Development of AI-Based Executive Office (Case Study of Wellspring University, Benin City)

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DOI: https://doi.org/10.51584/IJRIAS.2024.910035

Received: 07 October 2024; Accepted: 14 October 2024; Published: 15 November 2024

ABSTRACT

The increasing demand for efficiency and productivity in top management has led to the development of smart office technologies. Using Wellspring University, Benin as a model, this study developed an artificial intelligent-based, smart scheduling system for executive officers in the University system. The system automated most of the daily activities - reminders, deadline management, meeting scheduling and daily appointments - of the Vice Chancellor, Deputy Vice Chancellor, Registrar, Bursar and Librarian. PHP, CSS, HTML and JavaScript tools were harmonized in the design of this work while integrating greedy algorithm for prioritizing tasks and periodic evaluation of the overall performance. Decision extracts from high-powered meetings which could take weeks to get across to the implementers have been made easy with this system, by automatically generating the excerpts and sending them through the intra-communication channel for the executives' secretaries for validation and onward circulation. The system ensured security and integrity of data through secured login and access control with the AES/RSA encryption. This work has remarkably removed the mundane tasks and laid out a more effective and efficient way of improving productivity and time optimization in management. It shows a smart coordination of executive functions in a twenty-first century and technology-compliant University.

INTRODUCTION

In the past, offices operated manually with most processes depending on the use of paper, cabled telephone lines, faxes, typewriters, etc. Today, advancement in technology has introduced the use of intelligent systems that support cloud computing, software applications, smart peripherals, and fast internet connections, in the office space. Maple (2017) stated that increased productivity in many organizations and improved well-being of the workers are assured with the use of new technologies, but despite these advancements, modern office settings face daily challenges in addressing the demands of schedules and appointment management by the executives.

Executive officers in universities face many challenges with the management of their daily activities, especially with meeting schedules, appointments, documentation, and inter-departmental communications within the executive roles. To close this gap, it is necessary to employ emerging technologies in artificial intelligence (AI) and the Internet of Things (IoT) which provide smarter ways of doing things. Based on this strength, the development of a smart scheduling system is required to enhance the daily coordination of multiple appointments and schedules of the executives.

AI has a tremendous ability to change the executive offices' landscape with implications for positive impact on productivity, operational efficiency, and decision-making (Ma et. al. 2019) and Sarker (2022). Accepting and moving with these innovations in executive offices is particularly important in achieving high coordination and productivity while staying afloat in the competitive business market.

Problem Statement

Smart office technology provides the enabling platform for major improvements in the workplace about

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume IX Issue X October 2024

efficiency and productivity. However, these advantages can be underutilized if the daily activities are poorly coordinated for the executives. In various organizations, many executives struggle with tedious manual scheduling systems which often lead to missed appointments, conflicting meetings, low productivity, and poor management of the workforce. This problem is further complicated by the difficulties associated with the increased workload of modern work environments, where the need to coordinate multiple tasks and carry out real-time updates of records are highly essential.

Aim and Objectives of the Study

This study is aimed at developing a smart artificial intelligence-based (AI-based) executive office in the University system. An integrated system for effective and efficient management of scheduling and coordination of executive administrators' daily tasks. Using the executive officers of Wellspring University, Benin City, (the Vice Chancellor, Deputy Vice Chancellor, Registrar, Bursar and Librarian) as the model, this work has the following objectives:

1. To use greedy algorithm for full automation of the daily activities of the executive officers with schedulers, deadlines and priorities managers.

2. To integrate text to speech technology and task analyzer into work patterns and timing routines.

3. To build a robust activity tracker, reports/excerpts generator, intra management file processing and periodic assessment of functions.

4. To lay the AES/RSA encryption for the security and privacy of all executive officers in the university.

Theoretical Background

Building an AI-based executive office system needs a robust knowledge of the Requirement Engineering (RE) process, especially concerning AI systems. Ahmad et al. (2023) stated that it is important to include guidelines for AI with consideration and plans for human comfort and safety into the requirement engineering process, to ensure the system is built to meet users' needs. However the use of tools like the Unified Modeling Language and Microsoft Office packages to present requirements is not sufficient to handle the difficulties associated with the design of AI-based software, this then suggests the need to develop dedicated tools for the development process.

