Knowledge Based Support System

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Abstract

Technology advances have touched all the fields of human life, and the educational system is not an exception. Students in Nigerian universities experience challenges in their early or later stages of school due to a lack of a knowledge-based support system. This results in massive failure and confusion in later days in school. A knowledge-based online support system has been developed and implemented in this paper to improve academic support services for students and faculty members in the university. The need for such a support system stems from the various academic problems that the students often experience, including a lack of answers to certain questions, which can result in academic failure, taking too long to graduate, or dropping out of the university altogether. The system is web-based; therefore, users can access the necessary information when needed, and, in most cases, it solves common academic issues in a short time using the web. Following the Agile software development methodology and employing a client-server architecture, the system was designed in a user-friendly and efficient manner. Highlights of the system include an extensive database of FAQs, real-time interactive services, and multi-typed query handling.

Keywords: Knowledge-Based Support System, Agile Software Development, Client-Server Architecture, Real-Time Interaction, Faqs Database, Real-Time Interaction, Query Handling, System Testing

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Introduction

Over the past few decades, the dynamics of education have completely shifted due to technological innovations and the use of digital systems. Among these, the most considerable advancement is the inclusion of knowledge-based. Systems that have become extremely helpful in the process of teaching. The emphasis is given to OEKBSS indicates their role in

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solving the various problems that educators and learners in the current education system encounter.

An OEKBSS is fundamentally based on the knowledge-based systems concept, which mainly considers artificial intelligence. Artificial intelligence (AI) systems replicate human ability in a specialized area to provide answers and advice as an expert would. In this manner, systems have been created in the educational sector to reach out to the learners, teachers, and other staff involved in administration in providing organized knowledge and reference materials as well as in making decisions. Such systems use complex technologies such as machine learning, data analysis, and natural language processing to build and provide features or user interfaces that adapt to the specific user's needs (Chen et al., 2020).

Many higher education institutions nowadays utilize Internet learning management systems to keep an extensive amount of course-related materials for learners enrolled in a degree program. However, the systems which are mainly meant for displaying course content, in most cases ignore the information management needs of the users. In typical course-based learning, knowledge is kept within the granularity of a single course. In practice, however, both faculty and students often wish to extract information of merit from the course, not wanting to or being able to disclose it to others. Moreover, with the advancement of mobile technology, the students needed to study while on the move, using smaller portable devices. The expansion of web-based education services is hampered by the absence of knowledge services and low demand from potential users (Peng et al., 2013).

With the onset of the COVID-19 pandemic, the world experienced a paradigm shift where education had to adopt online and digital means. Most of the education systems and institutions stopped conducting face-to-face classes and resorted to online learning. This global occurrence made it easy to look for solutions that did not only offer educational materials but also provided other services aimed at ensuring students' health and well-being within the same online environment. This, therefore, increased the demand for OEKBSS systems, as these had the responsibility of ensuring that every student was able to access learning materials and other relevant resources, clamoring for an appropriate academic atmosphere even when on the program.

The pandemic has accelerated the ongoing exploration and is directing resources toward the creation of more sophisticated and effective knowledge-centric systems (Johnson et al., 2020) able to enhance the quality of education through its availability and customization. All the above lead us to another phenomenon distance education, and the expectation that the extent of using such systems for this purpose will increase in the future, as the institutions will be more interested in enhancing the processes of teaching and assessing information. When it comes to educational institutions, OEKBSS proves to be a vital support in administration management. The overhead that comes with administrative processes is minimized after the introduction of an automated system, thereby increasing the effectiveness of educational institutions (Li et al., 2020). Therefore, OEKBSS becomes a significant factor in elevating the level of education for both the learners and the teachers.

Literature Review

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The application of Knowledge Management Systems (KMS) within the context of distance education has rapidly attracted the great concern of educators over the last few years, primarily because of the increasing demand for flexible, easy-to-reach, and customized learning facilities. As stated by Jamshed et al. (2020), Knowledge Management Systems are significant in the delivery of educational content, especially in enabling the required course materials when the instructor is busy preparing the course. The authors claim that this KMS is very important in the management of the very large volume of data in distance learning agencies, which at times face geographical challenges in terms of access as they operate in several locations.

