An Agile Web-Based System for Planning and Managing Examinations in Nigeria: A Case Study of Federal University of Technology, Owerri

Ebiringa, O. T.[1]; Asiegbu, B. C.[1]; Amadi, E. C.[2]; and Ikerionwu, C. O.[3]

[1]Department of Entrepreneurship and Innovation, Federal University of Technology, Owerri. [1]Department of Entrepreneurship and Innovation, Federal University of Technology, Owerri. [2]Department of Information Technology, Federal University of Technology, Owerri. [3]Department of Software Engineering, Federal University of Technology, Owerri.

Corresponding author: oforegbunam.ebiringa@futo.edu.ng

Abstract

The paper developed and implemented an agile web-based system for planning and managing examinations (WSPME) in a university, focusing on the Federal University of Technology Owerri. The objective is to integrate an emerging technology to the university's examination processes for enhanced effectiveness, quality assurance, productivity and stakeholders' satisfaction. The paper adopted mixed method design combining Agile Development framework, Rapid Application Development for quick web-based system design and development as well as survey for testing. The developed system was deployed and operability tested based on valid responses of 200 stakeholders to survey questionnaire administered. Findings suggest that the turnaround time for semester examination schedule plan generation was significantly reduced, and semester examination management improved without any known error. Responses from stakeholder users indicated the friendliness of the web-based examinations system, and improved quality assurance, productivity, and satisfaction among stakeholders. However, the paper identified a lack of appropriate technology adoption policy, inadequate availability of technical and technological infrastructure, knowledge, awareness and skills among internal stakeholders as challenges that need to be addressed through policy formulation, technology and technical support infrastructure development planning and implementation, as well as continuous human capacity development.
Keywords: Agile, Web-Based System, Examinations Planning, Examinations Management, Performance, Productivity, Quality Assurance, Stakeholder Satisfaction.

Introduction

The examination planning and management is a critical activity of tertiary educational institutions that provide the mechanism for testing, assessing, monitoring, controlling and evaluating productivity of key participants in the teaching and learning process (Popham, 2018). The logistics of examination planning and management include key activities of examination schedule/timetabling and dissemination, questions drafting and preparation of marking schemes, question papers vetting and moderation; question papers production and storage; organization and preparation of venues; venue management; retrieval of

answers scripts and storage; marking of answer scripts and results processing, collation of results for approval; and publication of approved results.

Examinations planning and management systems deal with such objects as courses, students, halls, times available, invigilators, and supervisors, as well as the constraints of rules, facilities and manpower that limit flexibility in the planning and management processes and procedures. Considering the crucial role of examination planning and management, it has received consistent attention from the scientific education community in the last five decades with an emphasis on ways and means of improving output quality (Ebiringa & Lasis, 2014), and stakeholder productivity (McCollum & Burke, 2014; Özcan, Burke, Di Gaspero, McCollum & Schaerf, 2019). Technology applications have been identified as one sure way of achieving the above objective.

The global interest in examination planning and management effectiveness, especially at the higher education level, crystallized to the organization of the PATAT (Practice and Theory of Automated Timetabling) conferences in 1995, with repeat editions held after every two years since then. Discussions at these conferences led to the establishment of EURO (Association of European Operational Research Societies). WATT (Working Group on Automated Timetabling) in 2002, and their holding of an International Competition of Timetabling, with support from the PATAT (Özcan, Burke, McCollum, Kjenstad & Riise, 2016; Özcan, Burke, Di Gaspero, McCollum & Musliu, 2021). Hence, the need for effectiveness in examination planning and management in tertiary educational institutions in Nigeria, especially at the Federal University of Technology, Owerri, through technology integration cannot be overemphasized.

Problem Statement

The effectiveness of the quality control and assurance examination system of critically important for the maintenance of good academic standards by universities, leading to the production of graduates who are truly worthy of character and learning (Popham, 2018; Ebiringa, Ekwenwa & Ebiringa, 2015). Unfortunately, educational institutions in Nigeria, especially those at the tertiary level, are currently experiencing challenges to sufficient achievement of the above central objective, largely due to ineffectiveness in their examination planning and management systems.

The Federal University of Technology, Owerri, is having an unpleasant experience in this regard, given the fast declining trends in the employer rating of her graduates in recent times. Employers of labour in Nigeria, especially in the oil and gas industry in the 1990s, rated second class lower graduates of FUTO on same scale as second class upper from other Nigerian tertiary educational institutions, based on their average relative higher technical knowledge levels and intelligence quotient (IQ). A number of factor seem responsible for the above decline, top of which is the failing standards of examination planning and management, that seem to have compromised the quality assurance mechanisms, leading to an increased likelihood of an increasing number of graduates, who do not possess

sufficient knowledge and demonstrable traits that adequately match the certification grade the university issued to them.

