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Activity Scheduling System Using Higher Priority Algorithms and Critical Time Activity Scheduling, Algorithm, Critical Time, Efficiency, and Productivity

Badamasi Fatima Maina
Computer Science Department, Federal University of Lafia, Nasarawa State

Timothy Moses
Computer Science Department, Federal University of Lafia, Nasarawa State

Bamanga Mahmud Ahmad
Computer Science Department, Federal University of Lafia, Nasarawa State

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Conflict of Interest

The authors declare no conflicts of interest related to this work

Data Availability

The data supporting the findings of this study are available upon request. Due to privacy and ethical concerns, data may be shared with qualified researchers who have obtained relevant permissions. Interested parties should contact the corresponding author on fatimaina84@fulafia.edu.ng.

Author Contributions

Badamasi Fatima Maina: Conceptualization, methodology, and initial drafting of the manuscript. Timothy Moses: Data analysis, system design, and editing. Bamanga Mahmud Ahmad: Software implementation, testing, and manuscript revision. All authors contributed equally to the research and approved the final manuscript.

ORIGINAL STUDY

Activity Scheduling System Using Higher Priority Algorithms and Critical Time

Badamasi F. Maina*, Timothy Moses, Bamanga M. Ahmad

Computer Science Department, Federal University of Lafia, Nasarawa State, Nigeria

Abstract

The purpose of this project is to implement an Activity Scheduling System in a university setting, specifically focusing on the Federal University, Lafia. The system will utilise higher priority algorithms and critical time to optimise scheduling. The system's objective is to mechanise the process of scheduling activities, minimise conflicts in scheduling, and enhance the efficiency of the activity scheduling system. The suggested system utilizes priority-based algorithms to schedule activities based on the hierarchical order of university officials, including the Vice-Chancellor, Registrar, Bursar, Librarian, Directors, Deans, and Department Heads. The study methodology entails doing a comprehensive literature review on Activity scheduling, priority-based algorithms, and existing Activity scheduling systems. The study encompasses the depiction of the current Activity scheduling model, the merits and drawbacks of the model, and the formulation of an enhanced model. The enhanced model was developed utilizing PHP as the programming language for the user interface and MySQL for the design and administration of the system's backend. The system's hardware and software requirements were explicitly defined, and the process of programme development and system testing was executed. The system's evaluation metrics encompass the time required for activity scheduling, the quantity of scheduling conflicts, and the overall level of user satisfaction. The proposed Activity scheduling system aims to enhance the efficiency of the Activity scheduling process in the institution, minimise scheduling conflicts, and offer users a superior scheduling experience.

Keywords: Activity scheduling, Algorithm, Critical time, Efficiency, Productivity

1. Introduction

The Federal University, Lafia is a publicly-funded higher education school situated in Lafia, Nasarawa State, Nigeria. Founded in 2011, this university has rapidly emerged as a prominent institution in Nigeria. The university comprises many faculties, departments, and administrative divisions that collaborate harmoniously to accomplish the institution's mission and vision [1]. Activities constitute a fundamental component of the university's administrative and academic operations. These activities serve diverse objectives, encompassing decision-making, problem-solving, project planning, and progress reporting [2].

Currently, the process of arranging activities is performed manually, where the organiser sends activity requests to the participant and awaits confirmation from them [3,4]. Scheduling conflicts, missed opportunities, and diminished productivity can adversely affect the overall performance of the university [4].

The suggested Activity Scheduling System, utilising higher priority algorithms and critical time, aims to overcome these difficulties by offering a more efficient and simplified procedure for scheduling university activities. The system will consider the significance of the Activity and the availability of all participants to guarantee that the most crucial and pertinent matters are dealt with promptly.

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* Corresponding author.
E-mail addresses: fatimaina84@fulafia.edu.ng (B.F. Maina), moses.timothy@cmp.fulafia.edu.ng (T. Moses), mahmud.bamanga@cmp.fulafia.edu.ng (B.M. Ahmad).

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Additionally, it will enhance communication, enhance transparency and accountability, and optimise the utilisation of university resources [5].

Nevertheless, the task of arranging these events can be laborious, ineffective, and prone to mistakes, particularly when managing numerous people with varying schedules and preferences [6].

The study offers a pragmatic and efficient answer to the issues encountered by the university in scheduling and managing operations, with the aim of enhancing the overall efficiency and effectiveness of the university's administrative and academic endeavours. The proposed Activity scheduling system will help to improve the overall efficiency and effectiveness of the Federal University, Lafia, by providing a more efficient and effective approach to schedule and manage university activity's.