All these features of KMS facilitate the active learning process by providing instant access to the repository of information Ravichandran et al. (2021) propped that KMS enhances arrangement, teamwork, and communication among students and teachers, as well as school management. KMS was said to enhance learning in virtual schools by offering opportunities for students' participation in debates and group work as well as providing instruction for feedback from teachers in a particular time frame. This system is relevant to the end users of distance learning as it is conducive to the interactive and productive learning process Sadiq & Salim (2021), discuss how KMS offers personalized learning experiences, such as through machine learning and data analytics. They emphasized that KMS in internet-based classrooms can evaluate the effectiveness of a student in going through the curriculum and adjust the learning materials accordingly to the pattern of learning of the student. Learning performance is thus enhanced by the fact that learning activities can be monitored, and of course, support will be provided where necessary.

According to Mousavinasab et al. (2022), KMS can also be used to forecast the results of students, which can be a useful aspect of KMS. Their research showed that KMS designed with machine learning and artificial intelligence can recognize at-risk students and mitigate the risks using specific solutions, increasing the chances of persistence and success. According to Li et al. (2021), an advanced level of OKBSS is dominated by artificial intelligence to offer customized learning experiences. Such means of communication, by transforming the size and nature of content consumed by users content performance, content interactions, and even what the user likes allows the system to provide resources geared towards the user. Such a supportive environment guarantees that the learners get the right content in the right form and at the right time, thereby improving learning effectiveness even on virtual platforms. Zhu and Li et al. (2021) stated that the OKBSS encourages users to collaborate and share knowledge.

In the course of their research, the authors were able to demonstrate that the barriers to sharing knowledge about location can be addressed by the application of an OKBSS within the education sector. Such systems not only help bring about a better-integrated society but also make sure the learners get the information that they require regardless of the physical distance involved. In another context, unlike the above, in health care practices, according to Mousavinasab et al. (2022) experts discuss the importance of the implementation of OKBSS to enhance decision-making. Meantime, professionals in health care can retrieve not only patient files and decision-support treatment plans in no time but also best practice protocols thanks to machine learning and big data technologies. This knowledge support system on time helps in making decisions that are necessary for maintaining health care standards Ibrahim et al. (2023) described the role of OKBSS in ensuring knowledge retention and sustaining institutional memory in educational institutions. Their research highlights the importance of such systems in storing essential elements of the organization, such as policies, best practices,

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and learning outcomes that can be made available to new employees and learners for effective onboarding and learning processes.

In the case of Sadiq & Salim (2021), they talked about the factor of extending the functional capabilities of the OKBSS system in the context of the educational process, in particular, in massive open online courses MOOCs. With the increase in the number of students, the help extended by the OKBSS can be extended without increasing the resources, and therefore, they are important where large numbers of students are handled within the online learning environment. The systems offer a great deal of flexibility and can be molded to the needs of different learners on a case-by-case basis, assisting with requests, at whichever time. According to Ravichandran et al. (2021), pay attention to the data centric techniques used in the system, especially when, such OKBSS stores only knowledge and share, but can also evaluate solutions and offer preemptive ones. This characteristic is extremely useful in web-based schooling because the component of timely feedback and evaluation of a student's performance are imperative in the retention and performance of students (Kim & Kim, 2021) listed many applications of OKBSS technology including the management of students' emotional and psychological aspects. Encouraging students to utilize wellness resources and support systems embedded in the system ultimately leads to better grades improving mental health. Online support systems with tele-counseling facilities in place help ease the transition for the patients needing mental health help.

Methods

Agile methodology is a modern software development approach that focuses on iterative progress, collaboration, and flexibility. It allows for continuous delivery and improvement of software by breaking the development process into small, manageable phases called "sprints." This methodology is ideal for web-based systems like the proposed Online Educational Knowledge-Based Support System, as it facilitates adaptive planning and continuous feedback, ensuring that the system evolves according to user needs.

