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Effectiveness of EaseExam: AI-Powered Exam Preparation via API with 3rd Year BS Computer Science Professors and Students in NEU CICS

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TABLE OF CONTENTS

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LIST OF TABLES AND FIGURES

CHAPTER 1

INTRODUCTION

Background of the Study

Artificial intelligence is becoming increasingly crucial in our daily lives, with the potential to transform how we work, communicate, and learn. In education, AI can give students a more customized and interesting learning experience, as well as assist faculties in meeting each student's unique requirements (Melo, 2023). The educational environment is changing dramatically as a result of the digital revolution, with traditional exams giving way to online evaluations. This progress is driven by a global acceptance of technology, which allows for a smooth shift from pen-and-paper to digital evaluations. Online assessments provide the benefit of customization, allowing for bespoke question papers linked with specific syllabi and varied difficulty levels. This flexibility enables a more tailored assessment of pupils' knowledge and abilities (Mehta, 2023).

Having adequate abilities in designing test items has become an imperative prerequisite for every educator, especially when it comes to constructing tests. Elegantly designed tests provide some insight about such higher-request skills. Regardless of whether the data confirm that a few sorts of knowledge or capabilities might not be assessed by objective tests, faculties should also recall that what test objects can survey depends usually on the abilities and effort of the test constructor, rather than the test design. Furthermore, in practice, the professor's role in developing examinations is frequently overlooked (Monica, 2020). Faculties often treat tests as an afterthought, resulting in a lack of time for creating high-quality items. This is often due to a

lack of training in item writing, which teaches that writing good test items takes time. Tests can sometimes appear disorganized, making them difficult for students to understand and negotiate. Clear organization of items into sections makes tests more understandable and easier for students to navigate. However, even well-organized tests may not be understood by students, as they may not understand the specific tasks or instructions. Clear headings and directions can make the test more clear and easier for students to understand. Additionally, even with careful effort, problems such as typos, spelling errors, and unclear formatting can persist, making the test harder for students to understand. Therefore, professors need to prioritize the organization and clarity of their tests (Brown, 2013). Imagine pouring over textbooks and lecture notes, and crafting the perfect exam question to assess your students' understanding. Then, repeat that process dozens, even hundreds of times, ensuring each question aligns with specific learning objectives, difficulty levels, and assessment standards. This is often an invisible workload shouldered by faculties, a time-consuming and mentally taxing endeavor known as creating questions for exams (Gierl et al., 2012). This repetitive task of creating questions also takes its toll on the professor's creativity. Faced with generating questions for multiple assessments, fatigue can set in, potentially leading to recycled questions or less engaging content. This, in turn, diminishes the learning experience for students who crave stimulating and diverse challenges. Unfortunately, the facts reveal that creating effective objective test items takes effort land time.

Numerous strategies have been suggested to overcome the obstacles linked with manual question creation. One widely adopted method is the utilization of question banks or repositories, offering faculties a repository of pre-existing questions classified by topic, complexity, and other variables. A question bank is a repository that houses a collection of questions, providing users

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with the ability to create, preview, and edit stored questions. Within a question bank, questions can be organized into categories, which serve to facilitate management and retrieval. These categories can be tailored to different levels of granularity, such as site-wide, course-specific, or quiz-specific categories, offering flexibility in organizing and accessing questions based on varying contexts and needs (*Question Banks Explained*, n.d.). Although solutions like question repositories and computer-based assessment platforms exist, they don't completely bridge the gap between the current challenges and the effectiveness of these methods.

This study suggests filling the existing void by introducing an automated exam question generator. By harnessing advancements in natural language processing (NLP) and machine learning (ML), such a system can create questions aligned with particular learning objectives, customizable to individual student requirements, and consistently of high quality. Automating the question-generation process saves faculties time, minimizes biases, and enhances the variety of assessment items available. Additionally, an automated system can continually enhance its capabilities over time, refining question quality and adaptability through user feedback and performance data.