FUTO, like any other Nigerian tertiary educational institution, conducts examinations on a semester basis leading to cycles of routine examination planning and management, with associated resource limitation challenges (inadequacy of examination venues, standard sitting spaces, and qualified invigilators). The need for effective planning and management of limited physical, and human resources available to FUTO to achieve global best practices in examinations planning and management cannot be overemphasized, as the planning (timetabling) and management system currently in use is traditional and manual and highly inefficient (high timetabling man-hours and cycle time; courses and invigilators omission and duplication; venues omission, duplication, underutilization and over-utilization; courses rescheduling and misconduct). Implementation of a web-based system for examination planning and management by FUTO has the capability of providing solutions to the above challenges and offering likelihood for productivity, quality assurance, and stakeholder satisfaction improvements.

Objectives of the Study

A preliminary assessment of FUTO's existing examination planning and management system when benchmarked on international best practices, indicates a preponderance of inefficiencies and ineffectiveness in the use of available scarce resources, due largely to the manual approach been used, which affects quality assurance, productivity and stakeholders' satisfaction negatively. The need for implementation of a technology-enabled system has become more imperative than ever before, given the disruptive technologies that are revolutionizing the educational sector globally. Hence, this paper aims to develop a Web-based system for planning and managing examinations (WSPME) that improves the productivity of FUTO for value creation and stakeholders' satisfaction. Specifically, the objective includes:

a) develop a web-based examination planning and management system;
b) test operability of web-based system for examination planning and management;
c) assess the impact of web-based examination planning and management systems as regards:
   - reduction in input man-hours and cycle time of examinations planning process;
   - elimination of omissions and duplications of courses invigilators, and venues;
   - minimization pf capacities underutilization and over-utilization;
   - increasing stakeholders' acceptance and active usage;
   - enhancing stakeholders' productivity and satisfaction.

Review of Examinations Planning and Management System Algorithm

Different authors who have worked on this kind of problem that involves randomly allocating variables to different sets of variables, where some can be very easy to overlook, and others must be wholly considered as letting off, will lead to the production of results

that are less satisfactory (Ertmer, Ottenbreit-Leftwich & Tondeur, 2015). The problem of planning and managing examinations in the academic environment has been a long-lasting one. So many theories have emerged in the form of algorithms, which have been adopted by several researchers in trying to solve these problems (Educational Testing Service, 2018). According to Rezapoor-Mirsaleh and Meybodi (2018), the memetic algorithm (MA) can be viewed as an extension of the algorithm and the key feature is the coupling of the global optimization and local optimization. They further said that the global optimization is managed by the crossover procedure while the local optimization is performed using the local search as a mutation operator. By this, they are saying that the memetic algorithm breaks down the optimization process of efficiently distributing these constraints into 'local' and 'global'. The global optimization is achieved before the local optimization on various localized variables has been concluded.

The memetic algorithm has been seen as evolutionary, as an algorithm that has mutation, crossover, and hill-climbing as principal components. The meme will encode the score to indicate the level of performance of the concerned or associated operator and this is the main feature of the algorithm (Sun, Miao, Gong, Zeng, Li, & Wang, 2020). This algorithm (theorem) has been mentioned earlier in this work during the discussion of the memetic algorithm. It is an extension of the Genetic Algorithm which was done to better refine the optimization result. The memetic algorithm mentioned was one of the interventions for the deficiencies of the Genetic Algorithm. The memetic algorithm is different from the genetic algorithm as it employs intensively the use of local search mechanisms like hill climbing algorithms and evolutionary algorithms (Ghosh, Begum, Sarkar, Chakraborty & Maulik, 2019; Kayé, Diaby, Koivogui & Oumtanaga, 2021; Nguyen & Sudholt, 2020).

Current Examinations Planning Process at FUTO

Pieces of evidence available show that the current examination planning process of FUTO is manually operated and has presented severe problems that impede efficiency, effectiveness and productivity. Efficiency in resource utilization is an essential requirement of examination planning (Alghamdi, Alsubait, Alhakami & Baz, 2020).

Optimality in resource allocation taking cognizance of the system's limitations/constraints (examination venues, number of qualified staff, productive hours, student groups etc). The current examination planning process of FUTO is presented in Figure 1
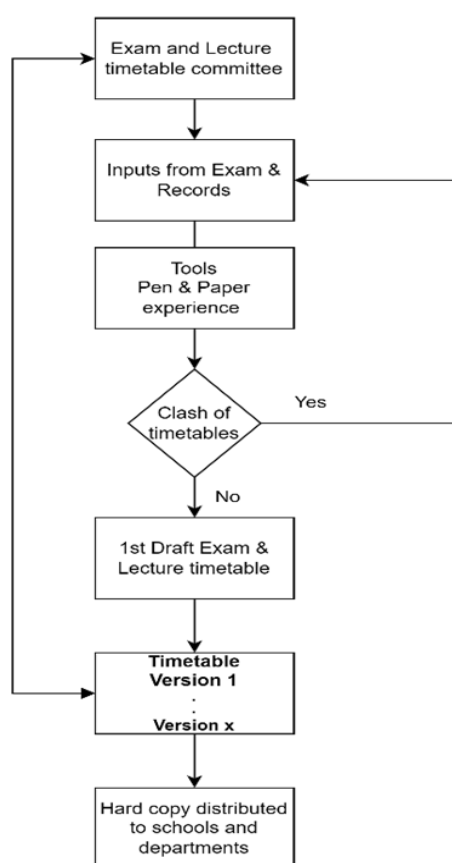
Figure 1: Current Examination Planning Process

Figure 1 appears complex and involves several steps that are prone to errors. The steps begin with the Deputy Vice Chancellor Academics (DVC) setting up a committee for related data gathering from the Examinations and Records Unit (ERU). The Committee adopts pen, paper, and experience as tools to commence the development of scheduling. The first development is checked for clashes in venues, dates, supervisors and invigilators, and other omissions/conflicts. If detected, the draft document is subjected to another review with inputs from the ERU. In the absence of any omissions/conflicts, the draft document is adopted as a first draft for every member of the Committee to review.