Myllynen et al. (2021) emphasized the capabilities of AI such as in Natural Language Processing (NLP) and Machine Learning (ML), to coordinate complex demands. Their work showed that AI can be applied to various conditions which include executive office systems. But Winfield & Jiroka (2018) proposed the creation of review boards and the use of risk management methods to handle ethical issues in the development of AI-driven executive office systems.

Rajab et al. (2023) developed a prototype smart office system with the combination of internet connectivity and wireless networks (WSNs), integrating Bluetooth and RFID. However, the model is vulnerable to intruders due to its dependency on Wi-Fi and Bluetooth. An attempt to avoid this weakness was earlier made by Bogdan et al. (2021) when voice assistant was introduced in the smart offices to enhance activities like environmental control and planning, but the system failed to predict intentions as expected and was unable to reconcile mispronounced speeches.

Swaroop et. al. (2023) discussed how IoT combined sensors, transducers, and actuators with mobile communication technologies in cloud computing, using ThingSpeak and Blynk platform for the implementation of the smart office. Their research showed the ability of Machine Learning to predict situations with inputs from the microcontroller when electrical appliances are linked to user's mobile devices to enable energy control and flexible communication. The major goal of the study done by Tuzcuoglu et. al. (2022) was to understand what the smart office means to the employees by analyzing what they prefer and expect of the system. To evaluate how the employees view and interact with features of the smart office concerning their relocation to a new office building in a Dutch municipality. The research used a small sample size which is a restriction of its applications

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume IX Issue X October 2024

to every office, with more limitations by not addressing the issues of data security and integrity.

Motivation for this Study

Most systems related to smart offices basically addressed the need for smart offices but neglected the scheduling of the daily routines, and especially did not focus on any executive officer, upon which hinges the administration and coordination of the entire workplace. Another major gap is that all the designed smart offices are generalized to middle-level staffers in ministries and parastatals, no system is tailored to suit the dynamic working situation and complexities of running a twenty-first (21st) century University like Wellspring University, Benin City.

METHODOLOGY

A purposive selection method identified the executive officers in the University as the Vice Chancellor, Deputy Vice Chancellor, Registrar, Bursar, and Librarian. The researcher applied through the Head of the Computing Department, of the University, to the executive officers as required with the code of ethics for case study research. A series of interviews were conducted with the officers and their secretaries, using structured questions validated by the Head of Computing Department and a senior visiting Professor from Ekiti State University, Ado Ekiti. It contained questions ranging from the major to minor activities and processes of communication in the executives' offices, and among the executives within the University.

Some more data was gathered from nearby universities and online information. It was discovered that the executive officers hitherto have been using manual scheduling systems for managing daily appointments and meetings by the secretaries. Upon further interactions, the secretaries all confirmed the need for the system to be developed as it would be a respite to the secretaries and officers while opening more time for other important tasks in the office. Adequate documentation on all existing appointments and related documents was reviewed to understand the daily workflow of the executives. These insights were used to create the use cases that shaped the flow of the development process after the data was collated and analyzed.

Data Preprocessing

In the interview with the Vice-Chancellor, it was discovered that as much as ten hours could be spent on meetings with Council while the monthly Senate meeting can take as much as eight hours. The Deputy Vice Chancellor spends as much as 4 hours on management and committee meetings and a closer look at Table 1 below reveals insight into how much time is spent on individual tasks by the executive officers. The information gathered was all arranged using Microsoft Excel. Using weights of one (1) to five (5), the activities of the executives were arranged in order of priority to the maximum time allocated to each activity. Table 1 is a summary of the information gathered.

