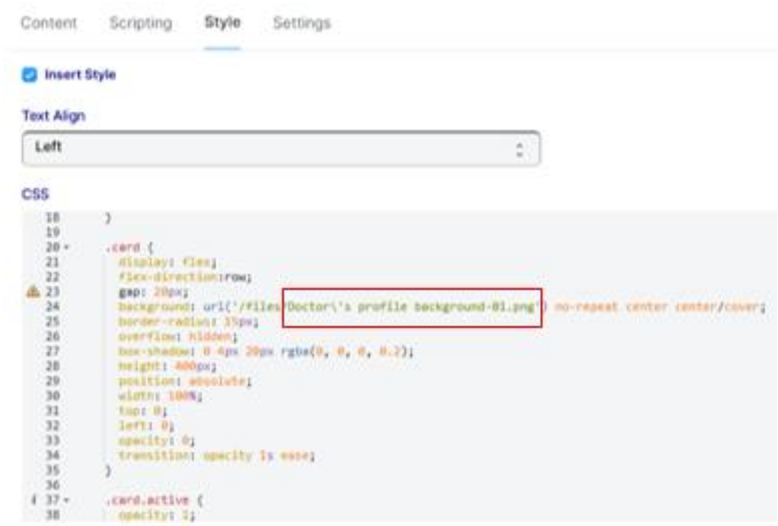


Figure 5.3.21 Slideshow Background

To change the slideshow background image, users need to modify the image URL found in the '.card' CSS background property. The correct path must follow the format /files/FILENAME.png, and the image must first be uploaded into the system.

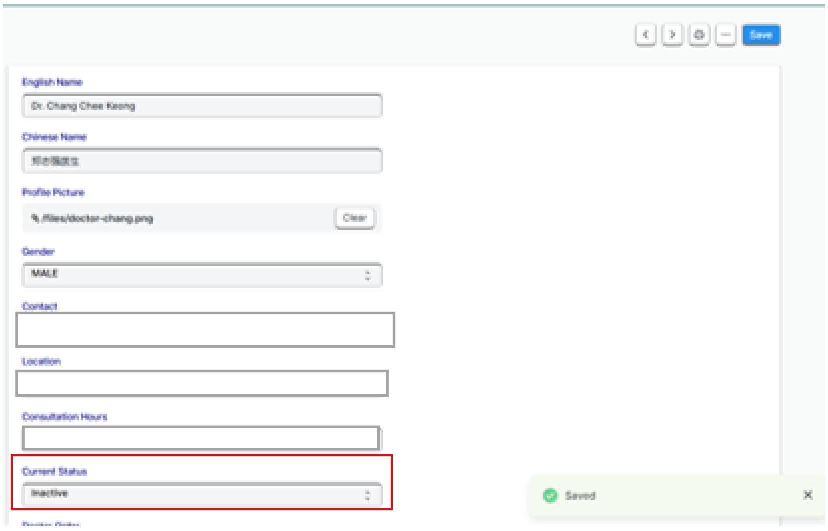
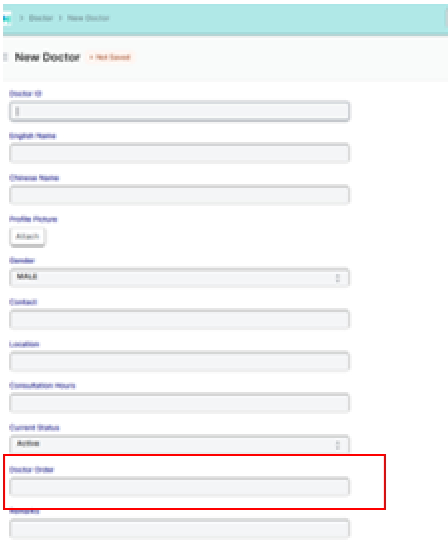


Figure 5.3.22 Doctor Current Status

The display content can also be dynamically controlled using doctor profile data. To change a doctor's display status, users can go to the Doctor table and switch the current status from "Active" to "Inactive" or vice versa. Inactive doctors will be excluded from the slideshow, while active ones will be included.