The output of the review is version 1, which is distributed to Schools/Faculties and Departments. Errors/omissions detected at this level are reported to the Committee for prompt correction and the output is subsequently named version 2 and circulated. This process is repeated until the exam is completed, leading to a planning cycle time as shown in equation 1.

Planning cycle time = commencement date - date of version 1 publication . . .   (1)

Theoretical Framework

This study is grounded in several interconnected theories and frameworks that provide a foundation for understanding the implementation and impact of web-based examination systems in higher education institutions. These include:

i. Technology Acceptance Model (TAM): theory posits that user acceptance of a technology is influenced by two primary factors: Perceived Usefulness: in this factor, it is believed that using the system will enhance job performance or effectiveness of the of an organisation (Wang, Liu & Tu, 2021). Perceived Ease of Use: This factor is focused on the degree to which the system is perceived as easy to use and learn. Therefore, this study believes that TAM can help explain the factors that will influence the adoption and acceptance of a web-based examination system by both faculty and staff.

ii. Diffusion of Innovations Theory (DOI): In the adoption of DOI, the focus is to examine how new ideas and technologies will spread within the institution (Tahiru, 2023). Its highlights include relative advantage which defines the perceived superiority of the new system (web-based examination management system) over the existing system. Secondly, the compatibility issue which defines the alignment of the new system's values and practices with the existing system. Thirdly, is the complexity of the developed system, which raises the question of defining the ease or difficulty of understanding the new system (Gupta & Bhaskar, 2020). Others include triability and observability, which define the ability to experiment with the system before full adoption and the visibility of the system's benefits to others, respectively. Summarily, DOI provides a guide for the implementation process that emphasizes the need to demonstrate the system's advantages, ensure its compatibility with existing workflows, and provide opportunities for trial and observation.

iii. Systems Theory: Systems theory view organisations as complex systems made up of interrelated parts. It highlights how crucial the comprehension of the new system in addressing interdependencies, which determines how changes in one part of the system (e.g., the examination process) affect the other parts (e.g., faculty workload, student experience). Another factor is the feedback loop which demonstrates the mechanism for collecting and using feedback to continuously improve the system (Nja, Idiege, Uwe, Meremikwu, Ekon, Erim, Ukah, Eyo, Anari, & Cornelius-Ukpepi, 2023). Conclusively, the feedback loop helps to synthesise the broader impact of implementing a web-based examination system on the entire university ecosystem.

iv. Change Management Theories: They guide how to effectively manage and implement organizational change. These theories emphasize on communication for clear and consistent communication about the reasons for change and the benefits of the new system. Also, training and support provide adequate training and support to users to facilitate adoption. Finally, defines framework for

stakeholder involvement, which stipulates key stakeholder engagement (faculty, staff, students) throughout the implementation process. Research suggests that the implementation of these theories help in planning a successful transition to the new system (Bharadwaj & Deka, 2021).

Through integrating these theoretical frameworks, this research can offer a thorough comprehension of the elements that contribute to the effective execution of an online assessment and administration system, as well as its consequences for the academic community.

Related Works

Many researchers have worked on various planning and management problems. University courses planning and School/Faculty courses and Departmental planning are some examples of academic time scheduling problems, which have been an issue in institution for a long time including FUTO. Several works have approached the problems of planning and management system of examinations from various perspectives. Kadam and Yadav (2016), Reis and Lau (2002), and Reis and Oliveira (2001) all presented a common language for representation of the examinations planning as timetabling problem, applying a standardized limited time, human and non-human resources as inputs for examinations planning timetabling system, which enabled a clear and natural representation of data, constraints, quality measures and solutions for different examination planning and scheduling problems.

Mauritius, Legowo and Gunawan (2018) classified the constraints of the class-teacher timetabling problem in constraints strong and weak. Violations to strong constraints (such as scheduling a teacher in two classes at the same time) result in an invalid timetable. Violations to weak constraints result in a valid timetable but affect the quality of the solution (for example, the preference of teachers for certain hours). The proposed algorithm was tested in a university comprising 109 teachers, 37 rooms, 1131 a time interval of one hour each and 472 classes and was significantly validated.

McCollum, Burke and White (2010) proposed an algorithm for resolving examination scheduling without violating the strong constraints in executions and achieved a solution that ensured that more than 30% of the strong constraints to an examination planning problem, were eliminated through a combinatorial optimization, using Ant algorithms problem-solving process.