In today's digital age, the use of AI technology in education is becoming increasingly prevalent, with tools like EaseExam: AI-Powered Exam Prep via API promising to revolutionize the way faculties create exam questions. As faculties at New Era University seek to enhance their teaching methods and adapt to the changing landscape of education, the effectiveness of such AI-powered tools in generating exam questions becomes a topic of interest. This research will explore the potential benefits and limitations of EaseExam in assisting professors at New Era

University in creating exam questions, ultimately arguing that while it offers certain advantages, it may also present challenges in ensuring the quality and relevance of the questions.

Objectives

This research has the objectives of the following:

- To significantly reduce the time required for creating exams, by automating question generation, formatting, and organization, thus overcoming the challenge of slow creation of exams.

- To ensure consistency in exam content and evaluation criteria, thereby reducing the risk of inconsistent exams and promoting fairness and reliability in assessment.

- To address the evolving needs and preferences of faculty and students, by offering flexible tools with customizable and continuous updates of exams, thus ensuring its relevance and effectiveness in diverse educational contexts.

Statement of the Problem

This study aims to investigate the effectiveness of the EaseExam application in assisting professors and students in the 3rd Year BS Computer Science 2nd Semester academic year 2023-2024 in creating exam questions

This study aims to seek answers to the following questions:

Q1. How effective is the EaseExam application in assisting professors and students in the 3rd Year BS Computer Science 2nd Semester academic year 2023 - 2024 in creating exam questions based?

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Q2. What are the key usability factors that influence the adoption and use of the EaseExam application by professors and students in the 3rd year BS Computer Science academic year 2023 - 2024?

Q3. How does the integration of the OpenAI API enhance the efficiency and accuracy of exam question generation within the EaseExam application?

Scope and Delimitations

This study is conducted at New Era University, College of Informatics and Computing Studies, specifically focusing on the professors and students in the 3rd Year BS Computer Science 2nd semester academic year 2023 - 2024. The study specifically focuses on the effectiveness of using an AI-powered Quiz and Exam Generation Tool via API in creating examination or quiz questions. It will not cover other aspects unrelated to the AI-powered Exam Prep via API, such as the implementation of the tool in other contexts or its impact on student performance.

Significance of the Study

The findings of this study will redound or will contribute significantly to the following:

The study deals with aiding professors and students by making an AI-powered Quiz and Exam Generation Tool via API to create questions to provide effectiveness in the creation of exam questions. It seeks to ensure the effectiveness of this AI-powered Quiz and Exam Generation Tool via API. Considering that efficient labor is essential, this study is significant as it will benefit faculties, students, educational institutions and future researchers.

For **professors**, this study will provide valuable support in creating exams efficiently and effectively. Using an AI-powered quiz test generation tool via an API, professors can simplify the process of creating test questions, increase the overall efficiency of the testing process and be able to create relevant course questions.

For **students**, this study will offer a comprehensive and personalized exam preparation tool. EaseExam, powered by AI, will enable students to enhance their exam readiness and performance through practice questions and explanations. This tool will provide students with a structured and efficient way to prepare for exams, ultimately improving their academic success. Students can also use the EaseExam in creation of their own mock exams for review.

For **educational institutions**, this study will benefit educational institutions by improving the quality and consistency of exams. This tool will help standardize exam creation processes and ensure that exams accurately assess student knowledge.

For **future researchers**, this study will provide valuable insights into AI-powered learning tools. It will provide an understanding of how AI can be used to enhance test preparation and education. Based on the findings of this study, future researchers can further develop AI-powered tools and adapt them for education to benefit both professors and students.

Definition of Terms

AI (Artificial Intelligence) - the ability of a digital computer or computer-controlled robot to perform human-like tasks.

API (Application Programming Interface) - it is a collection of programming instructions that allow data to be exchanged between specific software entities

Chatbot - is a computer program designed to simulate conversations with human users, especially on the internet.

Professor - is an academic professional who teaches and conducts research at a college, university, or other educational institution.

Knowledge Management (KM) - includes methods, practices and technologies to facilitate the creation, organization and distribution of knowledge assets throughout an organization, such as information, knowledge and best practices

ML (Machine Learning) - is a branch of artificial intelligence (AI) that focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.