Agile Methodology in Developing the Knowledge-Based Support System

The agile method is the one that is preferred because it allows for iterative advancement and offers flexibility which is a necessity when developing systems that are dynamic in nature such as e-learning systems. Each sprint encompasses a series of activities, starting from eliciting requirements, making plans, doing the code, testing, and finally, deploying. Agile is very much teamwork, which means there is always some stakeholder, either a student, teacher, or administrator, giving feedback. This creates a development feedback cycle that enables them to meet the existing needs of the target audience and make necessary adjustments without wasting time. Agile also facilitates continuous integration and testing of systems, validating every portion of the system with a clear intended purpose. This is very crucial while developing knowledge-based support systems because such systems usually contain different technologies that may include sophisticated machine learning and data analytic systems. Agile makes sure that the inclusion of these systems is both effective and efficient.

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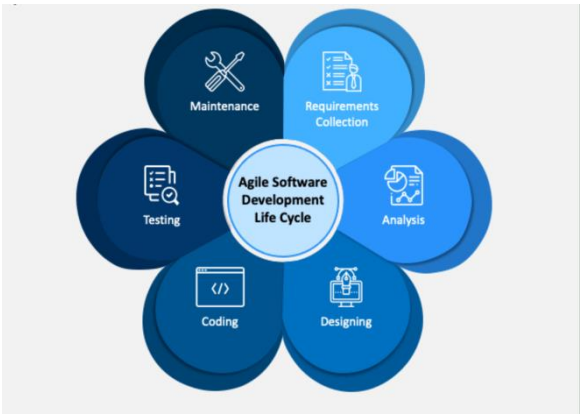

Figure 1. Agile Methodology Development Phases

Figure 2. Software Development Phases

By following Agile, the development of the Online Educational Knowledge-Based Support System can be responsive to user needs throughout the development cycle. This is especially important for educational platforms, where user feedback (from students and faculty) is crucial for improving the learning experience.

System Design

The methodology developed for designing the Online Educational Knowledge-Based Support System adopts the Agile approach. Agile methodology is more common and flexible in the development of complex systems such as web-based education systems. Because of its nature, the system goes through changes as a result of continuous user students, teachers, and administration feedback. Using Agile Methodology in Developing the Knowledge-Based Support System, as mentioned earlier, is a formal and guided approach to managing software projects. It segments the development process into a repeating sequence of events called "sprints". A sprint typically lasts between one to four weeks. Agile emphasizes developing the project in small parts thereby allowing for development, testing and even upgrading of the system while a user is using it in the process of its development.

Key Phases of Agile Methodology for Developing Knowledge-Based Support System

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Collecting Requirements and Initial Design

At the beginning stages of the project, the main features of the Knowledge-Based Support System are determined in cooperation with such users as educators, pupils, and administration. The specific purposes of the system, which entail personalized learning, supporting the students in real-time, and linking the knowledge resources into one functional system amongst others, are captured in user stories. In Agile, planning is adaptive so these requirements can change during the life of the project

Design and System Architecture

The design phase entails another creation of the high-level system architecture. The architecture explains how the various components of the Knowledge-Based Support System are related to one another. This involves the interaction of the user interface, the knowledge base, and the support tools. It is significantly important to have a conceptual model to comprehend how the system will perform. The essential components of this architecture, other than those described above, are:

User: System confines for students, teachers, or administrators using the application, Input Keyword: The keyword noted down by the user in the application which is usually a question/topic they seek help on, Support System Web App: The central place of interaction with the system where users submit requests and obtain assistance, Search Button: A function that prompts the system to execute a query on the knowledge base and pullout relevant information, Knowledge-Base: The system information which consists of structured databases, learning materials, and other aids to be used by the system's users, Result: The answer or the provision that the system generates about the input keyword. This can be in the form of an explanation, a document, or other types of relevant content.

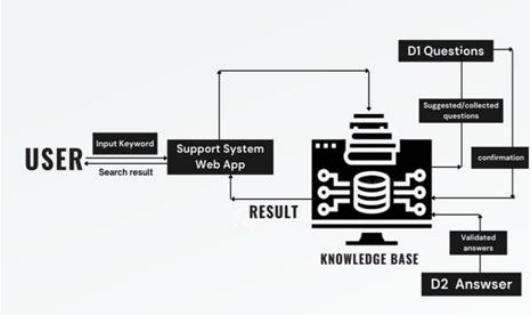

Figure 3. A Visual Representation of this System's Architecture.