Methodology

A mixed method research design made up a combination of Agile Development, Rapid Application Development algorithms and descriptive stakeholders' surveys were employed to achieve a time and cost-effective design and development of WSPME as well as test the performance of the developed prototype system when deployed (Ezirim, Briggs, Ebiringa & Maclayton, 2004). The following research activities were undertaken to realize the aim of this paper:

a. Designed the WSPME interfaces that are user and bandwidth friendly.
b. Used the web scripting language, PHP to develop the WSPME timetable generation algorithm.
c. Developed WSPME administering dashboard for administrative activities.
d. Develop WSPME interface that captures halls, students, invigilators, and courses
e. Develop WSPME interface that displays the schedules, halls, user guides etc.
f. Develop WSPME interface for reporting misconduct by participants.
g. Deployed, test and validate user acceptability of WSPME.

System Design

The WSPME is a web base information system that allows for users which broadly can be a Regular user (staff or student), a system admin user and the super admin. The System Architecture is as shown in figure 2.
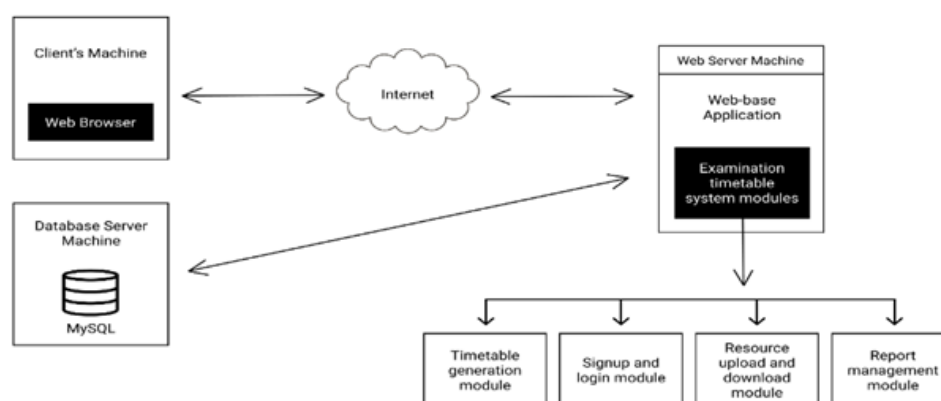

Figure 2: System Architecture Diagram

Figure 2 depicts the overall arrangement and setup of the entire system. Here we can see that the user through the client's machine usually a web browser links up to the internet where the web server that hosts the system online can be found using its address. Now with a specific pointer (Domain name of our application) WSPME can be located. The system contains a lot of modules which controls what a user can do. There is also an information flow between the webserver and the database server to access application specific information, which is facilitated by a module of the system. This diagram presents an overlay of the system from development to DevOps (upload) to eventual usage. The use case diagram is as shown in figure 3. The use case diagram describes the type of communication/interaction a user makes with the system. For the Examination management and automatic schedules generation system. From figure 3 the system primarily has four user's vis a vis: Students, other visitors, the exam officer, the chairman examination board. The students and visitors can report exam misconduct, and view the timetable, exam hall, semester calendar and exam rules and regulations. The exam officer

and admin can both login and update profile information and then manage other information to be added to the system.

A high-level model clearly depicts every page that is possible to be seen in this web-based system. It starts according to the diagram below with a homepage/landing page where the courses, Halls, Semester calendar, Examination Rules and Regulations view and download tabs.
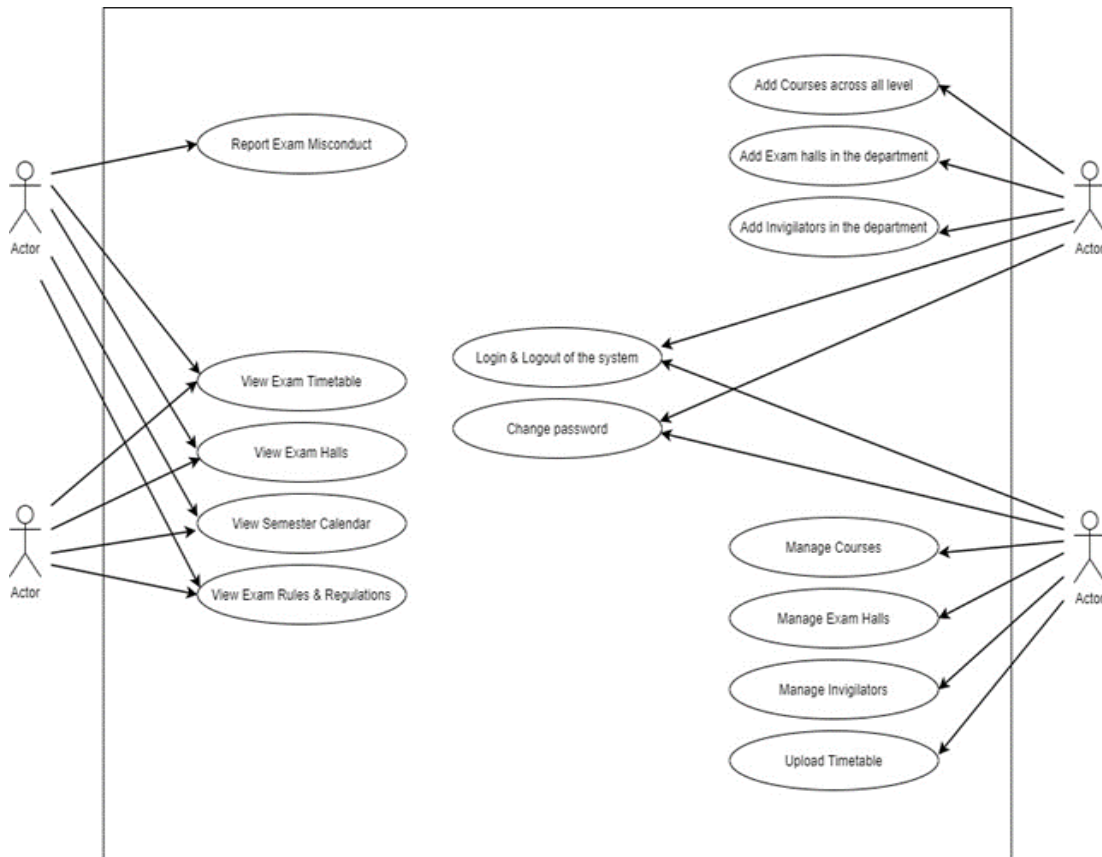