Table 1: Activities of Executive Officers in the University

S/No.	Officer	Tasks	Priority Level	Time taken per task (hours)
1.	Vice Chancellor	Council and Management	1	10
		Visitors	2	2
		Committees	3	3
		Senate	1	8
		External Liaison	2	2
		Staff	4	3

		Students	3	1
		Community	5	2
2.	Deputy Vice Chancellor	Management & Committees	1	4
		Academic Planning	2	2
		Staff Development & Welfare	3	2
		Students' Affairs	2	3
		Quality Assurance	1	1
		Works & Services	4	2
		Visitors	5	1
3.	Registrar	Establishment	4	2
		Council / Senate	1	8-10
		Admissions	2	2
		Records	3	2
		Community	5	2
4.	Bursar	Management	4	5
		Salary / Wages	1	3
		Accounts	2	1
		Audit	3	3
		Procurement	5	3
5.	Librarian	Projects	1	4
		Resources	2	2
		Publications	4	3
		Exhibitions	5	4
		Management	3	5

Software Development Methodology

The software development methodology deployed scrum of the agile methodology due to its flexibility in testing and delivery of the final product. Unlike other traditional methods which aim to complete the entire application before testing, the agile method allows the delivery and testing of segments of the software before the total

packaging. Agile methods ensure delivery of a highly valued product since testing is carried out throughout the development process which provides room for adjustment and early detection of bugs.

In the Implementation phase, team members executed tasks and activities that are contained in the sprint backlog list. The scrum emphasis here is on continuous daily stand-up meetings and review of the incremental progress. These meetings enabled the team to identify possible challenges during the work on each individual part of the project. Although the phase is difficult but presents with more benefits and proper communication among members.

The review and retrospect phase is an important part of developing the product, it follows immediately after the end of each stand-up meeting enabling the team to check what went well and easily identify problem areas for further review and improvement. All feedback from the stakeholders is documented to guide future work on the product.

The release phase is the final step in the development of the project which prepares the product for delivery to the stakeholders. Testing of the system was carried out throughout the phases of the project; this implies that each component of the system is tested in isolation, a measure that ensures the system is reliable and all functionalities are working accordingly. Eventually, all the modules are tested together to rule out issues after the integration. The overall system is tested by the actual users who validate that the needs and requirements of the users are met**,** the deployment of the application on a web server requires setting up the server to support PHP and MySQL. The team ensured the aim of the project is met and all efforts resulted in a good completion of the end goal by satisfying all the details of the software requirement specification of the application.

RESULTS AND FINDINGS: HOW THE SYSTEM WORKS

The system is a local host that runs on the Xampp environment. The administrator manages the system by creating accounts for the various users with necessary rights and permission, the VC, DVC, Registrar, Bursar, Librarian, and Secretary. The Welcome/Login page presents a friendly interface for the login page which enables the user to select their roles. Upon verification, access is granted to their account. The secretary manages the daily updates and review of the executive schedule and fills out the meeting extract of each completed task. The voice brief reads out details of the daily schedule and allows the executive to decide on a preferred task or perhaps pick up from the previous day.

Testing of the System

The system was tested at the completion of each module and a comprehensive testing of the integrated components was carried out at the completion of the entire system. To deploy the application on a web server required setting up the server to support PHP and MySQL, then all required database components such as tables and data are imported for efficient functionality. This configuration enables the database to store and retrieve the necessary data. The application files were uploaded using enforced security measures to ensure secure access and execution of data. Ensuring data security during the sessions between the user and the server requires setting up an SSL certificate to encrypt and protect data from possible threats.

Table 2: Improved time taken for activities of Executive Officers in the University

S/No.	Officer	Tasks	Priority Level	Time taken per task (hours)	Time taken in the new system (hours)
1.	Vice Chancellor	Council and Management	1	10	4
		Visitors	2	2	1
		Committees	3	4	2