Figure 5.3.23 Doctor Order



Similarly, users can control the slideshow order by changing the Doctor Order field in the Doctor table. The slideshow will automatically follow the updated numerical order.

These steps ensure the hospital staff can easily maintain, update, and personalize the doctor slideshow display without requiring deep technical knowledge.

5.4 Implementation Issue and Challenges

During the implementation of the centralized doctor profile system with digital signage integration, several practical challenges emerged. Designing the web interface to support multiple display formats such as showing 1, 2, 4, or 8 doctor profiles required repeated adjustments to ensure proper alignment, readability, and visual consistency across all layouts. Creating a clear and simple UI was crucial, especially when adapting the layout into the fixed digital signage space. Another key challenge was preparing documentation and operational steps that would allow non-technical hospital staff to perform basic tasks like inserting and updating doctor profiles or modifying the slideshow content. Ensuring these tasks could be done smoothly without confusion required simplifying the interface and providing detailed, step-by-step instructions.

5.5 Concluding Remark

The implementation of the centralized doctor profile system has successfully integrated database management with digital signage display to meet UTAR Hospital's operational needs. Through the use of the Frappe framework, a user-friendly interface and structured database were developed, enabling efficient data entry, updates, and real-time display of doctor information. Detailed operation steps and flexible layout designs were also incorporated to support various signage configurations. Despite certain challenges during development, the system is now capable of delivering reliable and easily maintainable digital content for hospital use, paving the way for future enhancements if required.

CHAPTER 6 SYSTEM EVALUATION AND DISCUSSION

6.1 System Testing and Performance Metrics

The digital signage system was subjected to thorough testing to ensure it functioned reliably and met the core requirements of the hospital's doctor profile display needs. Testing focused on validating the stability of the web interface, the accuracy of data retrieval from the Frappe database, and the real-time presentation of doctor information on the digital signage slideshow. Each feature was evaluated based on usability, accuracy, responsiveness, and reliability.

The following performance metrics were considered during testing:

- Data Insertion and Update Accuracy: Ensured that all doctor profiles entered the database appeared correctly on the website without data mismatch or delay.
- Display Responsiveness: Measured how quickly the slideshow updated to reflect newly added or edited doctor profiles.
- System Uptime and Reliability: Tested the hosting environment's stability in continuously serving the web page over a local IP without service interruption.
- Slideshow Transition Timing: Verified that the slideshow respected the configured duration (e.g., 5 seconds per slide) and operated smoothly.
- Doctor Status Filtering: Confirmed that inactive doctors were correctly hidden from the display, and reactivated profiles appeared without requiring a manual refresh.

The goal of system testing was to ensure the digital signage operated as a seamless and self-updating visual system that staff could manage with minimal technical effort.

6. 2 Testing Setup and Result

The testing setup involved executing a series of structured test cases aimed at verifying the core functions of the centralized doctor profile database and digital signage display system. These test cases were designed to simulate real-world user interactions, such as inserting and updating doctor data, managing image uploads, and adjusting slideshow settings. Each case documented the expected system behaviour and was compared against the actual outcome during testing. The following table summarizes the test scenarios and their results to demonstrate the system's performance and reliability.

Test Case	**Expected Result**	**Result (Pass/Fail)**
Insert single doctor profile	New doctor profile is added and appears in the list	Pass
Update existing doctor profile	Updated fields reflect correctly in the doctor profile	Pass
Insert bulk doctor profiles	All new doctor profiles are added from the import template	Pass
Update bulk doctor profiles	All selected doctor profiles are updated based on import file	Pass
Delete doctor profile	The selected doctor profile is removed from the system	Pass
Create new doctor profile table (Doctype)	A new table is created and added under the UTAR Hospital Doctor module	Pass
Create new workspace	New workspace is created and visible on the dashboard	Pass
Change slideshow duration	Slideshow interval updates to the new value and reflects in the display	Pass
Change background image	Slideshow displays updated background image	Pass
Change doctor display order in slideshow	Doctors appear in the new order on the slideshow	Pass
Change doctor active/inactive status	Inactive doctors are hidden from the slideshow; active ones appear	Pass
View doctor profile slideshow through webpage	Slideshow displays doctor profiles correctly on webpage through IP access	Pass

