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DESIGN AND IMPLEMENTATION OF A WEB-BASED INFORMATION SYSTEM FOR UNIVERSITY STAFF UNION

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ABSTRACT

The Academic Staff Union of Universities (ASUU) in Nigerian public universities has long championed the welfare and interests of academic staff. However, operational inefficiencies stemming from manual processes hinder its effectiveness in addressing contemporary challenges. This inefficiency hampers ASUU's effectiveness and limits its ability to interact efficiently with its members and stakeholders. Therefore, this study proposes that the ASUU Web-Based Information System (AWBIS) should modernize data management, communication, and decision-making within the union. Drawing on related work in online information systems across various sectors, the methodology involves requirements gathering, leading to the development and implementation of AWBIS.

Leveraging development technologies, AWBIS offers modules for member management, communication, event organization, and biometric attendance. This project uses the waterfall model approach to developing software as the research methodology. The data collection techniques include interviews and questionnaires. The AWBIS enables various operations to be performed online, consisting of registering members by the admin, logging members, and allowing members to manage their profiles. The system also provides a login page for both members and admins, each with their own username and password. A secure and accessible database for storing member profiles, academic information, and other relevant data was created. The successful implementation of AWBIS will significantly streamline ASUU's operations, resulting in improved communication, reduced administrative burden, and enhanced transparency. Members will have access to up-to-date information, and the system will facilitate better coordination of ASUU's activities. Future enhancements, including financial management, election processes, loan applications, and mobile app development, are suggested to further optimize AWBIS's functionality and accessibility. AWBIS is a model for leveraging technology to advance organizational efficiency and effectiveness within the education sector.

Keywords: information system, web-based, academic staff union, university staff, web programming.

INTRODUCTION

The Academic Staff Union of Universities (ASUU) has played a pivotal role in advocating for the welfare and interests of academic staff within Nigerian public universities since its establishment in 1978. Over the years, ASUU has actively engaged in negotiations and strikes to address challenges such as inadequate funding, infrastructure deficits, and issues related to academic freedom. ASUU's commitment to championing the interests of academic staff and improving the quality of tertiary education in Nigeria presents a compelling demand for the pragmatic adoption of modern solutions. Despite ASUU's dedication, there is a noticeable gap in utilizing contemporary technologies to support administrative and communication needs. Manual and time-consuming processes for managing member information, coordinating activities, and disseminating information

hinder ASUU's effectiveness. Moreover, operational inefficiencies due to offline documentation systems, communication delays, and resource allocation challenges are common attributes of manual systems.

In today's rapidly evolving technological landscape, integrating advanced digital solutions is crucial for organizational efficiency. Recognizing the need for modern technological solutions, ASUU needs transformative initiatives through a web-based information system to streamline operations, enhance communication, and improve decision-making within the union. This will ultimately benefit its members and contribute to the advancement of the tertiary education system in Nigeria. Thus, the present study addresses the challenges highlighted by developing an ASUU Web-Based Information System (AWBIS) to enhance ASUU's efficiency, communication, and overall functionality.

The primary objective of the AWBIS is to provide a secure and accessible database, provide tools for effective communication, automate event organization, and implement a biometric attendance system. These specific objectives are geared towards modernizing data management, enhancing communication, and improving decision-making within the union, contributing to the broader goals of ASUU in shaping the Nigerian tertiary education system. This study's significance lies in its potential to significantly streamline ASUU's operations, reduce administrative burden, and enhance transparency, ultimately serving as a model for leveraging technology within the education sector. The subsequent sections of this article will delve into the related work, methodology, system implementation, and testing and conclude with recommendations for future improvements.

RELATED WORKS

Studies on the design, implementation, and evaluation of online information systems focused on both functional and non-functional requirements such as security, seamless system integrations, and usability. Notably, it offers benefits for secure data storage, collaboration, and efficiency in various use cases such as educational, business, and unionism, among other purposes. However, successful implementation requires both technical and non-technical

considerations, including adaptation to emerging trends. Existing literature explored the impact of web-based information systems on various sectors, highlighting their diverse applications in education, healthcare, business, and community management, amongst others (Babu et al., 2023; Budiarto et al., 2024; Fatchurrahman et al., 2024; Hidayat et al., 2024; Ma et al., 2007; Perbangsa et al., 2018; Purwanto et al., 2019; Rantung et al., 2020; Sari et al., 2020; Sijabat et al., 2020; Sikiru & Oyekunle, 2021; Wee & Maesako, 2002; Yunanto et al., 2019; Ziveria & Elvander, 2016). Thus, it emphasizes the role of information systems in enhancing decision-making, communication, and operational efficiency.