2. Methodology of the research

The methods employed to accomplish the specific objectives include: Literature review, Oral interviews, system analysis, system design, Data modelling, and Black box testing. The instruments employed in the implementation of the system. The steps involved in implementing the proposed and revised model for Activity Scheduling System utilizing Priority Algorithm (ASSUHPACT) for Federal University of Lafia (FULafia) are as follows:

Requirement Gathering: The researcher gathered the necessary information to execute the new system as outlined below:

i. The researchers conducted oral interviews with stakeholders at the Federal University of Lafia, to gather information on the current scheduling process, challenges faced, and desired improvements.
ii. The researchers utilized questionnaires and surveys to collect feedback from university staff and administrators regarding their scheduling needs and preferences.
iii. The researchers conducted thorough analysis of existing data and documentation related to activity scheduling procedures at the university.
iv. Also, internet research was employed to gather additional insights and best practices from similar institutions worldwide.

2.1. System analysis

In this subsection; the researchers, analyzed the gathered requirements, identifying key features and functionalities needed in the new Activity Scheduling System (ASSUHPACT). Also, utilized techniques such as stakeholder analysis, use case modeling, and requirements prioritization to define system requirements clearly.

2.2. System design

The Activity Scheduling System utilizes Higher Priority Algorithms and Critical Time to optimize the scheduling process within the university setting. Higher Priority Algorithms ensure that activities are scheduled based on the hierarchical order of university officials, while Critical Time considerations prioritize scheduling based on the urgency and significance of each activity [7].

Mathematically, the following equations according to [8] provide a mathematical framework for determining the priority and scheduling order of activities within the system, considering both hierarchical priority and critical time constraints.

Priority-Based Scheduling Equation:

$$Pi = \frac{\text{Priority of Activity } i}{\text{Total Priority}} \tag{1}$$

Where:

i. P*i:* Is the priority of Activity *i.*
ii. Priority of Activity *i*: Is determined based on the hierarchical order of university officials and the significance of the activity.
iii. Total Priority: Is the sum of priorities assigned to all activities.

Critical Time Equation:

$$\text{T}ci = \frac{\text{Deadline i Current Time}}{\text{Total Time Available}} \tag{2}$$

Where:

i. T*ci*: Is the Critical Time for Activity *i.*
ii. Deadline *i*: Is the scheduled deadline for Activity *i.*
iii. Current Time: Is the current time when scheduling is being performed.
iv. Total Time Available: Is the duration available for scheduling activities.

Combined Priority and Critical Time Equation:

$$Si = \alpha \cdot Pi + \beta \cdot Tci \tag{3}$$

Si: is the combined score for Activity.

α *and* β: are weighting factors to balance priority and critical time considerations.

Pi: Is the priority of Activity.

Tci: Is the Critical Time for Activity.

The equations (1)–(3) provide a mathematical framework for determining the priority and scheduling order of activities within the proposed system, considering both hierarchical priority and critical time constraints.

The researchers adopted an Object-Oriented Design (OOD) methodology, employing iterative waterfall approach, to translate requirements into system architecture.

The developed detailed system architecture, including components, modules, and their interactions, using tools like Unified Modeling Language (UML), was also adopted.

The researchers, created data flow diagrams (DFD) and entity–relationship diagrams (ERD) in other to illustrate data flow and relationships within the system flow.

Lastly, a top-down design methodology to decompose high-level requirements into smaller, manageable modules was employed.

2.3. ASSUHPACT context data flow diagram

The Fig. 1 is a context data flow diagram (DFD) of a scheduled reporting system. It shows how information flows between the system and two external entities: a scheduler and a participant.

i. Scheduler is the person who creates and manages scheduled reports.
ii. Participant is the person who receives the scheduled reports.

The DFD in Fig. 1 uses standard symbols to represent the system and the data flows between it and the external entities.

i. A rectangle represents the scheduled reporting system itself.
ii. An arrow represents the flow of data. The text label on the arrow describes the data that is flowing.