Table 6.2.1 Test Case and Result

6.3 Project Challenges

Throughout the development of the centralized doctor profile system and digital signage display, several challenges were encountered that required careful troubleshooting and adjustments. One of the main issues was managing the structure and integrity of the database in the Frappe framework. Ensuring that all the necessary fields, relationships, and permissions were correctly configured took multiple iterations, especially when dealing with bulk data import and export features. Inaccuracies during file import often caused failed uploads, which required reviewing the template and ensuring data consistency.

Another challenge involved setting up the digital signage display through the web interface hosted on a virtual machine. Although the basic functionality of auto-loading the doctor profile slideshow via a local IP address was straightforward, maintaining a stable and consistent display on different machines introduced some configuration difficulties. This included browser compatibility, screen resolution alignment, and file path issues for background images and doctor profile pictures. Despite these technical hurdles, the project was successfully implemented with solutions that allow easy future updates by hospital staff.

6.4 Objective Evaluation

The project successfully met all the stated objectives through systematic design, implementation, and testing processes. The centralized database system was effectively developed using the Frappe framework, enabling accurate and consistent storage of doctor profile information. The use of Doctypes allowed administrative staff to manage data through an intuitive interface without requiring programming knowledge. The inclusion of multiple language fields ensured comprehensive and culturally appropriate communication for a diverse patient base.

The second objective, which focused on developing a visual layout for digital signage, was also achieved. A structured slideshow format was implemented, displaying doctor profiles with professional presentation and legible formatting. The slideshow dynamically reflects real-time changes made in the database, ensuring the content remains current. Additionally, the layout was designed with clear readability in mind, making it suitable for display in public hospital areas.

Lastly, the project delivered a functional web-based method for data retrieval, using a webpage hosted via a local IP address. This approach enabled seamless integration with the hospital’s digital signage system without the need for external APIs or complicated configurations. The system can now serve updated doctor profiles to the signage in real time, fulfilling the third objective of enabling scalable and flexible data distribution.

Overall, all project objectives were fulfilled effectively, contributing to improved operational efficiency and communication within UTAR Hospital.

6.5 Concluding Remark

This project successfully delivered a centralized doctor profile management system tailored to the operational needs of UTAR Hospital. By leveraging the Frappe framework, the system not only simplified data entry and maintenance for administrative staff but also ensured real-time synchronization with a digital signage display. The integration of a web-based interface hosted on the hospital's private network provided a secure and efficient method to broadcast doctor information to patients and visitors. Through careful planning, user-friendly design, and robust testing, the system has proven to be both practical and scalable. The outcomes of this project serve as a solid foundation for future enhancements, such as external system integration or extended signage features, ultimately contributing to better information flow and service delivery within the hospital environment.

CHAPTER 7 CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

This project set out to address a practical and administrative need at UTAR Hospital: the management and presentation of doctor profiles in a centralized, accessible, and visually organized manner. By focusing on three core objectives which are centralized database management, visual display through digital signage, and seamless data retrieval via web interface, the project has successfully delivered a working system that enhances the efficiency and quality of hospital communication.

The implementation of a centralized doctor profile system using the Frappe framework enabled the consolidation of vital information such as names, qualifications, specializations, availability, and contact details into a single, structured database. This not only reduces the risk of data duplication and inconsistency but also allows non-technical administrative staff to manage the system intuitively through Doctype forms. The data is stored in a clear, organized format that supports scalability and future expansion.

One of the major accomplishments of this project was the development of a web-based interface designed for digital signage. This interface allows real-time display of doctor profiles using a slideshow format, which includes background images, stylized content cards, and dynamic transitions. The digital signage system fetches this web page through a local IP address, ensuring security within the hospital's private network while eliminating the need for complicated third-party integration. The solution also allows for real-time updates, any changes made to the doctor data in the backend such as doctor status or order are automatically reflected in the display without requiring manual intervention.