The architecture supports real-time access and retrieval of educational content, enabling users to quickly find the information they need. Development Sprints: during the course of the project, each sprint aims after a certain component of the system. For instance, one sprint may be directed at the development of the design of the application, while another may target the embedding of the knowledge database and the search activities. Short regular meetings and

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feedback sessions (termed "scrums") help keep the team abreast with the changing requirements of the users.

In the first sprint, we worked on building the support system web app and creating the user interface where students and teachers can enter queries. In subsequent sprints, the development involves adding more complexity, such as the search functionality that connects the web app to the knowledge base. As the system evolves, the focus shifts to improving user interaction and refining the knowledge base for better query processing and accuracy. Also, after the end of each sprint, the developed features are tested concerning functionality, usability, and whether they work with the existing system. Considering that the system targets students and teachers, user acceptance testing (UAT) becomes very paramount. There are recorded feedbacks at the end of each sprint, and any appropriate amendments or improvements are made in the next sprint.

For example, after testing, they may say that the system should be easier to use, or that search results should be more appropriate. This information is why the system is changed in the following sprint. Agile methodology supports iterative deployment which gives the opportunity of deploying the Knowledge-Based Support System in steps. Each step provides a working version of the system with basic requirements, and later on, enhanced features are developed as per the users and their needs. Deploying in such a manner ensures that the system can be utilized by users at an early stage but they can still enhance and add features to the system. The agile methodology employed allows for constant evolution of the system to accommodate the dynamics in user needs and emerging technologies.

System Architecture: Conceptual Model

The system architecture of the Online Educational Knowledge-Based Support System can be referred to as a conceptual model which shows how the different parts of the system are structured and how they interact with one another. It acts as a guide for the process of development and also guarantees that all the necessary elements function together in an appropriate manner to enhance the web-based educational setup. Student-Teacher Interface: The interface permits the instructor and students to type in relevant keywords or questions about the academic content and its assistance.

Searching Mechanism: When the user types in a keyword or phrase and hits the search button the system starts looking in the knowledge base for applicable information. Knowledge Base: This part of the system is very important because it contains all the information such as lectures, readings, tasks, support materials, and so on. It serves as the storehouse of the information that the system utilizes to solve problems. Result Display: Once the system has received inquiries for the knowledge base content, it delivers to the user the most applicable information, for example, study aids, advanced courses available, or even an explanation of a difficult subject.

There are numerous advantages of utilizing Agile methodology in the course of Building the Online Educational Knowledge-Based Support System. As such, the process becomes more dynamic, adaptable, and team oriented. This methodology enables every system aspect of its user interface, knowledge base, and search capabilities, to be developed in iterations, improved from the field, and adapted to the evolving educational environment. The overall architecture

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of the system lays out the structure of the key components and their interaction with the users such that it assists as and when appropriate in an online learning environment.

The Systems Requirements

Hardware Requirement

The table below highlights the minimum hardware requirements for client devices to successfully run the system.

Table 1. Hardware Requirements

Hardware	Personal Computers	Smartphones
Processor (CPU) or Equivalent Processor	1.0 GHz Dual Core, Intel or AMD CPU	Dual-Core ARM Cortex
Random Access Memory	1GB	500MB
Hard Disk (Secondary Storage) Free Disk Space	At least 1GB of free hard disk space	At least 500MB of free disk space
Display	VGA Colour display monitor	At least 4.4 inches (diagonal) VGA color display
Network	3G compatible modem or WiFi card	3G compatible modem or WiFi support
Multimedia	Microphone, Webcam, and Speakers Microphone	Front-facing camera, and Speakers

Software Requirement

The table below highlights the minimum software requirements for client devices to successfully run the system.

Table 2. Software Requirements

Software	Personal Computers	Smartphones
Operating System	Windows 7 or Higher, Mac OS 10X, Linux	Android 4.4 or Higher, IOS 10
Application Software	HTML5, Javascript, Laravel, MySQL compatible web browsers.	HTML5 and Javascript, Laravel, MySQL compatible web browsers.

The table below highlights the minimum software requirements for client devices to successfully run the system.