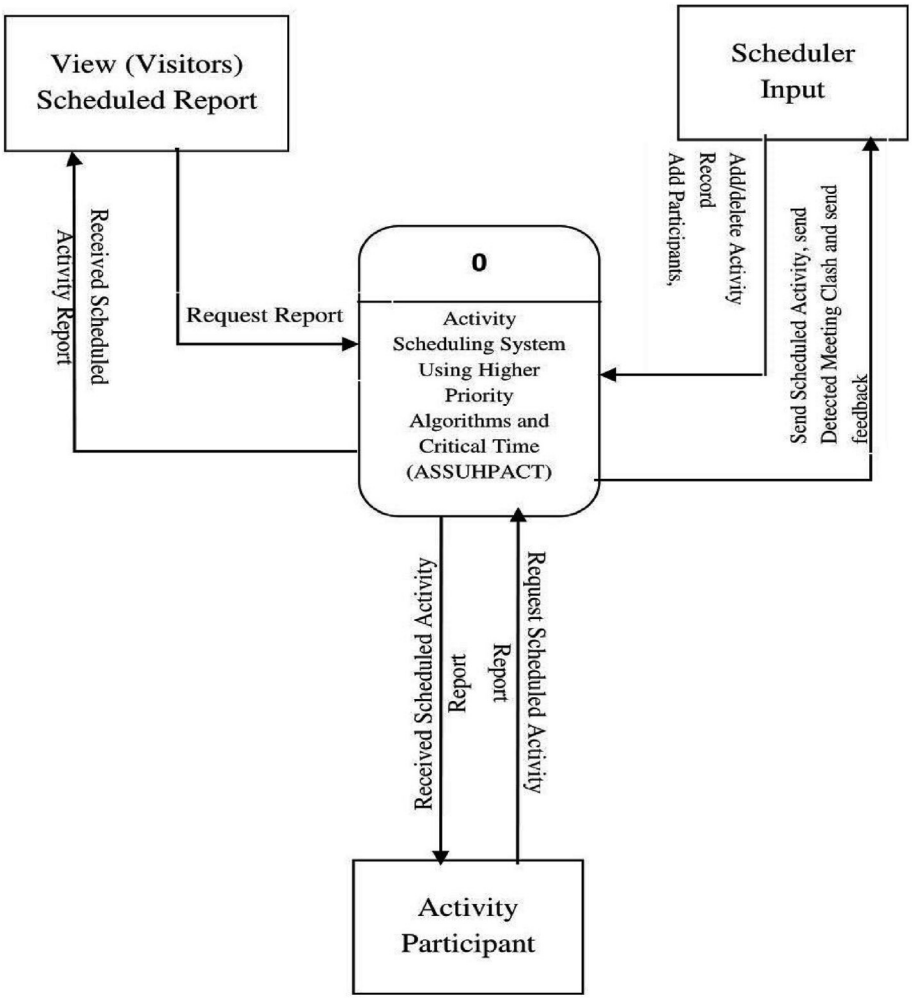

Fig. 1. ASSUHPACT context data flow diagram.

iii. A square represents an external entity.

The DFD shows that there are three main data flows between the system and the scheduler:

i. Request Report: The participant sends a request to the system to schedule a report.
ii. Add/Delete Activity Record: The scheduler adds or deletes activities from the report.
iii. Add Participants: The scheduler adds participants to the report.

The DFD also shows that there are two data flows between the system and the participant:

i. Received Scheduled Activity Report: The system sends the scheduled report to the participant.
ii. Send Scheduled Activity, Send Detected Meeting Clash and Send Feedback: The participant can send the following information back to the system:
   a. The scheduled activity
   b. Feedback about the report
   c. Notification of a meeting clash

3. ASSUHPACT system use case structure

Fig. 2 illustrates the interactions between a participant, visitor, and the system admin in order to accomplish activity scheduling. It provides a concise overview of the sequential actions that a user must undertake to successfully accomplish a task within the following tasks:

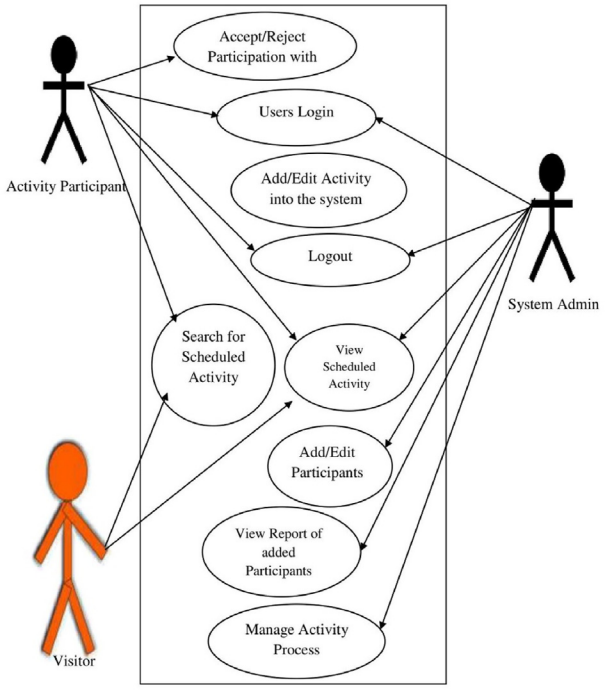

Fig. 2. The ASSUHPACT use case diagram.