Figure 3: Use Case Diagram of the System

The login tab also is available and has a whole range of tabs like the home tab, the add student tab, add halls tab, add invigilators tab and the message tab. This tab indicates pages of actions which the system admin (usually the exam coordinator of any department) can perform.
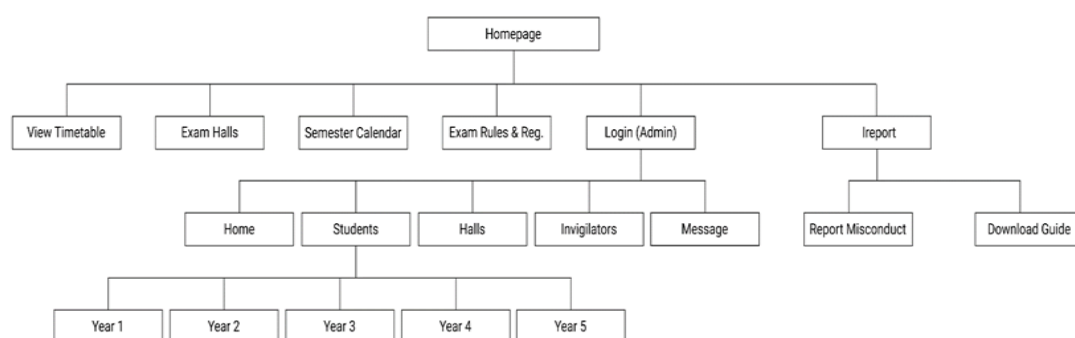
Figure 4: High Level Model of the System

Figure 5 shows the flow chat of the WSPME. As seen on the flow chat, a student is required to login to perform related actions, while an admin logs in to be authenticated as either a regular admin or a Super admin.
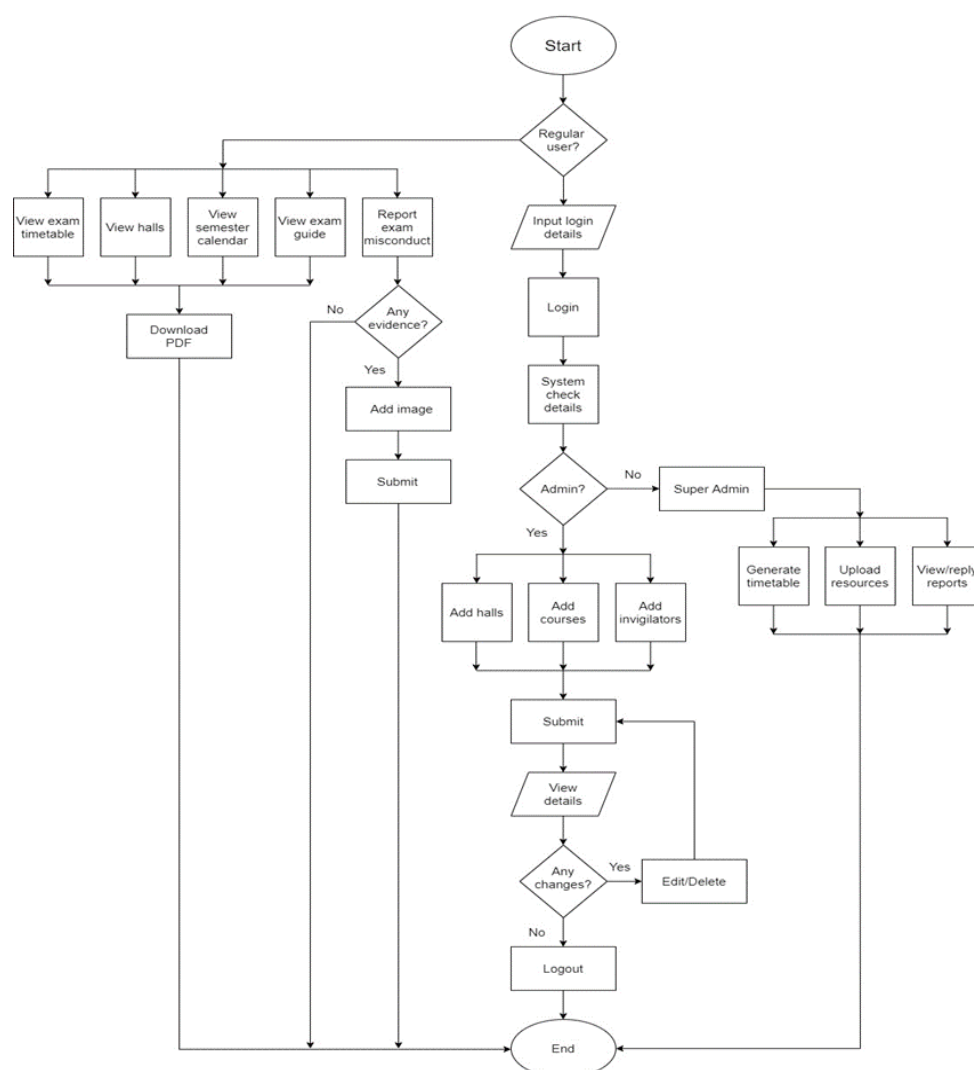