System Design

System design for an Online Educational Knowledge-Based Support System aims to create a technical vision that resonates with the purpose for which the system is designed. In this regard,

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the document provides the architectural details, data elements, and data movements within the system that are designed to ensure that students, teachers, and administrators can use and access the system without any difficulty. The design intends to create a situation where the users both within the university and the external users who have to rely on this web-based system for academic purposes for all twenty-four hours seven days a week can use it without any difficulty.

Database Design Architecture

The data component of the system will include: (1) Logical Data Models: These are models that depict how data will be structured within the system in terms of student data, educational material data, and the data about the queries as well. They will make sure that the relations between different entities are accurately represented (e.g. students, course materials, support resources, etc.) Course modification, Instructor Profile, Programming, Scheduling, and other data model components will include the relationships between the various entities that they comprise; (2) Database Design and Structure: The graduate data system will carry all relevant data like courseware, students' questions, and their responses. It will undergo fast data retrieval optimization and allow massive volume expansion to accommodate a knowledge base on courseware at quite fast-growing rates. Relational Database Management System is software utilized for the management of data while ensuring integrity and consistency; (3) Data Dictionary: Eventually, a data dictionary will be established introducing all the system data components starting with naming conventions, the classes of data, and their permissible values. This will serve to promote consistency and clarity about the data employed and designed in the course of building and maintaining the system over time.

Algorithm

The algorithm of the system offers an unambiguous and detailed account of how the system will proceed to process the inputs given by the user and give the relevant outputs needed. (1) Start: The system starts when the user enters the interface; (2) Go to the search box and type a keyword: The users will type a keyword or a question (for instance a course content or an academic-related question) in the search box; (3) Get the Search Result: The input is accepted by the system knowledge base, the relevant materials are searched, and the results are shown to the user; (4) End: The interaction is over when the system has availed the result.

System Architecture

The proposed structure will be based on the client-server level, which is most appropriate for developing websites' applications. In this plan, the system is built on the central internet protocol (IP) web server, which is equipped with TCP, the transmission control protocol modem used to connect clients to the server. The application processing unit responsible for carrying out users' requests and supplying the information required will be housed by the web server. Such an arrangement enables persons from different places to access the system through a network-enabled device such as a desktop computer, a mobile phone, or a tablet. The web server also plays the role of providing the data storage space and access to the database, permitting the smooth flow of information from the knowledge-based system. Thus, thanks to the architecture of the system using TCP/IP, it is ensured that many users can be served

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concurrently without degrading the quality-of-service performance, which is very essential when the number of users is vast.

In the client-server model used in this system, only the presentation layer is kept on client devices, which shows the user interface and accepts user commands, while processing and saving all system information is the server's task. This division of responsibilities aids in the maintenance of the system as well as in the distribution of resources. Moreover, the present operation of the system across various platforms is a key benefit because it allows users to use the system via different devices without considering the operating system of the device. The server performs all operations with the system using standard web protocols, which allows the system to be easily used, expanded, and built upon in the future. Such a choice of architecture provides high uptime, security, and sturdiness for any geographical location the user accesses the system from.

Database Design and Structure

The database design for the proposed system is based on a relational database structure with two main tables. The Suggested Questions Table includes all the questions that the system users have suggested and archived, which is where the system will retain all old and new questions that are likely to be posed. The Answers Table holds matching responses to the above questions forming an organized question-answering database. There will also be data input mainly through web forms, in which users will be able to post questions or follow up with the system. Such input/output structuring is important in the system for the purposes of collecting and storing data in an effective manner to provide timely and relevant information to the users.

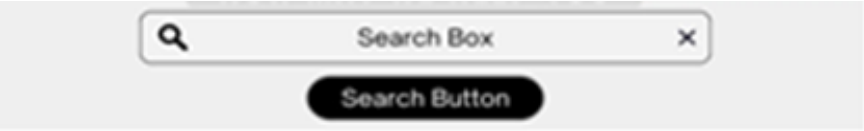

Figure 4. Text Input Form with Button

To enhance interaction, users will be able to enter data via a search box, drop-down options, and buttons. These input forms will be suitably designed to collect adequate information effectively. The images below deal with the design pattern of the input forms.