Web-based information systems have been instrumental in enhancing decision-making processes, communication, and collaboration among stakeholders in educational sectors, including higher education (Franco, 2016; Hidayat et al., 2024; Kusumojati & Mediawati, 2024; Purwanto et al., 2019; Sari et al., 2020; Sijabat et al., 2020; Wee & Maesako, 2002; Yunanto et al., 2019). For instance, Purwanto et al. (2019) demonstrated the development of an academic information system mobile-web based at the Cilacap Nature School (SACIL). The system functions as a medium for managing the academic administration of students in SACIL and as a platform of communication between parents and teachers using smartphone devices. Similarly, Sari et al. (2020) discussed the implementation of a web-based educational administration system aimed at streamlining student affairs and fostering data-driven decision-making processes. Instances for higher education can be observed in the work of Franco (2016) and Sijabat et al. (2020). Meanwhile, Sijabat et al. (2020) proposed a web-based tracer study information system for Universitas Klabat to integrate alumni tracer study processes and enhance productivity. The study highlighted the utilization of Laravel, a PHP-based framework to cater to administrators, operators, alumni, and employers, facilitating data collection, processing, and reporting. In addition, Yunanto et al. (2019) developed a web-based information system for Universitas Negeri Jakarta (UNJ) aimed to produce a web-based UNJ alumni data information system that can be accessed anywhere. The development of the alumni information system website, UNJ, is object-oriented programming (object-oriented) that utilizes the Unified Modeling Language (UML) as a model. In addition, the research was conducted using the waterfall method where the research underwent several stages: needs analysis, system planning, and system design. In this

study, two testing phases were performed, namely feasibility testing and usability testing where this evaluation was conducted after the web was completed and assessed using a questionnaire as a research instrument. Kusumojati and Mediawati (2024) proposed a web-based asset management information systems in higher education, aimed to determine the asset management information system in higher education. The research method used in this study is the Systematic Literature Review (SLR). In this study, SLR is used to identify, review, evaluate, and interpret previous studies on the Google Scholar database with a period of the last ten years, namely 2013 to 2023. The results revealed that universities do not yet have an internal information system to control their assets. Notably, the absence of an asset management information system will have difficulty in tracing asset data. Therefore, the solutions to overcome existing problems require a web-based asset management information system that can perform asset management to be more efficient and organized and make it easier to collect the number of assets. This also includes data about assets based on their condition, grouping assets by type and making it easier to search asset data. Franco (2016) presented the design and implementation of a web-based faculty information system, which replaces traditional email-based submission methods. The system collects comprehensive data on faculty members' personal information, work experiences, outreach engagements, and research outputs, with various admin and user roles within the institution. Similarly, Hidayat et al. (2024) illustrated the development of a web-based new student admission information system. The purpose of this research is to design a web-based new student admission information system, "SIPSB," and facilitate the registration of prospective new students more efficiently. In designing this new student admission information system, the Object Oriented Analysis and Design (OOAD) method and the waterfall model are used. The use of the waterfall model in this study makes it easier for researchers to design information systems since there are several stages in system development: requirements analysis, system design, implementation, system testing, and maintenance. Moreover, the results of this study revealed that the new student admission information system "SIPSB" is able to manage the web-based new student admission process more efficiently.