i. **Users** can perform the following actions:
   a. Login to the system
   b. View a list of scheduled activities
   c. Search for specific activities
   d. Add new activities to the system
   e. Edit existing activities
   f. Logout of the system
ii. **System Admin** has the additional responsibility to:
   a. Manage the activity approval process (Accept/Reject)
   b. Manage participant involvement (Add/Edit Participants)
   c. View reports on participant additions
iii. **Visitor** (an actor type that may or may not require login depending on system implementation) can view scheduled activities.

3.1. ASSUHPACT entity relation diagram

Fig. 3 illustrates the entities and relationships involved in the system and the relationships between them. With the following entities and their attributes:

i. **Meeting (entity)**: This entity represents a scheduled meeting within the system. It has attributes such as:
   a. meetingID (primary key): A unique identifier for the meeting
   b. title (varchar): Meeting name
   c. date (date): Date of the meeting
   d. time (time): Time of the meeting
   e. location (varchar): Location of the meeting
   f. meetingDetail (text): Description of the meeting
   g. type (varchar): Meeting type
ii. **Participant (entity)**: This entity represents someone attending the meeting. It has following attributes:
   a. participantID (primary key): Unique identifier for the participant
   b. name (varchar): Participant's name
   c. department (varchar): Participant's department
   d. position (varchar): Participant's job title
   e. username (varchar): Participant's username for login purposes
   f. password (varchar): Participant's password for login purposes