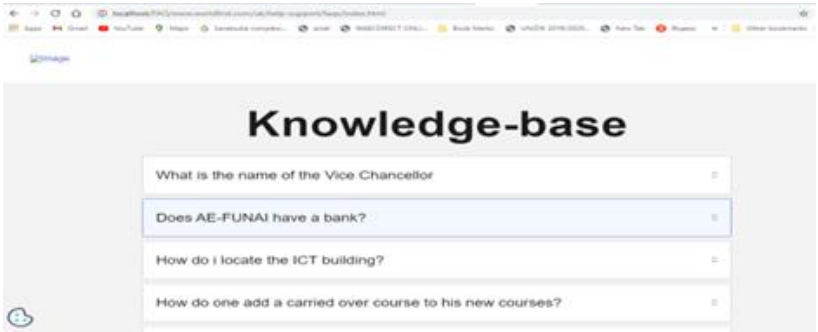

Figure 5. Output Result Display

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Major components of the system: The system is installed into the target devices in order to test its operations. Testing and evaluation take place so as to verify that the system aligns with the initial design features, with adjustments being made before it is finally deployed.

Main Menu Implementation

The main menu was designed to provide the primary navigation for the proposed system.

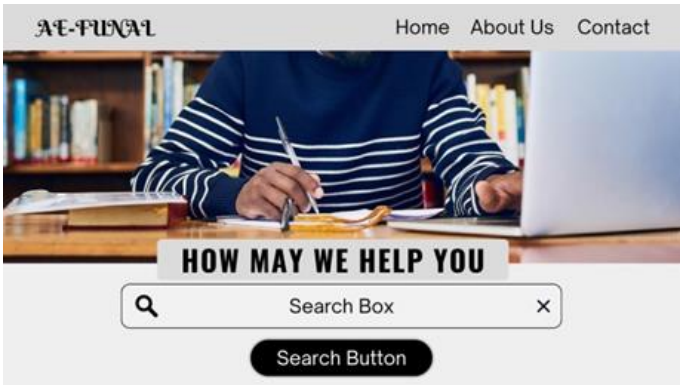

Figure 6. The Implemented Interface

System Testing

Testing is perhaps one of the most important activities that has to be carried out during implementation and deployment, to ensure the effectiveness and reliability of the system. In the course of the development, there are three major building stages of testing performed: modular testing, integration testing, and system testing. In the modular testing phase, single components are tested and examined for usability. After that integration testing takes place, where these modules are checked whether they work together. After that, system testing is conducted to check the system as a unit. Any programming errors or bugs that may be detected at this stage are fixed without delay. After this, however, the entire system is subjected to another testing encompassing all the features and making sure that the actual outputs match the expected ones specified by the criteria.

Entering a question: A user can ask any question in the system, Expected Result: The answer to the question is provided.

Results and Discussion

System Verification

Actual Result versus Expected Test Result

The proposed system was successfully tested according to the test plan which defined the expected results. After successful testing, the following results were obtained vis-à-vis the expected results.

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Table 3. Actual Test Result vs Expected Test Result

Test Case	Expected Results	Actual Results
Question Search: A user can input new questions into the search box.	The questions will be answered successfully and correctly.	The questions asked were answered correctly.

The analysis of the executed test cases shows that the AE-FUNAI system performs quite well in all functionalities, particularly in answering different types of questions. System performance during testing was evaluated in terms of time taken to respond, correctness of retrieved data, and relevance of information contained in the responses based on the input from the user. The layout of the system was designed in such a way that the users hardly experienced difficulties in shifting from one section to another. These results reaffirm that the system is too strong in providing knowledge-based assistance as required and can support the use cases it was developed.

However, the tests conducted have proved that the system is equally proficient in dealing with incorrect input. As good as the system was performing with valid input, it was built to recognize and handle such errors when users submitted invalid or incomplete input. At all times during testing, the system was able to detect such invalid input and report with appropriate error messages to the user, indicating what information was needed to be inputted correctly. This improves both the reliability and usability of the presented system as it informs users when they are wrong allowing them to rectify the situation in an orderly manner.