Similar web-based systems offer solutions to the challenges posed by traditional paper-based processes in community management

(Beigzadeh et al., 2011; Budiarto et al., 2024), health (Babu et al., 2023; Edeh et al., 2024), business (Firmansyah et al., 2019), and legislative (Perbangsa et al., 2018) sectors. Particularly, Babu et al. (2023) highlighted the modernization of medical processes by enabling online patient registration, appointment booking, and prescription management using a technology stack, including HTML5/CSS3, JavaScript, and PHP. Accordingly, it enhances the efficiency and accessibility of healthcare delivery. Similarly, Sikiru and Oyekunle (2021) proposed a web-based Hospital Management System (HMS) using a mobile application, making it ubiquitous and cost-effective. This proposed system assures the three major stakeholders in the health sector: patients, health staff, and management. Furthermore, the system would facilitate patient satisfaction, hospital efficiency, healthcare service quality, healthcare safety, and time management. Notably, the system design of the proposed web-based HMS was executed using PHP, jQuery, JavaScript, Cascading Style Sheet (CSS), and HTML. Sublime Text 3 and Visual Studio code were used to design the interface, while MySQL workbench was utilized to design most of the database. In addition, the proposed Web-based HMS was designed, developed, and assessed to examine its effectiveness when deployed. Perbangsa et al. (2018) demonstrated efficient management of legislative processes for government institutions to streamline the proposal, discussion, and publication of legislative documents. The study utilized OOAD methods and UML to establish accessible and transparent legislative activities. At the same time, Beigzadeh et al. (2011) illustrated the development of a web-based community management information system, providing online data recording, query functions, and electronic authorization using open-source platforms, including Hypertext Preprocessor (PHP) and MySQL. Similarly, Budiarto et al. (2024) demonstrated the digital transformation of local government: Design and development of the Pakuhaji district community service information system website, aimed to perform digital transformation in the government of Pakuhaji District, Tangerang Regency by designing and building an efficient and responsive public service information system website. Through a systems development approach, the research identified community needs, evaluated existing service processes, and designed information technology-based solutions. Notably, the designed information system covers various aspects of community services, including submitting correspondence, public service information, and managing population data. Furthermore, Firmansyah et al. (2019) proposed that sales information should be provided on the

web for small businesses (case study: cv. Tanaka Service). This study aimed to create a media sale that is clear and easily accessible by the consumer and easy to manage by small businesses (CV. Tanaka Service). This study described the activities and the products produced at each stage of the web design for CV. Tanaka Service. However, the design of this information system is limited only to the extent of information systems sales and the sales transaction database. At the final stage of the design, the implementation of the web-based information system was designed. Verma and Gupta (2013) proposed a portable fingerprint-based student attendance system using global System for Mobile Communications (GSM) automating functions like information acquisition, processing, and reporting. Notably, biometric systems, such as fingerprint recognition, play crucial roles in user authentication, security, and criminal identification. Edeh et al. (2024) illustrated the design and implementation of an short message service (SMS) and email-based interactive online medical record management system. The paper proposed that online medical record management system with SMS and email notification would create and update patient's profile, manages schedules between a doctor and a patient, diagnoses patient's symptoms, saves laboratory test results and doctor's prescriptions as well as utilize SMS and email to notify users when necessary. Correspondingly, the system was assessed and the results of the test revealed that the system was relatively efficient, fast, accurate and secured.

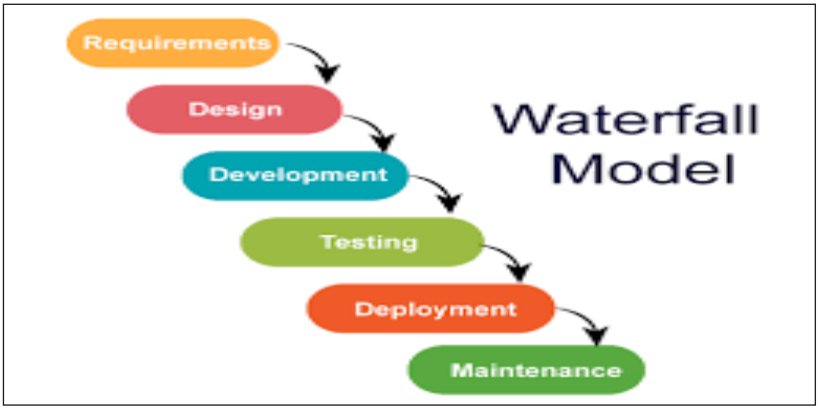
The present study leverages the technology stack, including HTML, CSS, AJAX, JQuery, PHP, MySQL, and Xampp Server, to develop AWBIS. These technologies define web-based structure, facilitate asynchronous data exchange, simplify Document Object Model (DOM) manipulation, and function as server-side scripting languages. In particular, Xampp Server integrates these components for local hosting.