Figure 5: Flowchart of the System

Results

Interface Design

The use of very friendly, highly interactive, and easy to use interface for the system was a major point of interest which was provided in the system. Before the eventual coding was undertaken a user interface mockup tool FIGMA was used to achieve the user requirement as it pertains the user interface. With this tool a lot of prototyping was done to obtain a very acceptable user interface. With the use of this tool prototypes and high-fidelity models were achieved. When it was time to finally write the codes to implement the user interface design, a very responsive and interactive user interface builder/framework; Bootstrap was used. For sake of explanation and clarity some images of a few of the pages of the website were made as a mix and is added here below in Figure 6. While the rest of the pages were added in the appendices.

Figure 6: The System User Interface Mix

Figure 7 shows one of the regular admin's pages; the exam officer. The exam officer represents the department and performs all the task for the department which includes uploading course lists and class sizes, available halls, and invigilators. Other admin officers are the head of department, the dean of studies, chief invigilators, and Quality Assurance officers (monitoring and evaluation).
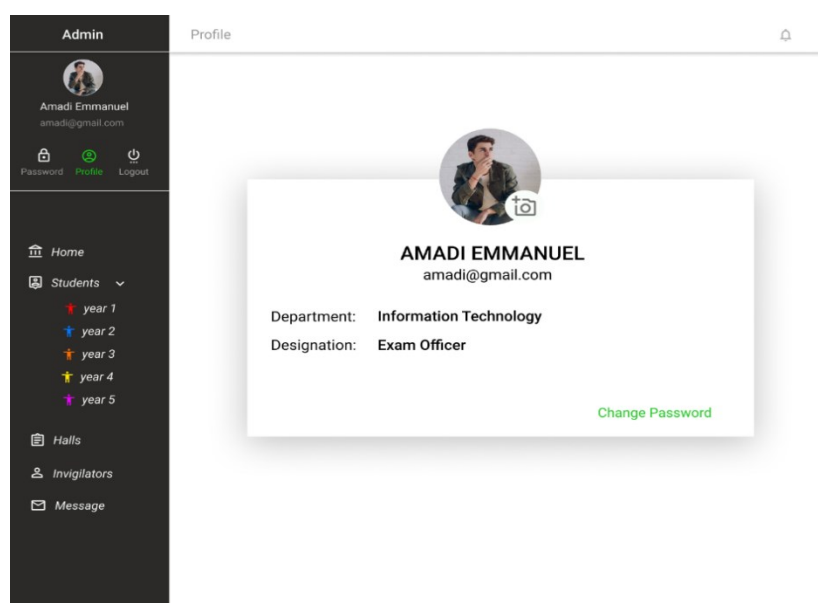
Figure 7: Regular Admin Page: Examination Officer

The super admin can add and remove courses, halls, and invigilators. The super admin is responsible for assigning other regular admin users and generates schedules on the platform. Other administrative tasks such as viewing all examination days reports, uploading relevant information on the view page etc is performed by the super admin or any regular admin assigned to perform such tasks by the super admin. Figure 8 shows the brief image of the super admin page.
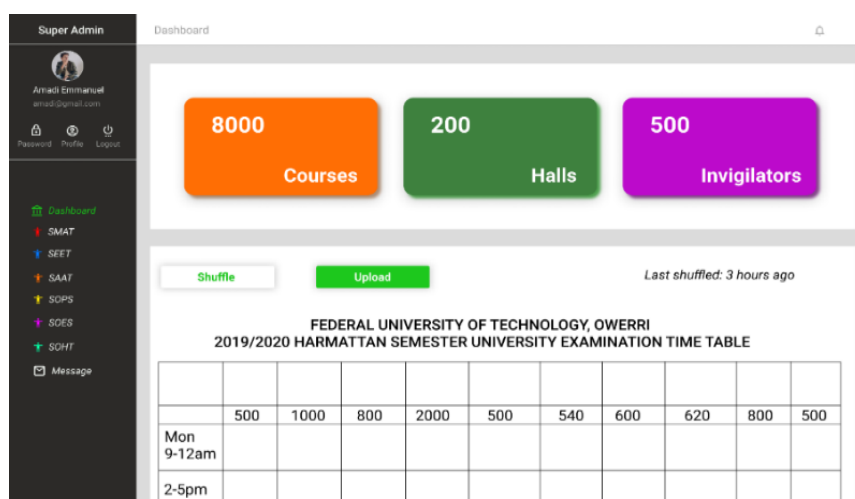