		Senate	1	6	3
		External Liaison	2	3	1
		Staff	4	3	1
		Students	3	1	0.5
		Community	5	2	1
2.	Deputy Vice Chancellor	Management & Committees	1	4	2
		Academic Planning	2	5	3
		Staff Development & Welfare	3	2	1
		Students' Affairs	2	1.5	1
		Quality Assurance	1	1	45mins
		Works & Services	4	2	1
		Visitors	5	1	40 min
3.	Registrar	Establishment	4	2	1
		Council / Senate	1	9	5
		Admissions	2	2	45 minutes
		Records	3	2	1
		Community	5	9	5
4.	Bursar	Management	4	5	3
		Salary / Wages	1	3	1.5 hours
		Accounts	2	1	35 minutes
		Audit	3	3	2
		Procurement	5	3	1
5.	Librarian	Projects	1	4	2
		Resources	2	2	1
		Publications	4	3	2
		Exhibitions	5	4	3
		Management	3	5	3

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume IX Issue X October 2024

Table 3: Extracted time taken for activities in both systems

Tasks	Time taken per task (hours)	Time taken in the new system (hours)
Council and Management	10	4
Visitors	2	1
Senate	6	3
Community	2	1
Management & Committees	4	2
Academic Planning	5	3
Establishment	2	1
Audit	3	2
Publications	3	2

The figure 1 below represents the percentage visual Presentation of the time taken in the old system and improved time taken in the system for the completion of individual task.

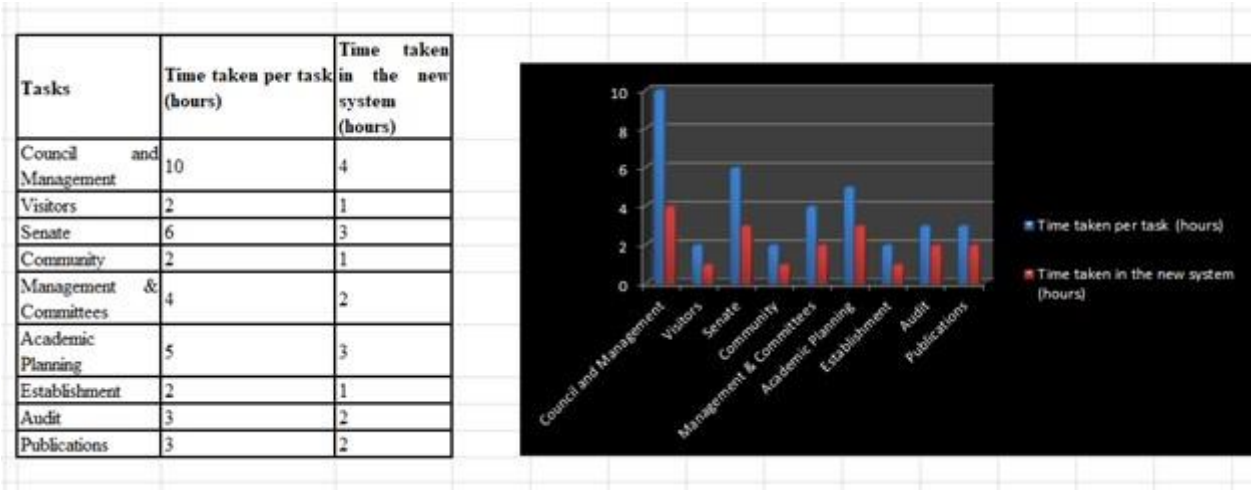


Figure 1: Graphical representation of Percentage Improvement of activities

The new scheduling system has shown a high improvement in the time taken by the executive officers of the school to complete different tasks. In the Figure 1 above, the time spent by the Vice Chancellor on various task like the council and Management has reduced from 10 day to 4 hours, while the other tasks such as attending to visitors and senate reduced to 1 and 3 respectively. Similarly, the Deputy Vice Chancellor has experienced reduction with management and committees task from 4 to 2 hours and academic planning has reduced from 5 to 3 hours and improvement is recorded with establishment task for the Registrar while community related task has been cut down by half. The Bursar and the Librarian have also experienced a significant reduction in time to 2 hours in audit and publication respectively. Summarily, the smart scheduling system has shown a remarkable improvement in time management and efficiency across various executive roles and tasks.