METHODOLOGY

A waterfall model under the Software Development Life Cycle (SDLC) is the methodology used in this system. It is employed by system developers to produce or alter information systems or software. Additionally, it divides the development process into several stages or processes (Hidayat et al., 2024). The waterfall model process can be observed in Figure 1.

Figure 1

Waterfall Model



System Analysis

We have conducted requirements gathering for our new proposed system by conducting interviews with the members and staff and observing how the manual system of managing their activities works to design our new proposed system. We concluded that we have several problems with the existing system. For instance:

- The administrative staff finds it challenging to manage member profiles, academic information, and other information manually as such; this will lead to inefficiency, data redundancy, and security risks.
- Lack of efficient tools for communication delays in information sharing and real-time updates. There are cases of misinformation.
- Managing events and resources manually is often time-consuming and prone to errors.
- Paper-based sign-in sheets for taking attendance can be prone to inaccuracies and require manual effort for record-keeping.

Present System

The existing system for the ASUU, Kano University of Science and Technology branch has been discovered to be a non-computerized system where all operations are done manually by the chairman,

secretary, and other members of the association. Therefore, the current processes for managing member information, coordinating activities, disseminating information, and facilitating engagement are often manual, time-consuming, and prone to errors. This system has proven to be inefficient. Thus, there is a need for modern technological solutions to streamline its operations and enhance communication between its members. Hence, AWBIS has been proposed.

Proposed System

The proposed system will eliminate the significant problem of manual operations in the union's activities, address its operational challenges, and empower its members to advocate for quality education and improved working conditions. By facilitating efficient communication and meeting management, the system contributes to the union's mission of advancing the interests of academic staff and enhancing the Nigerian tertiary education system.

RESULTS

Table 1

Problems and Solutions

Problem	Solution
Managing member profile.	A secure and accessible database for storing member profiles, academic information, and other relevant data has been created. Thus, it enables ease in information retrieval and member profile management.
Lack of tools for effective communication.	A resources-sharing module is provided to streamline communication, collaboration, and real-time updates.
Meetings and event management.	Meeting module: This module helps oversee and organize meetings and events by making it easier to manage schedules and resources.
Attendance	The attendance module provides a secure and efficient way of generating attendance using a biometric finger system.

Implementation

a. Home Screen

On the home screen, a menu of options will be displayed in the AWBIS, consisting of Home, Resource, About Us and Members.

Figure 2

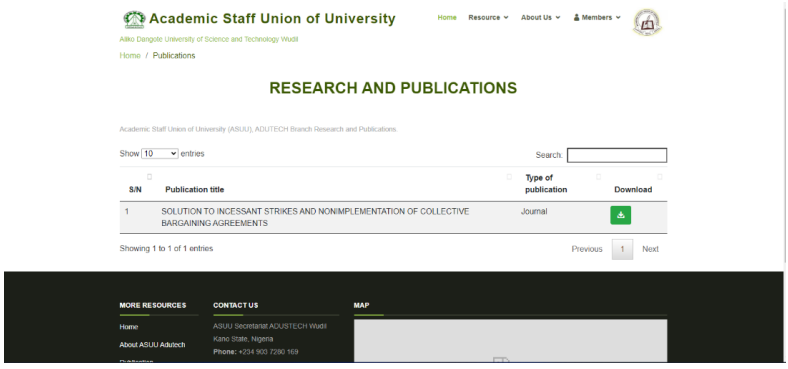
Home Screen

b. Resource

The resource page displays all the research and publications of the union.