NLP (Natural Language Processing) - is a branch of artificial intelligence (AI) that enables computers to comprehend, generate, and manipulate human language. Natural language processing has the ability to interrogate the data with natural language text or voice.

Student - a person enrolled in a course or educational program at a school, college, or university.

CHAPTER 2

REVIEW OF RELATED LITERATURE

This chapter reviews the relevant literature on effective educational technology, enabling resources, and the integration of AI into education. It identifies gaps in existing research to evaluate the study.

Overview of Knowledge Management

Knowledge management (KM) initiatives to encourage knowledge sharing, teamwork and learning among employees often require significant changes in organizational culture (Samia, & Odeh, 2022). In addition to gathering and sharing information, knowledge management involves the creation of best practices, insights, and knowledge that can be applied to organizational operations.

A Knowledge Management (KM) method is the intentional integration of humans, processes, and technology aimed at developing, capturing, and executing an organization's creative infrastructure. Knowledge Management helps educational institutions improve their ability to acquire and share information and knowledge, apply it to problem solving, and promote research and continuous development (Galgotia, & Lakshmi, 2022).

A robust Knowledge Management (KM) system aims to provide the organization with more efficient and effective information and knowledge. Knowledge acquisition, storage, organization, sharing, and use are only a few of the many activities that are required to increase productivity and encourage creativity in a firm. By implementing Knowledge Management (KM) strategies, organizations can leverage their internal knowledge base to gain competitive

advantage, adapt to changing environments, and support continuous learning and improvement (Yazdani et al., 2020).

Importance of Knowledge Management

Knowledge management is a highly effective method for developing and strengthening regulations, as well as increasing their efficiency and effectiveness at a university or college. Higher education institutions have a great opportunity to use knowledge management practices to enhance their viability, efficiency, competitiveness, and quality. To achieve a better result, we must implement knowledge management systems in the academic sector. By investigating the knowledge management process in universities, we can achieve an even better outcome for the learning success process (Saeed et al., 2022).

In organizational and educational contexts, knowledge management (KM) is crucial because it makes it easier to use knowledge resources effectively to improve performance and innovation. Applying knowledge management (KM) principles to education is becoming more and more important, especially as technology like artificial intelligence (AI) is used for educational tasks like creating test questions. Knowledge management (KM) plays a vital role in higher education institutions (HEIs) by facilitating the improvement of educational models and fostering learning and education through efficient knowledge sharing. In the context of preparing exam questions for educators using AI, KM becomes instrumental in ensuring the effectiveness and relevance of assessments (Quarchioni et al., 2020).

Knowledge management (KM) is important in higher education institutions (HEIs) because it provides them with a competitive advantage. It is frequently stated that effective knowledge management entails faculty sharing their knowledge and collaborating for improved

teaching and research outcomes. Nevertheless, perceived obstacles include faculty who see knowledge as power and the presence of institutional silos. For higher education institutions to achieve this, they will need to have a knowledge management strategy, a culture that supports this idea, investments in technology, and leadership that fosters generation, sharing, and transfer of it. These challenges were partially solved by universities of a higher class which made them able to apply it into making knowledge-based learning more dynamic in order to enhance the success of the entire institution (Nair, & Munusami, 2019).

Types of Knowledge Management Systems

In today's period, the educational field, learning, collaboration, and innovation all rely on the effectiveness and efficiency of the management of knowledge in the organization. Educational institutes use a variety of knowledge management systems to acquire, share, and preserve their educational resources. Knowledge management in education uses a wide range of strategies to achieve this goal. Particularly, knowledge management in an educational context is centered between the professors and students in the institute. Knowledge management systems administer procedures and promote collaboration to ease the sharing of knowledge. Here are the different types of Knowledge Management Systems in Education and other organizations (Patel, 2023):

First, an Enterprise-wide Knowledge Management System is an application that aids in reducing the effort in accessing various sources and databanks. This kind of Knowledge Management System operates and handles collected data. In some communities, it is often

characterized as knowledge community management software as it uses and utilizes the data gathered (Patel, 2023).