Figure 8: Super Admin Page

Discussions

The WSPME operability and disruptive effects validity test was carried out using data collected from two hundred (200) stakeholders in the FUTO semester examination planning and management system This is to determine their assessment of the effectiveness of the

planning and management processes. Their responses were collected through a questionnaire administered two semesters' examination cycles using manual and web-based planning and management systems, as shown in Table 1. The results show that in all eight (8) selected indicators of examination planning and management system parameters, the *t-calculated* values are all negative and less than the critical values, implying that WSPME led to significant reductions in observed ineffectiveness of the traditional manual examination planning and management system.

Table 1: Summary of Stakeholders Comparism of WSPME and Manual System Operability

	Test Value = 50					
	t	df	Sig. (2-tail)	Mean difference	95% Interval Confidence of the difference	
					Lower	Upper
Scheduling man-hours	-4.140	199	.000	2.7860	1.4543	4.0876
Scheduling cycle time	-5.253	199	.000	2.8642	1.3642	4.1062
Courses omitted or duplicated	-4.645	199	.000	1.9684	1.2456	3.9834
Invigilators omitted or duplicated	-3.986	199	.001	1.8921	1.4725	4.0426
Venues omitted, duplicated,	-4.095	199	.000	2.3564	1.7241	4.9342
Venues underutilized and over-utilized	-3.867	199	.001	2.9362	1.9824	4.2041
Examinations rescheduled	-3.645	199	.000	1.6684	1.3156	3.7234
Misconducts reported	-4.026	199	.001	1.7921	1.0725	4.1026

Source: Authors Field survey, 2024

Table 1 results imply a statistical confirmation that WSPME have a likelihood of positively disrupting the existing traditional manual semester examination planning and management for enhanced efficiency, productivity, quality assurance and stakeholder satisfaction if adopted and implemented. This result is in agreement with earlier findings of Mauritius, et al; (2018) and Özcan, et al; (2021). Further, Table 2 shows that in all the eight (8) selected indicators of stakeholders/users' acceptance of WSPME as a new system for planning and management of semester examinations in FUTO, the *t-calculated* values are all positive and less than the critical values.

Table 2: Summary of Stakeholders Comparism of Benefits of WSPME over Manual System

| | Test Value = 50 | | | | | |
| | t | df | Sig. (2-tail) | Mean difference | 95% Confidence Interval of the difference | |
					Lower	Upper
User friendliness	4.140	199	.000	2.7860	1.4543	4.0876
Reliability	5.253	199	.000	2.8642	1.3642	4.1062
Integrity	4.645	199	.000	1.9684	1.2456	3.9834
Cost of usage	3.986	199	.001	1.8921	1.4725	4.0426
Speed in use	4.095	199	.000	2.3564	1.7241	4.9342
Ease of use	3.867	199	.001	2.9362	1.9824	4.2041
Trust	3.645	199	.000	1.6684	1.3156	3.7234
Confidence	4.026	199	.001	1.7921	1.0725	4.1026

Source: Authors Field survey, 2024

Table 2 results imply that the WSPME exhibited significant likelihood of enhancing the efficiency and effectiveness of semester examinations planning and management system for enhanced value creation and stakeholders' satisfaction. This result agrees with those of Alghamdi, et al; (2020); Kadam and Yadav (2016). Further, Table 2 results presents a statistical validation of stakeholders' perception of WSPME given its significant positive likelihood disruptive effects of examinations planning and management system's productivity performance and stakeholders' satisfaction.

Table 3: Stakeholders' Perception of Challenges to WSPME Implementation

	Strongly Agree 5	Agree 4	Undecided 3	Disagree 2	Strongly disagree 1	Weighted Total Score
Stakeholders are actively involved in planning and implementation of automation projects	5	8	2	163	22	411
Possession of required basic skills and knowledge by internal stakeholders	21	29	1	148	1	521
Availability of financial resources for implementation of automations	0	0	1	85	114	401
Existence of trainings programmes for technological	11	18	3	71	97	375*

knowledge, skills and awareness creation						
Inclusivity in human resources training programmes implementation	2	8	2	105	83	341*
Existence of Secured Website/Network against cyber attacks	0	12	5	132	51	378*
Existence of conducive and secured physical environment	0	0	0	161	39	361*
Existence of appropriate technology adoption policy	0	1	12	123	64	350*
Existence of responsive top management support for automation projects implementation	23	11	5	105	56	407
Availability of Technical and Technological Infrastructure/Internet Networks	0	6	1	167	26	387*
Group Average weighted score						393.2

Source: Authors Field survey, 2024

*weighted score less than average group score

Availability of six (6) out of the ten (10) requirements for effective integration of web-based systems to the examinations planning and management process of FUTO based on stakeholders weighted assessment scores is below the group weighted average score of 393.2. These include:

   a) Availability of technical and technological infrastructure/internet networks;
   b) Existence of appropriate technology adoption policy;
   c) Existence of conducive and secured physical environment;
   d) Existence of Secured Website/Network against cyber-attacks;
   e) Existence of trainings and human resources capacity building programmes on technical, technological and management awareness, knowledge and skills acquisition;
   f) Inclusivity in human resources training programmes implementation.