Figure 3

Resource Page

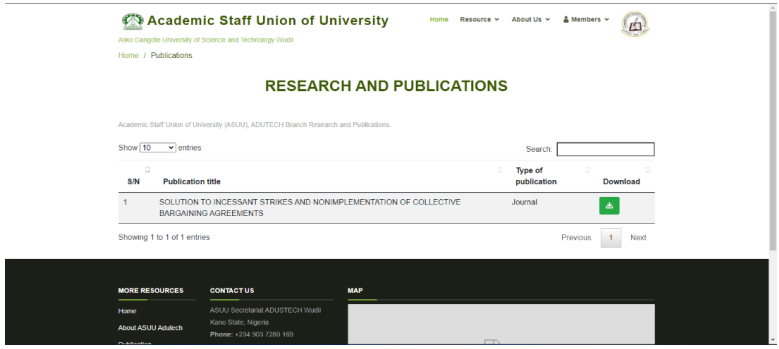


c. About Us

On the About Us page, there is brief information about ASUU National and ASUU, Kano University of Science and Technology.

Figure 4

About Us Page

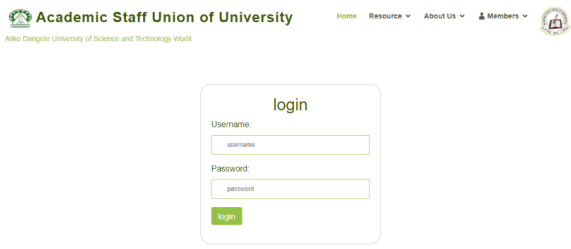


d. Members

On the Members page, a login page is available for users, i.e., members, secretaries, and admin. They are required to enter their username and password in order to access the inner system. All users are expected to enter their staff identity number as the username and password in the login form, which he or she will then click login. The user input here is validated, and no empty input field is accepted.

Figure 5

Members Login



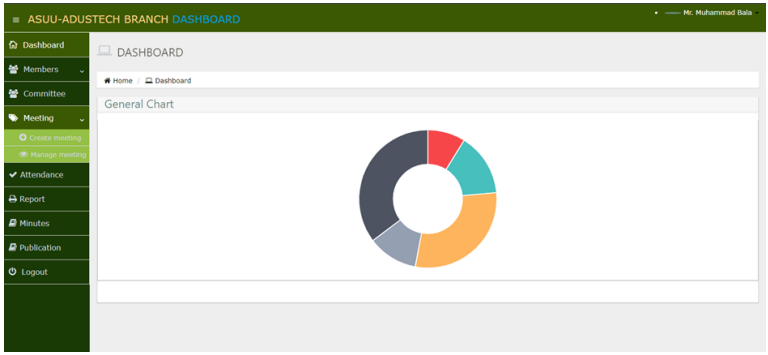
e. Admin Dashboard

The dashboard is the first page that displays when either a member, secretary, or admin logs in. When a member logs in, he or she will be

redirected to the member's dashboard. This is the same for secretaries and admins. The main menu is displayed on the side, known as the sidebar, for easy navigation.

Figure 6

Dashboard Page

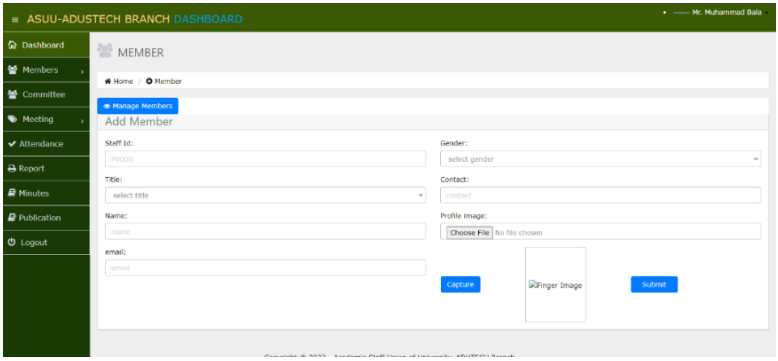


f. Member Registration Page

The registration page is the page where members are required by the admin to fill in their personal details to register with the system. Biometric fingerprints are captured during registration and verified or recaptured for attendance at every meeting.