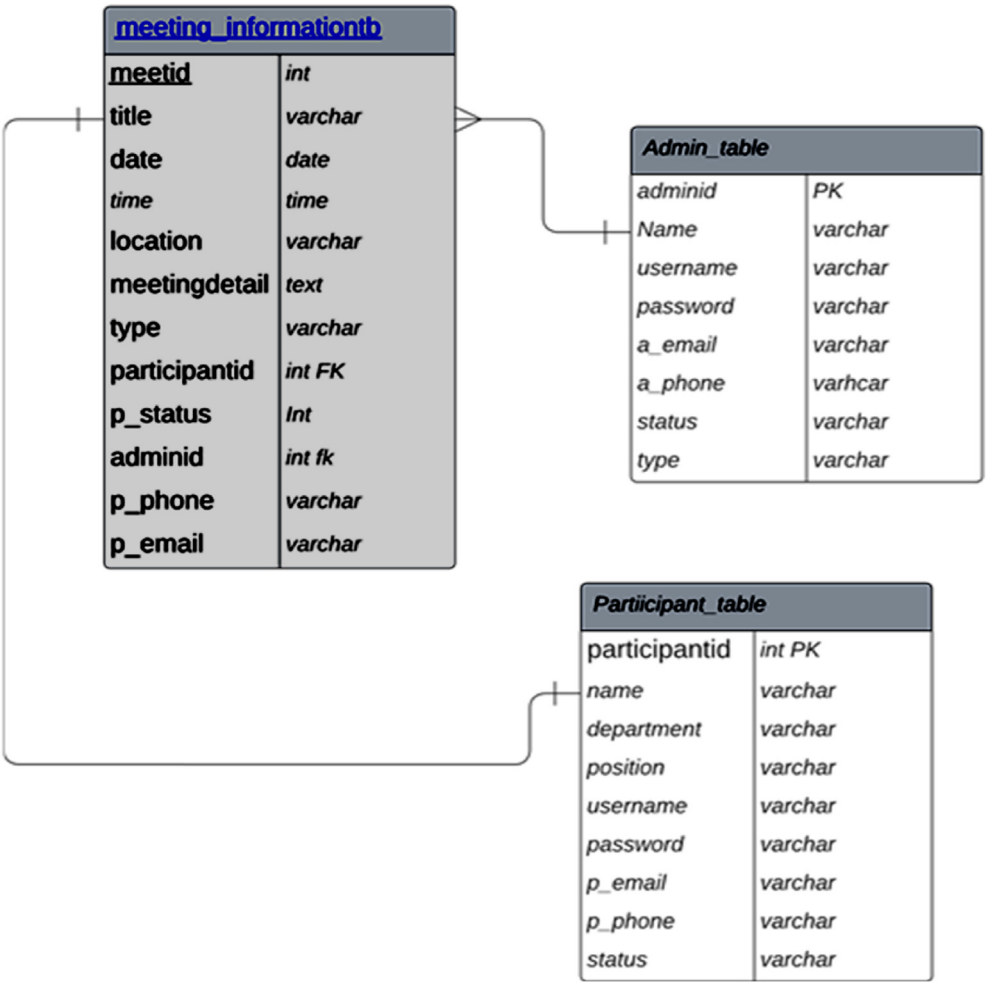

Fig. 3. ASSUHPACT entity relation diagram.

g. email (varchar): Participant's email address
h. phone (varchar): Participant's phone number. It's a varchar; due to country code
i. status (varchar): Participant's meeting attendance status

iii. **Admin (entity)**: This entity likely represents the system administrator. With the following attributes:
a. adminID (primary key) unique identifier for the admin
b. name (varchar) admin's name
c. username (varchar) admin's username for login purposes (assumed)
d. password (varchar) admin's password for login purposes (assumed)
e. email (varchar) admin's email address
f. phone (varchar) admin's phone number
g. type (varchar) possibly the admin role type

The relationships between the entities are:

i. **One Meeting to Many Participants:** A meeting can have many participants attending it. This is indicated by the crow's foot on the participantID attribute in the "Participant" entity.
ii. **One Admin to Many Meetings:** An admin can manage many meetings. This is indicated by the crow's foot on the adminID attribute in the "Meeting" entity.

4. ASSUHPACT program flowchart

Fig. 4 represent the program Login Flowchart, which was built to show the linkage in the node. This illustrates the steps a user goes through to log in to a system, as following:

i. Start: The process begins here.
ii. Enter Username and Password: The user enters their username and password into the system.

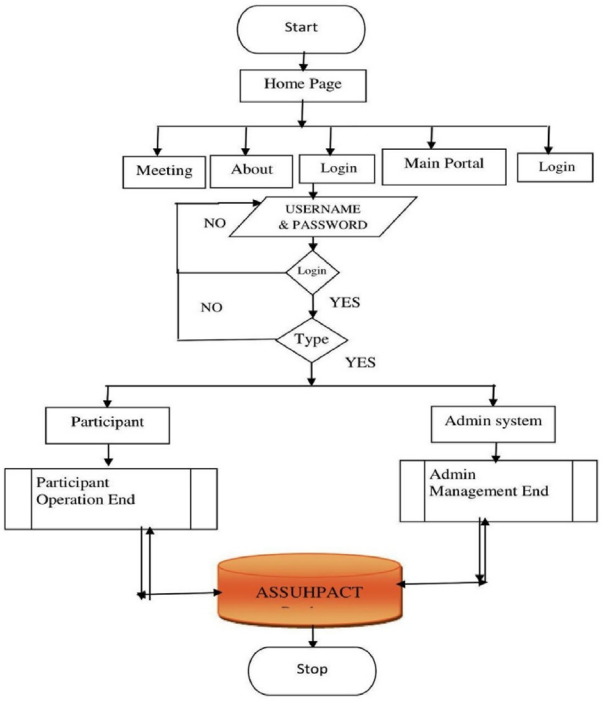

Fig. 4. ASSUHPACT program login flowchart.

iii. Validate Username and Password: The system validates the entered credentials against a database or some other mechanism to determine if they are correct.
iv. Yes (Valid Credentials): If the username and password are valid, the system proceeds to "step v".
v. No (Invalid Credentials): If the username and password are invalid, the system directs the user back to "step ii" to enter their credentials again.
vi. Login Successful: The user is granted access to the system.
vii. End: The process ends here.