Additionally, the system offers robust features for database management including single and bulk data insertion, updates, and deletions through Frappe's built-in Data Import Tool. Custom Doctypes and Workspace interfaces were developed to make the system modular and maintainable. Every design choice from the slideshow transition duration to the background customization was developed with usability and future flexibility in mind.

During development, several challenges were encountered, including issues with testing digital signage integration, configuring the local network and hosting environment, and maintaining consistency between backend records and real-time display. However, these challenges were effectively addressed through a combination of systematic testing, logic refinement in the web code, and documentation of key operational steps such as how to insert, update, or remove doctor profiles.

Overall, the project achieved its intended goals. The system is functional, intuitive, and deployable in a real hospital setting. It meets the expectations of UTAR Hospital’s requirements by offering a unified, real-time, and visually clear method for presenting doctor information to patients and visitors.

7.2 Recommendation

While the current system can serve its purpose effectively, there are several areas where future improvements can enhance its capabilities further.

First, although the web interface is currently accessible via a local IP address, migrating the system to a secure cloud-based environment could increase accessibility and offer easier maintenance options. This could also open the possibility of integrating doctor profiles into the hospital’s main public-facing website or mobile app, allowing users to access real-time doctor information before visiting the hospital.

Second, the slideshow display currently relies on hardcoded settings for slide duration and image backgrounds. These settings could be made configurable via a dedicated admin panel, enabling administrators to adjust the slideshow behaviour without modifying the code. Similarly, offering more slideshow templates or layout styles could improve the visual engagement of the display.

Third, user role-based access control can be implemented in future versions. Right now, all users with access to the Frappe backend can modify doctor profiles. Introducing tiered permissions would increase data security and ensure that only authorized staff can make changes.

Fourth, to further support data integrity and reduce errors, validation features can be strengthened. For example, implementing field validations such as proper name formatting, contact number length, or ensuring non-empty specialization fields will help maintain clean and consistent data across the system.

Lastly, expanding support for multilingual content display, particularly Chinese and Malay text on digital signage will greatly improve inclusiveness for patients from diverse linguistic backgrounds. Although the data is already stored in multiple languages, dynamic language switching for the signage display can make the system more adaptable and user-friendly.

In conclusion, the foundation built through this project offers a reliable and adaptable platform that can evolve with the hospital's growing needs. With additional refinements and enhancements, the system can serve as a long-term solution not just for UTAR Hospital, but potentially for other healthcare institutions looking to modernize their information management and patient communication systems.

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POSTER

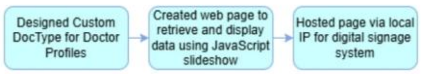
Design and Implementation of a Centralised Database System for Doctor Profiles with Digital Signage Integration at UTAR Hospital

Author: Tew Chia Li Supervisor: Ts Dr Saw Seow Hui

Introduction

UTAR Hospital lacked a centralized platform for managing and displaying doctor profiles. Data was scattered and updates were manual, increasing the risk of outdated or inconsistent information. This project addresses that problem by developing a centralized database system using the Frappe framework, with an integrated digital signage display.

Methodology



Results

✅ Successfully centralized doctor data in one platform.

✅ Digital signage web interface implemented with live data syncing.

✅ Admin can manage data without technical skills.

✅ Page is displayed smoothly on signage via IP address.

Objective

✅ Design and develop a centralized system for managing doctor profiles.

✅ Implement a digital signage layout to display doctor information in a readable slideshow.

✅ Enable dynamic data updates via website (hosted on local network) for real-time synchronization.

Discussion

 Strengths:

- Avoids duplication or inconsistency
- Easy to scale or modify

 Challenges:

- Frappe customization learning curve
- Hosting and local access setup

Conclusion

The system meets the hospital's need for a centralized, scalable, and signage-integrated profile management platform. Future work can include integration with ERP or mobile-based staff directory.