Figure 7

Member Registration Page

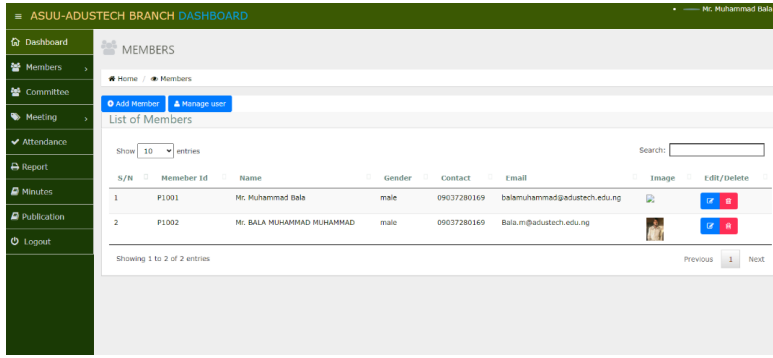


g. Manage Member

On the Manage Member page, a list of all registered members' profiles will be displayed, and the admin can easily modify them.

Figure 8

Manage Member

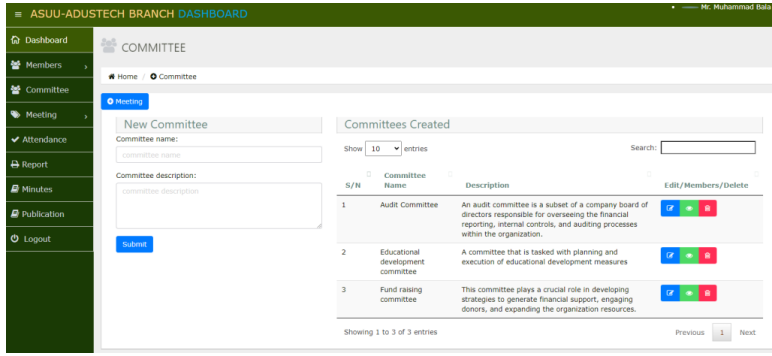


h. Committee

On the Committee page, the admin and secretary are allowed to create and manage committees.

Figure 9

Committee Page

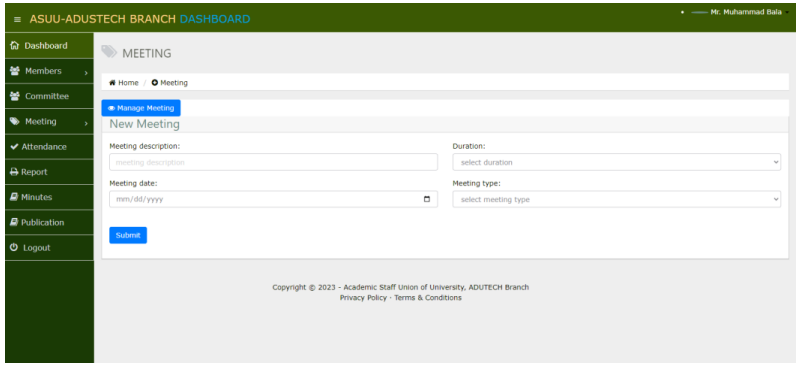


i. Meeting

This page allows the admin to create and manage meetings.

Figure 10

Meeting Page

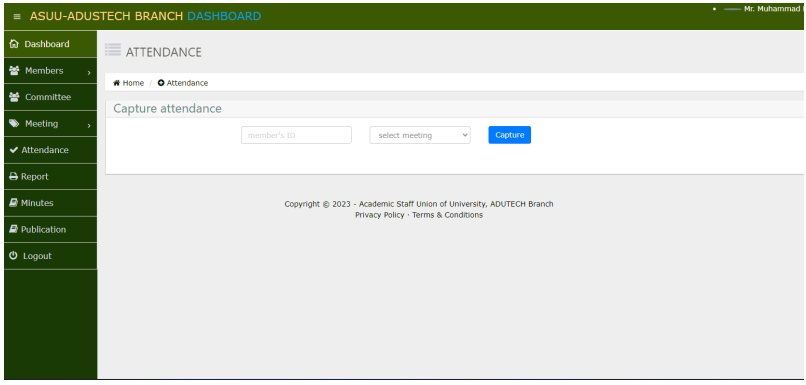


j. Attendance

This page allows the secretary and admin to take attendance during and/or after the meeting.