5. High level model of the new system

This model provides an overview of the main features and sequence of actions in the Activity Scheduling System. It highlights the integration of advanced algorithms and time-sensitive factors to enhance the efficiency of scheduling tasks in a university setting. The system's objective is to efficiently handle and improve the scheduling of activities within the institution by integrating advanced algorithms that prioritise important tasks and take into account time constraints.

i. **User Roles and Access Management:** Various user roles (Scheduler, administrators, organizers, participants) with different levels of access and permissions. The scheduler is in charge of supervising the entire scheduling process and establishing crucial deadlines.
ii. **Activity Submission and Prioritization:** Users submit activity requests through an intuitive interface, providing specific details. We utilize the following parameters: date, time, place, participants, and priority level. - Priority algorithms allocate importance levels based on urgency and essential time restrictions, as previously discussed in the literature of this study.
iii. **Conflict Resolution and Scheduling:** Implementation of automated conflict resolution procedures to minimize scheduling conflicts. - Scheduling algorithms prioritize crucial time periods in order to assign appropriate time slots and resources. For instance, if the Vice President is scheduled to attend two separate meetings, one lasting 30 min and the other lasting 2 h, the meeting with the shorter duration will be given higher priority for the Vice President to go first.
iv. **Notifications and Communication:** Participants will receive automated alerts regarding activity schedules, reminders, and any changes that may occur. - Integrated communication tools, such as email and SMS, to enhance participant involvement.
v. Dashboard and Reporting: - A user-friendly interface for schedulers and administrators to monitor schedules and handle important tasks. - The reporting functions offer valuable information on how resources are being used, our commitment to meeting important deadlines, and the attendance of participants.

6. Workflow overview

i. **Activity Submission:** - Users (organizers) submit activity requests via the system, specifying details and priority levels.
ii. **Priority Assignment and Conflict Resolution:** - Higher priority algorithms assess urgency and importance, assigning priority levels to activities. - Automated conflict resolution minimizes overlapping schedules and resource conflicts.
iii. **Scheduler Review and Confirmation:** - Scheduler reviews scheduled activities, confirms critical timeframes, and makes adjustments if needed.
iv. **Participant Notifications and Confirmation:** - Participants receive automated notifications,

confirmations, and reminders regarding scheduled activities.

7. Database design and structure

The system's database is specifically developed and implemented to contain Activity details, user information, and any other pertinent data [9]. The MySQL management system was employed for the effective storage and retrieval of data. The following tables comprise the database of the new system.

i. Administrator Table
ii. Activity Schedule Table
iii. Participant Table
iv. Visitor log Table
v. analysis table

This section comprises numerous relational tables, entities, characteristics, and data types.

8. Data modelling

A data model delineates the trajectory of data as it traverses various processes inside an organisation [9]. It denotes the systematic arrangement of data in the system, without describing the methods of data generation, storage, or manipulation. This enables the researcher to prioritise the business aspect without being overwhelmed by technical intricacies [10]. The logical data model is converted into a physical data model that accurately represents the storage structure of the database.

Entity relationship diagramming (ERD) is a graphical technique developed by Peter Chen in 1976 as quoted in [11]. It is used to explain the data component of a business system and represent the data in a new system. The system employs three fundamental components: entities, characteristics, and relationships. Entities are representations of individuals, occurrences, or objects for which data is gathered. There exist parent entities and child entities. It demonstrates occurrences of a CLASS ASSUHPACT at Federal University Lafia. The components in the new system consist of date, time, address, patient, venue, activity title, attendants, meeting detail, and timeslot.

The entity-relationship diagram representing the model of ASSUHPACT for Federal University Lafia is displayed below.

9. Data dictionary

The following table, Table 2, provides a comprehensive data dictionary that includes detailed information about all data entities, attributes, definitions, and relationships within the database. This document serves as a comprehensive guide for comprehending the data elements and structures of the system.

10. Review of related work

The following table, Table 1, presents the review of the relevant literature that was undertaken during the research.

11. Implementation and result

The system implementation phase entails the installation and merging of the created Activity

Table 1. Related work.

Year	Methodology	Challenges
2021	This study evaluated the effectiveness of an automated Activity scheduling system at a Nigerian university,	Finding significant improvements in productivity and cost savings.
2022	This study evaluated the use of a priority-based algorithm in a Activity scheduling system in a university environment,	Finding significant improvements in efficiency and productivity.
2022	This study used a user-cantered approach to design a Activity scheduling system for a Jordanian university,	Finding that simulation and user testing were effective in identifying and addressing usability issues.
2015	This study evaluated the use of a cloud-based Activity scheduling system for rescheduling	Finding significant improvements in efficiency and productivity.
2021	This study evaluated the use of a Activity scheduling system at a Neelain University	Finding significant improvements in productivity and user satisfaction
2021	The study found that the system significantly reduced the time and effort required to schedule activity's, resulting in improved efficiency and productivity	The system was also found to be user-friendly and easy to use, with high levels of user satisfaction reported.
2017	The authors proposed an intelligent agent-based Activity scheduling system that uses a priority-based algorithm to assign priority to activity's based on factors such as the importance of the attendees and the urgency of the Activity.	The system also uses artificial intelligence techniques to learn from past scheduling decisions and to adapt to changing scheduling requirements over time.
2018	This paper presents a Activity scheduling system that uses a combination of priority-based and optimization algorithms to schedule activity's in a large organization.	