Second, the Knowledge Work System (KWS) is a part of an enterprise-wide Knowledge-Management System. It focuses on the organization's different aspects of information. KWS includes components such as knowledge databases, repositories, and graphs. These components serve to gather and acquire work-related data that will be used for specific organizational needs (Patel, 2023).

Last, Intelligent Techniques. These are knowledge management systems that leverage into using and utilizing Artificial Intelligence (AI). They can be used for knowledge discovery; creating solutions to problems that are too hard and large to be solved by humans, and filtering and searching data (Patel, 2023).

Knowledge Management (KM) Systems are a type of information systems that are used and applied to manage an organization's knowledge by leveraging Information Technology (IT) based systems. These systems are developed to support, enhance, and make Knowledge Management efficient. Some kinds and types of Knowledge Management Systems include Repositories of Information; Document Management Systems; Expert systems; Management information systems etc. Document Management Systems are the centralization of documents made possible. These systems facilitate efficient access and management of crucial information by organization members. For instance, document management systems can store a repository of previous exam questions, curriculum documents, and instructional materials, giving educators easy access to pertinent resources when it comes to using AI to prepare exam questions for

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educators. Another type of KM system is the Expert knowledge system. These systems contain specialized knowledge about the operations within a particular department, often contributed by specialists working within the industry. Expert knowledge systems can be created for different departments in educational institutions, like academic affairs, student services, or administrative offices (Riswanto & Sensuse, 2021).

Indeed, Knowledge Management Systems can be in different aspects and forms, but they all have common features: collaboration, repositories, processes, and knowledge directories. Collaborative Tools are tools that increase the flow of knowledge within the organization through the improvement of communication. Knowledge Repositories are tools that collect the knowledge of an organization and individuals and then store it in one storage that can be accessed by all of the individuals in the organization. Process Tools are tools that allow organizations to codify practices, processes, and procedures to improve the organization's performance. Directories are applications that allow persons to be available to other persons using tools to make them easily approachable when in need (Tucker & Kotnour, 2022).

Knowledge Management Processes

"Knowledge Management Process (KMP) is a vital unit of Knowledge-Sharing (KS). In knowledge-based organizations such as a university, enhanced specialization in Knowledge Management (KM) works as a catalyst for boosting collaboration and exploration" (Iqbal et al., 2019).

Knowledge Creation is defined as the development of new concepts and ideas through the connection between explicit and tacit knowledge in the personnel's mind (SYED et al.,

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College of Computer Studies

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2020). The creation of knowledge is made through the participation of individuals, working teams and groups in the process of generating a new knowledge capital for new issues and practices, which will consequently contribute to defining problems and finding new solutions in an innovative manner (Albream & Maraqa, 2019). Online examination questions are considered as knowledge creation, where faculties use their expertise to create questions that evaluate understanding, critical thinking, application of knowledge, and abilities of the students. Faculties contribute to the ongoing refinement and expansion of educational knowledge, making examination questions a valuable aspect of knowledge creation in education by reflecting on student responses and adjusting future assessments.

Knowledge Acquisition is defined as the acquisition of ideas, knowledge, and skills that multiply the current pile of knowledge (SYED et al., 2020). Knowledge acquisition involves the organization's ability to absorb knowledge from its primary knowledge base in a learning perspective (Karageorgou, 2022). Online examination question creation involves synthesizing existing knowledge rather than acquiring new knowledge. Faculties use their expertise on the subject. However, they may also review innovative teaching methods to ensure accurate assessment of the students' knowledge, skills, and abilities. Knowledge Acquisition can still incorporate knowledge integration and adaptation elements.