Figure 11

Attendance Page

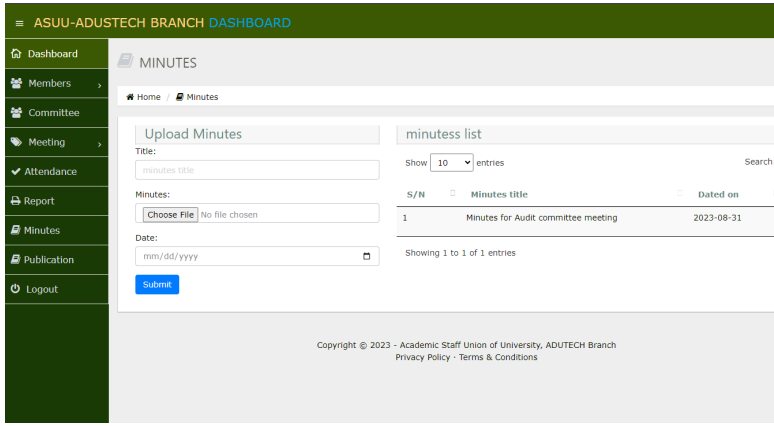


k. Minutes

This module enables the upload of meeting minutes.

Figure 12

Minutes Page

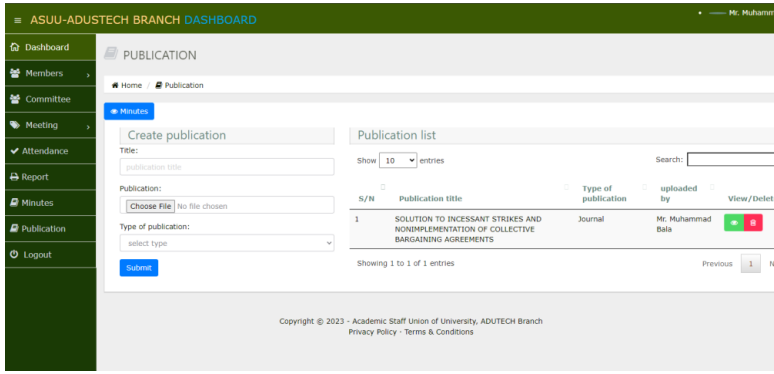


l. Publication

This page enables the upload of research and publication documents.

Figure 13

Publication Page

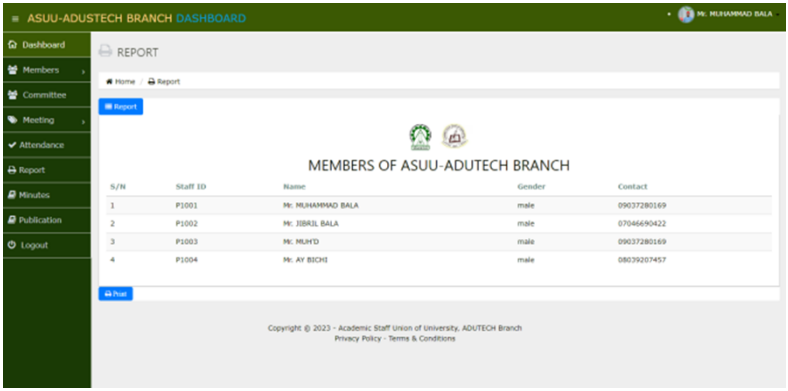


m. Report

This page enables the generation of a report, such as a list of all members or a list of all members in a particular committee and an attendance report.

Figure 14

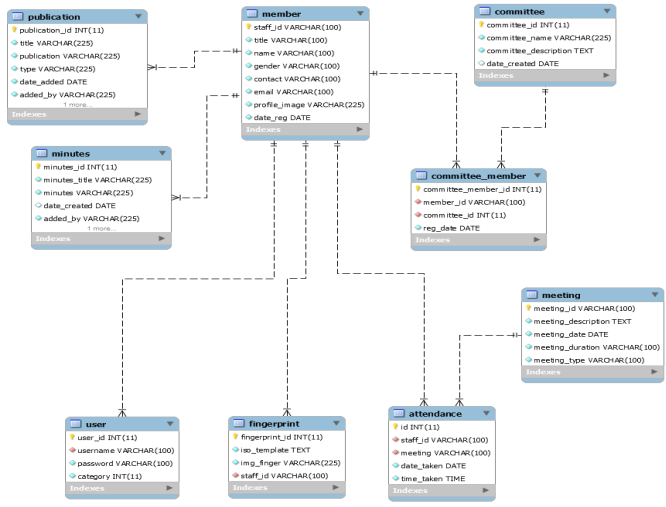
Report Page



FINDINGS

Figure 15

Frame Work for ASUU Web-Based Information System (AWBIS)