Procedure for Running the System

The system is designed to coordinate the daily schedules of the executive officers of the school. Upon arrival at

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume IX Issue X October 2024

the office, the user should follow the steps:

1. Open the system
2. Enter the Uniform Resource Locator of the model: http://localhost/appointment/index.php
3. Login to access the features of the smart scheduler
4. Verify Role of user
5. Automatic Voice command (read out the entire brief for the day)
6. Input choice of next task.

All the Executive Officers have a similar interface but different schedules and appointments. Each user must verify the role before assigning tasks.

Fig. 1: Welcome / Login / Admin Pages

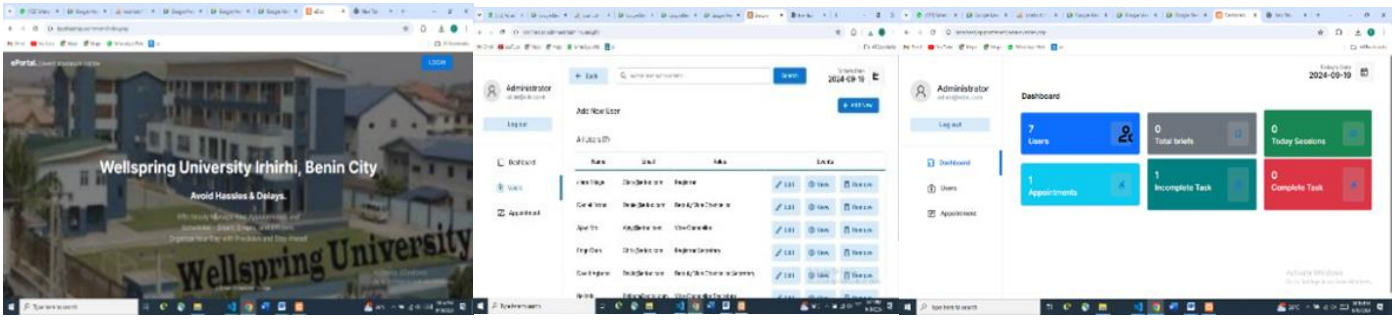


Fig. 2: The Vice Chancellor's Secretary Scheduler and Daily Reviewer

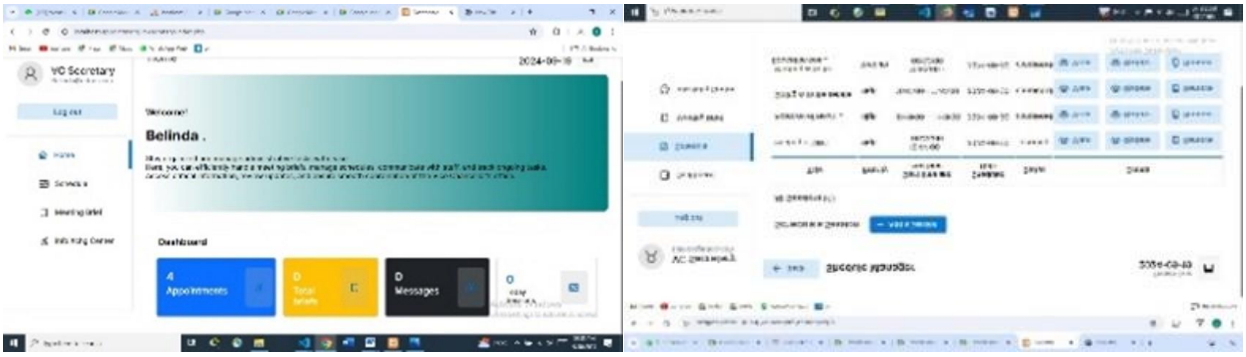
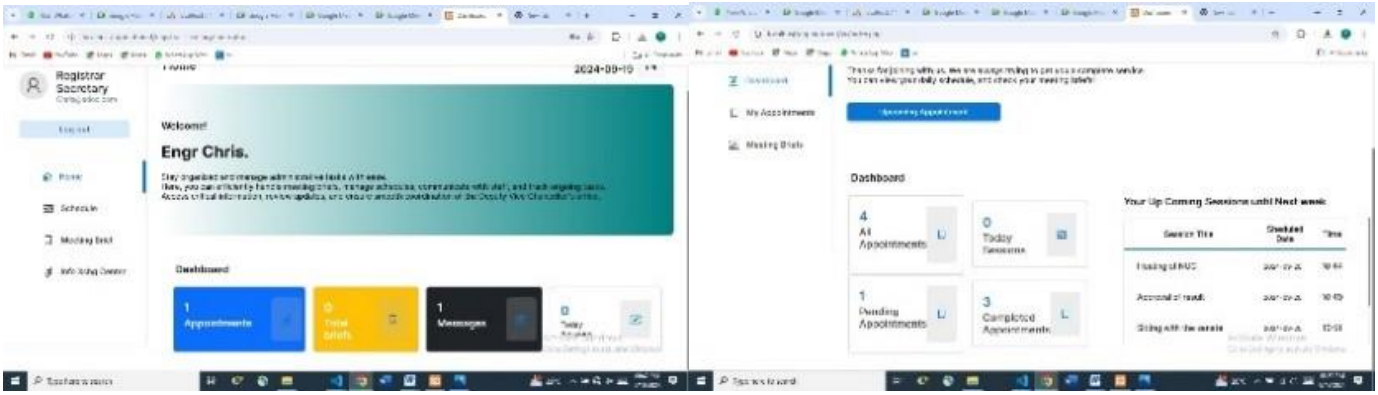