Table 2. Data dictionary.

S/N	Field	Data Type	Data Size	Data Description
1.	Location	varchar	280	Activity location
2.	Activitydetail	Text	Unlimited	Activity Details
3.	Type	varchar	100	Activity Type
4.	Participant id	Int	11	Participant Identity Number
5.	Adminid	Int	11	Admin Identity Number who created the Activity
6.	Participant id	Int	11	Participant Identity Number
7.	Username	Varchar	30	Username
8.	Password	Text	Unlimited	Password
9.	Position	Varchar	60	Position hold
10.	Reg_date	Timestamp	Null	Registration Date
11.	Phone	Varchar	15	Participant phone
12.	E-mail	Varchar	50	Participant Electronic Mail
13.	Name	varchar	250	Name of Participant
14.	Status	Int	11	Status of Account
15.	acc_type	varchar	15	Account Type
16.	Datelog	Date_time	Timesramp	Date and Time of last Login to the system
17.	Participant id	Int	11	Participant Identity Number
18.	analysisid	Int	11	Analysis Identity Number
19.	Activity_id	Int	11	Activity Identity Number
20.	name	varchar	100	Name of the Activity
21.	Prirory_algorithm_r	varchar	100	Priority Algorithm Report
22.	Resool	varchar	100	Resolution
23.	Time_slotset	varchar	100	Time Slot Set
24.	Location	varchar	280	Activity location
25.	Aeetid	Int	11	Activity Identity
26.	Title	varchar	180	Activity Title
27.	Date	Date		Date of Activity
28.	Time	Time		Time of Activity

Source: [12].

Scheduling System Using Higher Priority Algorithms and Critical Time into the current infrastructure of Federal University, Lafia. This phase encompasses the process of making the system accessible to users and ensuring its readiness for active utilisation.

12. Results

Every software development project has a distinct desired outcome. The result is the culmination of a certain endeavour in software/program development that indicates if further study is needed or if the activity can progress to the next level. This system effectively address all the complex issues that currently arise in the institution's department resources. It will also significantly enhance speed, reliability, and security. Upon completion, the technology will autonomously enhance the existing FULafia system. It pertains to the information regarding the timetable of activities. Additional outcomes comprise:

i. View all scheduled Meeting records
ii. View all Scheduler officer Report
iii. View All system admin Report
iv. View meeting Report
v. Attendance of meeting report

13. Performance evaluation

Assessing performance is a crucial element of every system development effort. Assessing the effectiveness and efficiency of the system in achieving its objectives is beneficial. The performance evaluation of the Activity Scheduling System Using Higher Priority Algorithms and Critical Time in the University were conducted using predetermined metrics. The evaluation metrics encompass the system's accuracy in scheduling activities, its processing speed in handling requests, and its capability to manage conflicting activity schedules. These metrics will be assessed using actual datasets, and the outcomes will be compared to those of the current model.

The performance evaluation process was conducted via a diverse range of tests to ascertain that the system fulfils the defined requirements. The conducted tests encompassed functional tests, load testing, and stress tests. The functional tests verify that the system operates according to expectations, while the load tests assess the system's capacity to

handle a substantial volume of requests. The stress tests assess the system's capacity to manage demanding scenarios, such as maximum workloads.

The performance evaluation results were utilized to pinpoint parts of the system that require enhancement. The system exhibited excellent performance. Given the favourable outcome of the test, we can confidently assert that the system is prepared for implementation in the production environment. The system fulfils the specified performance metrics.

14. Discussion

The utilization of Higher Priority Algorithms and Critical Time in the suggested Activity Scheduling System signifies a notable progression in the field of scheduling systems, specifically within the framework of Federal University, Lafia. In order to comprehensively assess its effectiveness, it is crucial to compare it with other cutting-edge solutions as well as the existing system. This part does a thorough comparative analysis of the proposed system and current cutting-edge solutions, with a specific emphasis on important aspects such as functionality, efficiency, user experience, resource consumption, adaptability, and scalability.