Conclusion

There are several reasons why students at Alex Ekwueme Federal University Ndufu-Alike Ikwo, encounter academic problems that go unanswered, leading to academic underperformance, loss of a year in the university or even dropping out from the institution. These problems arise due to the issues of getting critical information and assistance when needed which impedes the progress of the students and their experience in the university as a whole. In light of these challenges, it is important to find or come up with a working online-based assistance system. The system in question will be developed in such a way that every student and member of staff will be able to access it and fetch basic information regarding the institution without necessarily coming to the premises of the institution on the Internet. As a result, various questions, answers, and resources will be made available to students as and when they require them via this online knowledge-based support system to reduce their academic challenges thus improving the learning conditions for these students.

The area of the focus of this research work is the process of development of this online knowledge-based support system which has borrowed from existing systems but also improved it to cover some of their shortcomings. The modern systems for this project have applied the Agile development lifecycle, client-server architecture, and state-of-the-art web technologies and programming languages to build a strong system. Integration tests conducted on the final system indicate that the various modules operate as intended ensuring consistency in functionality and user experience. This research is aimed at making academic structures more accommodating to students at Alex Ekwueme Federal University Ndufu-Alike Ikwo, through the use of technology in education resources and services. A robust web-based knowledge support system installed at Alex Ekwueme Federal University Ndufu-Alike Ikwo is a great source for students and scholars where they can search for and find answers to any questions relating to the university. Given that most students and even faculty members have access to

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the internet through devices like smartphones and laptops, the current digital period presents a good reason to implement such a system. Through the use of a suitable developmental approach and a sound system design, such a knowledge base management system can be customized for AE-FUNAI and also suited for use in other universities in the country.

References

Ajayi, A. S., Kim, S., & Yun, R. (2024). Study of developing a condensation heat transfer coefficient and pressure drop model for whole reduced pressure ranges. *International Journal of Air-Conditioning and Refrigeration, 32*(1), 15.

Chen, M., Zhang, Y., Liu, X., & Li, X. (2020). AI in education: Current applications and future directions. *Journal of Educational Technology, 48*(2), 45–58.

Ehizojie, L., Okiyi, R., Akindipe, S. O., Adebayo, S., & Nwachukwu, C. (2024). Exploring customer insight analytics with descriptive methodology: A case study of Adventure Hardware Group. *International Journal of Data Science and Analysis, 10*(4), 61–76. https://doi.org/10.11648/j.ijdsa.20241004.11

Ibrahim, M., et al. (2023). Knowledge retention and institutional memory in web-based schools: The role of knowledge management systems. *Education and Information Technologies, 28*(2), 201–219.

Jamshed, A., Ullah, K., Mahmood, Z., & Liaqat, R. (2020). Knowledge management system in education: Enhancing learning experiences through technology. *Journal of Educational Technology & Society, 23*(4), 120–135.

Johnson, L., Adams Becker, S., Estrada, V., & Freeman, A. (2020). Nurturing student wellness through digital systems. *Horizon Report.*

Kim, J., & Kim, H. (2021). The role of digital learning environments in student mental health. *Journal of Online Education, 35*(3), 229–243.

Li, H., et al. (2021). AI and natural language processing in knowledge management systems for virtual education. *Computers in Education, 12*(3), 133–145.

Li, Z., Wang, Q., & Chen, L. (2021). AI-driven personalized education and its impact on student learning. *Educational Research Review, 31*, 100–118.

Mousavinasab, E., et al. (2022). Predictive analytics in knowledge management systems: Enhancing student retention in web-based schools. *Journal of Educational Data Science, 5*(2), 98–113.

Peng, J., Jiang, D., & Zhang, X. (2013). Design and implement a knowledge management system to support web-based learning in higher education. *Procedia Computer Science, 22*, 95–103.

Ravichandran, K., et al. (2021). Knowledge management systems and e-learning: Enhancing collaboration and interaction in virtual education. *Journal of Educational Research and Practice, 9*(4), 234–251.

Ravichandran, K., Shah, A., & Kumar, A. (2021). Enhancing collaboration in online learning environments using knowledge management systems. *International Journal of Educational Research, 45*(3), 189–204.

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Sadiq, A., & Salim, R. (2021). Personalizing learning in web-based schools using knowledge management systems: A data-driven approach. *Computers & Education, 162*, 104–115.

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