Knowledge Sharing is a process that refers to the dissemination and sharing of knowledge among members of the organization. The process of knowledge sharing is a fundamental process of KMPs and represents the delivery of appropriate knowledge (implicit or explicit) in a timely manner and to the right person within the appropriate means of communication. Sharing of knowledge depends on the presence of effective mechanisms, such as

reports, manuals, training, and formal meetings (Albream & Maraqa, 2019). Online examination questions are a form of knowledge sharing and can guide students towards concepts they should understand. Leading to further knowledge acquisition, students engage with the material through answering these questions. Knowledge Sharing facilitates between faculties and students, ultimately enhancing learning outcomes. Additionally, faculties share exam questions with each other to collaborate and improve assessment practices collectively.

Knowledge Utilization is a mixture of operational, technical and social aspects; it is the application of knowledge to organizational operations and processes to produce valuable output in terms of products and services (SYED et al., 2020). Online examination questions are knowledge utilization. It involves application of the subject and concepts to create effective assessments. Online examination questions evaluate the students' comprehension, critical thinking, and problem-solving skills, promoting meaningful application of acquired knowledge. Faculties use a variety of resources and experiences to create questions that effectively measure the students' learning.

Applications of Knowledge Management

Today, Knowledge Management (KM) has grown especially in online learning environments. A recent study highlighted the important role of automated question generation and response analysis in online learning environments. The study highlighted the challenges faced in designing a practical survey, such as time and labor, which can hinder learning. To address these challenges, this study proposed the use of an automatic system to generate questions from text and image material. Using natural language processing (NLP) and machine

learning (ML), these algorithms can extract relevant information and generate questions that effectively test student understanding. This approach not only facilitates the assessment process, but also provides scalable and personalized data that enhances learning. The research highlights the transformative possibilities of knowledge management (KM) to change and adapt educational research processes with the broader goal of improving learning outcomes and student engagement in online learning environments (Das et al., 2021).

Another area where KM can significantly impact efficiency and knowledge retention is in the development of innovative solutions. However, maintaining this knowledge over time is a challenge. Getting a lot of information is difficult to begin with, when individuals face practical problems, it can be difficult to apply what we have read. Improving efficiency and collecting data in less time is a challenge. Individuals often look for information on the Internet, but soon forget it. A more effective way is to make a quiz generator where the individual can just upload information in an image (Gupta et al., 2021).

Furthermore, the recent trend towards AI chatbots has attracted a lot of attention, especially in education. ChatGPT and Google Bard (Gemini) led the development of chatbots due to the great features they offered. Powered by OpenAI, ChatGPT is widely recognized by the crowd for its ability to process data and deliver informative content. Built on large language models trained on large amounts of data, the chatbots can overcome human limitations in some tasks and increase efficiency and productivity in others. AI chatbots have the ability to create information, creative content, and it provides informative answers to questions, though the accuracy of the questions given is not always perfect (Labadze et al., 2023).

Issues and Challenges in Knowledge Management

Knowledge is conceived and externalized through printed and digital texts and databases or embedded in artefacts. Therefore, knowledge can be comprehended in different natures, forms, and modes (De Bem Machado et al., 2021).

With the use of Knowledge Management systems, used to gather, manage, share, and utilize knowledge that has been stored in different databases throughout the organization (Tilahun, 2023), the use of knowledge is only possible when individuals can share their knowledge and can generate new, from the knowledge of others. It is also recognized the importance of sharing for the interconnection between the knowledge at the individual level and organizational level, knowledge and learning both levels. On the other hand, since much of the organizational knowledge lies in the individual level, that acquires and complements its daily activities and functions. If not promoted a culture of knowledge sharing, the risk, if the individual leaves the Organization, to lose this specific knowledge or the risk of this knowledge not being properly taken advantage of since it is no longer accessible to others (De Jesus Ginja Antunes & Pinheiro, 2020). When an organization does not have a proper knowledge management system (KMS) the organization may get memory loss and brain drain. Memory loss means the absence of KM that leads to the repetition of the same mistakes because nothing has been learned from previous experiences. Brain- drain leads to the loss of valuable knowledge resources when employees leave the organization (Tilahun, 2023).