Although the current system provides basic functionalities for activity scheduling, it may not possess the level of complexity required for effective administration of intricate scheduling activities [12]. On the other hand, the system under study presents novel elements, including priority-based algorithms and critical time considerations. These enhancements allow the system to provide priority to activities according to their significance and the availability of participants, guaranteeing that urgent concerns are addressed swiftly [13]. The new system provides a more comprehensive solution for activity scheduling by improving basic functionalities and resolving constraints seen in older scheduling systems.

The seamless operation of any scheduling system relies heavily on the efficiency of scheduling operations and resolving disputes [14]. The current method may encounter challenges related to extended scheduling durations and limitations in conflict resolution procedures. On the other hand, the proposed system exhibits notable enhancements in terms of efficiency and time management. The optimization of scheduling procedures, conflict minimization, and overall time management is achieved by employing priority-based algorithms and critical time analysis.

The acceptance and effectiveness of any scheduling system are significantly influenced by the user experience [15]. Usability difficulties and low user engagement rates are commonly observed in traditional systems. Conversely, the suggested system places a higher importance on user experience by providing a user-friendly interface and improved functionalities. The primary objective of the new system is to enhance user engagement, satisfaction levels, and adoption rates through the implementation of user-centric design principles.

Maximizing the efficiency of scheduling systems necessitates the optimization of resource allocation and usage [5]. The current system within the institution may demonstrate inefficiencies in the distribution of resources, resulting in the wastage and poor utilization of those resources. Conversely, the suggested system enhances resource allocation by taking into account the significance of activities and the level of participation. The new approach effectively reduces waste and improves resource usage by ranking operations according to their significance.

The long-term sustainability of scheduling systems, especially in dynamic university environments, relies heavily on their scalability and adaptability [16]. Conventional systems may face difficulties in adjusting to changing user needs and accommodating an expanding user population. Conversely, the suggested system is specifically engineered to possess a high degree of adaptability and scalability. Through the utilization of priority-based algorithms and a flexible design, the novel system possesses the capability to readily adjust to evolving requirements and effectively cater to an expanding user population.

The implementation of the proposed technique, which involves the utilization of Higher Priority Algorithms and Critical Time in an Activity Scheduling System at the Federal University, Lafia, distinguishes itself from previous studies due to its rigorous methodology, innovative characteristics, comprehensive performance evaluation, and comparative analysis.

The results of the comparison analysis indicate that the Activity Scheduling System, which incorporates Higher Priority Algorithms and Critical Time, presents significant enhancements compared to current cutting-edge alternatives. The suggested system demonstrates a notable improvement in the efficiency and efficacy of scheduling operations at Federal University, Lafia, through the identification and resolution of important flaws, as well as the introduction of innovative features.

15. Conclusion

The utilization of Higher Priority Algorithms and Critical Time in the creation of an Activity Scheduling System is a potentially effective answer to the difficulties faced in scheduling activities within the educational environment. The suggested approach has the potential to greatly improve time management, coordination, and decision-making efficacy by giving priority to participants and utilizing this information in activity scheduling.

The present study examined different prioritized scheduling algorithms and determined that the priority-based scheduling algorithm is the best appropriate for scheduling activities inside our institution. Expanding upon current models, our improved model rectified their shortcomings and exhibited greater efficacy in our evaluations. By conducting a thorough assessment utilizing predetermined metrics, we have demonstrated that our improved model outperforms existing methodologies.

The work we have conducted holds great importance due to its potential to improve time management, coordination, and decision-making within the academic setting. This study aims to lay the groundwork for future research in activity scheduling systems, thereby facilitating on-going enhancements in administrative and academic procedures.

Nevertheless, it is crucial to recognize the possible constraints and disadvantages of our suggested approach. Although our study has emphasized the advantages of priority-based algorithms, it is important to acknowledge that every system has its limitations. The utilization of algorithms may give rise to intricacies that necessitate meticulous handling throughout the stages of installation and maintenance. Furthermore, it is important to thoroughly analyze several elements that can influence the effectiveness of the system, including technological infrastructure, user adoption, and organizational dynamics.

Moreover, the intricate nature of the system, particularly with regards to the hardware and software prerequisites, necessitates careful consideration. Although the technical requirements included in our study are comprehensive, a more in-depth analysis of system complexity and scalability would provide significant insights for stakeholders engaged in the deployment and operation processes.

In future research attempts, it is recommended to perform thorough investigations into these concerns, doing rigorous evaluations to determine the system's resilience and flexibility in diverse operational scenarios. Through the identification and subsequent improvement of these constraints, we may introduce more efficient and robust activity scheduling systems within educational establishments, thereby augmenting administrative and academic pursuits.

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