The above findings are in agreement with earlier results obtained by Özcan, et al; (2021) and Techopedia. (2022); implying that these identified policies, infrastructure, human resources and secured operational environmental inadequacies have likelihoods of

imposing challenges to sustainable implementation of WSPME for effective examinations administration in the University Value Creation and stakeholders' satisfaction if not urgently alleviated.

Conclusion

This paper has successfully demonstrated that the implementation of web-system for planning and management of examinations (WSPME) at the Federal University of Technology, Owerri is a feasible, viable and sustainable project that needs to be adopted by the management. WSPME is an integrated adaptive system for planning and managing examinations, that grants multi-user access as well as dissemination of information in real-time to all stakeholders/users.

The WSPME is adaptable and scalable given that the PHP scripting language used in its design and development is very flexible and complete, providing flexibility for recording to suit specific scopes and institutional needs.

Equally, WSPME offers a sustainable framework for examination administration as the agile methodology adopted offers the leverage for constant user and developer interfacing, which will always support continuous system redesigning of the prototyping given the user-centric nature that allows for easier collaboration.

The results of the WSPME operability testing and validation indicates that the web-based system, has high likelihood offering significant disruptive improvements on currently existing examinations administrative systems of the university in areas of: user friendliness, reliability, integrity, cost of usage, speed in usage, ease of usage, trust and confidence of stakeholders.

However, the above-identified disruptive benefits of WSPME can only be experienced, if needed technology adoption and usage policy, secured technological and technical infrastructure, secured physical environment and human resources development are put in place by top management in collaboration with stakeholders, thereby addressing identified challenges and providing viable solutions to the existing problems of poor quality assurance, low productivity and stakeholders satisfaction associated with administrative systems of examinations in the university.

Key contributions of this study include identifying the potential of WSPME to improve the efficiency, effectiveness, and transparency of the examination process at FUTO when implemented. Identifying key challenges towards implementation of WSPME, such as the lack of appropriate technology adoption policy, inadequate technical and technological infrastructure, and lack of knowledge and awareness among stakeholders. Similarly, development and adoption challenges such as the absence of adoption policies, infrastructures, technical skills, and lack of awareness among stakeholders were identified through this study.

Recommendations

This paper strongly recommends that Nigerian universities yet to automate their examinations system, especially the Federal University of Technology, Owerri should adopt and implement WSPME to replace the traditional manual examinations planning and management approach they are currently using. To effectively implement WSPME for result-oriented outcomes the university needs to institute a framework that ensures that appropriate policies, programmes, projects and administrative procedures are put in place for WSPME sustainability.

Consequently, this paper makes the following recommendations:

a) Universities interested in adopting the WSPME need to follow a structured step-by-step procedure starting with a needs assessment following the SWOT (strengths, weaknesses, opportunities and weaknesses) methodology. The focus of this should be on the existence of appropriate technology adoption and usage policy, capable technological infrastructures, technical support infrastructures, human capital, financing resources and the enabling operational physical and cyber environments.

b) Given the ethical considerations and responsible usage challenges often associated with emerging technologies and integration into traditional systems, especially in developing environments like Nigeria, as this paper has established, there is an urgent for universities in Nigeria, starting with FUTO to develop and institute appropriate emerging technologies adoption and usage policy framework as the first step in the process of adopting and implementing the WSPME for examinations administration and other associated issues.

c) Efforts need to be made to ensure the cyber-space and infrastructures of the university are continuously fortified and adequately secured against intrusions by unauthorized users and cyber-attacks.

d) Efforts made to ensure the provision of appropriate and adequate technical support infrastructure such as reliable power supply, and high-speed affordable internet connectivity.

e) Continuous training and capacity building of all staff and students in relevant areas of emerging technological knowledge, awareness and skills.

f) Continuous re-engineering of the security architecture of the physical environment to ensure that technical and technological infrastructures that support the effective functioning of the WSPME are not compromised or vandalized by unscrupulous elements.

Areas for Further Research

Although significant milestones have been achieved in this study, there remain areas for further research such as investigating the long-term impact of WSPME on student learning outcomes, developing additional features for WSPME, such as online exam administration and automated grading, and examining the cost-effectiveness of WSPME compared to traditional manual examination planning and management systems

Limitations

The study, by its scope is limited to a single university (FUTO) in Nigeria and one academic. It is possible that the conclusions derived from this study could not be applied to other Nigerian universities or universities beyond. Furthermore, the system was only studied for two semesters, which could not have been enough time to thoroughly examine the system's long-term effects.

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