Fig. 4: The Registrar's Secretary and Scheduler



The system is a web-based application that can be accessed through the Uniform Resource Locator of

http://localhost/appointment/index.php locally, access is granted by the Admin after verification to their dashboard.

Plate 2: The Administrator's Interface

The Administrator's module allows the addition and management of each individual user's account. The administrator sets the rights and privileges for every user and oversees the appointments of each. All details of the users and the schedules for the executive roles are backed up in the database and the administrator has full access to all users and information in the database.

DISCUSSION OF RESULTS

The system was evaluated and compared with the existing manual method of coordinating the executive schedules. It is a welcomed development considering the manual method of coordinating schedules for the executive officers. It has also shown to be an efficient tool in organizing the daily activities and functions of the executives. The model provides a centralized platform that enables the user's access to the schedules and supports review of a daily, weekly and monthly schedule. The model ensures the executives are duly notified of upcoming meetings and deadlines, 30mins before the time which promotes prompt response. The real-time platform of this model supports flexible resolve of conflicting schedules and appointments reducing the need for the executives to manually update their daily appointments, this allows them time to concentrate on other important functions and supports a strategic decision-making process.

The central platform for the secretaries to communicate among themselves through the information exchange center promotes internal communication and flexible notification of schedules. The system's ability to manage emergency meetings and deadlines showcases its adaptability to the growing need of the unpredictable office environment of the executive officers.

Additional findings are that the model improves the overall performance and productivity of the users by effectively reducing administrative burdens. The executives can effectively concentrate on more important functions instead of investing time in articulating the administrative task these advantages also support the clear vision of due appointments and responsibilities.

Finally, the result from this study shows the capabilities of AI-based smart schedulers in successfully meeting the major objectives of improved productivity and flexible management of time for executives through automated schedules and a friendly user platform. In the future, this model can present as a platform for improved solutions to the demand of the daily management of official duties and help the executives flexibly navigate their busy schedules which will significantly increase the success of the organization.

SUMMARY AND CONCLUSION

The study developed an AI-based smart scheduling system tailored at the efficient and effective activities of the executive officers in a University by automating the management of their daily appointments and schedules. The system allowed the secretaries to update and review the schedules enabling real-time view and management of priority schedules by the executives. A one hundred percent efficiency was recorded to the objectives of the study. It efficiently coordinates tasks and can manage emergency notices of appointments and schedules with reduced administrative workload. Decision excerpts are easily extracted from meetings' recordings. This will enhance the productivity of the executives and provide a foundation for future innovations in IoT and AI-driven office culture.

Suggestions for Further Research

The system can be expanded to collaborate with other platforms with the tools for project management and mails, and because of the sensitive nature of executive meeting extracts, more layers of encryption can be added for more privacy and security.

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