DISCUSSION

The proposed system was successfully implemented using HTML, CSS, AJAX, JQuery, PHP, MySQL, and Xampp Server. The AWBIS is a comprehensive platform designed to streamline and enhance the management, communication, and coordination processes of the union. This advanced system aims to address the specific needs and challenges faced by the union in managing its members, negotiations, activities, and interactions with stakeholders. Furthermore, the system offers a centralized database for ASUU members, allowing efficient management of member profiles, contact information, and areas of expertise. This facilitates targeted communication and ensures accurate representation of the membership. It also consists of a secure digital repository to store vital documents, including research papers and minutes of meetings. Accordingly, authorized members can access and contribute to this repository, ensuring easy retrieval of historical data and vital resources. Most importantly, AWBIS has been assessed and approved by the union for use.

The successful development and implementation of the AWBIS at ASUU, Kano University of Science and Technology Wudil, will have far-reaching benefits. This system will significantly streamline ASUU's operations, improving communication, reducing administrative burden, and enhancing transparency. Members will have access to up-to-date information, and the system will facilitate better coordination of ASUU's activities. Additionally, the project's outcomes could serve as a model for leveraging technology to enhance the operations of other labor unions and organizations within the education sector.

CONCLUSION

With the traditional manual system used to store members' information and coordinate activities of the union, numerous problems occur. This includes data redundancy and inaccuracy, communication delays, limited accessibility, resource allocation challenges, inefficient decision-making, documentation and retrieval challenges, transparency issues, record-keeping, and accountability. This inefficiency hampers ASUU's effectiveness and limits its ability to interact with its members and stakeholders efficiently. Therefore, this project will streamline and enhance the operations and activities of the ASUU, Kano University

of Science and Technology, Wudil branch, facilitating efficient communication, management, and coordination among its members and stakeholders. The system aims to address the challenges faced by the union in managing its operations and engaging with its members spread across various universities in Nigeria. Accordingly, we have gathered requirements for our new proposed system by conducting interviews with the members and staff and observing how the manual system of managing their activities works to design it. The primary objective of this project is to develop a web-based information system that will enhance the union's efficiency, communication, and overall functionality.

The development of an AWBIS holds significant promise for advancing the union's objectives and streamlining its operations. Such a system would offer a comprehensive platform for ASUU to effectively manage its membership, facilitate communication, and enhance its advocacy efforts. In addition, by embracing technology to create a unified digital ecosystem, ASUU can overcome some of the challenges it faces in coordinating activities, disseminating information, and engaging with its members and the public. This would improve internal processes and foster a sense of unity and collaboration among academic staff across different institutions.

Furthermore, the system could serve as a repository for historical data, enabling ASUU to reach other significant milestones. This valuable resource could provide insights for future negotiations and help ensure accountability in implementing agreements. As technology continues to shape modern organizations, an online information system represents a forward-looking approach for ASUU to adapt, remain relevant, and effectively champion the interests of its members. However, it is essential to ensure that the system's design and implementation consider user experience, security, and accessibility to guarantee its effectiveness and widespread adoption.

It is recommended that further enhancements be conducted on this project to ensure that necessary amendments and improvements can be made to obtain a perfect system. Such improvements may include:

1. ASUU Financial Module: This module will allow the treasurer to manage the financial activities of the union.
2. ASUU Election Module*:* This module will allow the admin to calculate the percentage of attendance of the members and to

determine the eligibility of members to participate in a union election. This module can allow members to nominate members for a position only if they meet the union requirement (e.g., 60% of attendance, as the case may be).

3. ASUU Loan Application Module*:* This module will allow members to apply for loans, allow admins to initiate deductions, and allow members to view queue numbers. Furthermore, this module will allow the admin to add possible loans for which a member can apply; the loans will appear on the member's portal.
4. Mobile App: The information system developed and viewed on the web application using a browser (e.g., Chrome) will be developed to work on mobile phones (Android phones). The main functionalities of the mobile application will be considered.

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