Review of Existing Knowledge Management Systems

In Knowledge Management (KM), an automated question generation system, such as an examination question generation system, plays an important role in curriculum planning and information storage. These systems are designed to facilitate questions and answers to written questions arising from text and graphics. However, limitations are presented, examples of such limitations can be found in automatic question generation systems which, despite their ability to generate questions including multiple choice questions (MCQs), true or false questions and open-ended questions;. First, the quality of the questions generated by the system directly affects the quality of the resulting data, possibly reflecting the "Garbage In, Garbage Out" phenomenon. Finally, the system's ability to present consistent distractors (alternative response options) is limited by the size of the available lexical database. This database does not cover all possible word associations, making it difficult to assign credible distractors to specific words or phrases. These limitations highlight the need for further development of automated survey generation systems to improve the capabilities and applications in data management practices (Ledi, 2022).

Moreover, a recent study examines the complexity of medical data queries. This research addresses the fundamental issue of survey complexity, an often overlooked key factor in survey design. Difficulty levels are important to ensure that questions are sufficiently difficult, avoiding situations where questions are too easy or difficult. Unmanaged complexity leads to problems such as asking inappropriately difficult questions which are either easy or inappropriately difficult questions. In addition, it can be difficult for the test designer to identify a problem-related question from the large number of questions created. This study adds to the

growing body of literature aimed at improving the quality and effectiveness of self-administered questionnaires (Kurdi et al., 2019).

Furthermore, another study explored automatic question generation (AQG) systems related to chatbots, machine reading and education. It combines text, graphics and video-based survey creation and divides AQG into representational, visual and conversational. The review addresses data sets, applications and challenges and helps develop a systematic framework for AQG development. It also defines question types: factual questions, multiple sentences spanning questions, yes/no questions, and deep understanding questions (Mulla & Gharpure, 2023).

Gaps in Literature

Technology is becoming increasingly important in how we facilitate learning. One area that's drawing considerable interest is the development of Exam Question Generator Systems (EQGS). As mentioned in the previous part, these systems offer educators powerful tools to create a variety of questions efficiently, potentially transforming how assessments are conducted. However, despite their potential, there's a lack of comprehensive research on EQGS, leaving significant gaps in our understanding of how effective they are, how easy they are to use, and what impact they have on learning outcomes. This part of the literature review aims to delve into existing studies in this field, pinpointing areas where more research is needed to better understand EQGS. By doing so, we hope to shed light on the challenges and opportunities they present, paving the way for further advancements in educational technology.

In Exam Question Generator Systems that exist today, there are a lot of flaws and gaps that need to be addressed. In an implementation an Automatic Quiz Generation System for

generating quiz questions consisting of Multiple choice questions, True or False questions, and Open-ended questions (Ledi, 2022). Here are some of its limitations:

1. The quality of the questions generated is a function of the quality of the knowledge source given. The better and well-written the source text, the better the quality of the questions generated by the system (Garbage In Garbage Out).

2. The format of the questions generated by the model currently is in a comprehension style format. This is largely because the model was trained on a comprehension-style question-answer dataset. Most open-source datasets (SQuAD, RACE) are comprehension-styled datasets. These types of questions have their answers directly found in the source text. They do not require high cognitive abilities to answer.

3. The question-distractor coherence is not always guaranteed because the available lexical databases do not currently capture all possible relations between groups of words. In other words, there exist words and phrases that are connected to any reference in the database. This means we cannot find alternatives/distractors to such words/phrases using the currently available lexical databases.

Furthermore, in the study of Kurfi et.al. (2019), they gathered question generator system studies. They found out the existing flaws and areas that needs improvements for the current existing systems. One part is about the generation of question with controlled difficulty. As mentioned in the review, there is only a little research about the question's difficulty in the question genertion. It needs focus and improvement regarding the topic. It should be considered together and not in isolation. To further improve the Automatic Question Generator researchers,

a formulation of a theory behind an intelligent question generator with a control in difficulty would be a good factor. This will be used for identifying and improving the quality of the generated questions by the generator. Another limitation of existing works are the simplicity of the generated questions. Most of the questions generated only consists of few terms and targets lower cognitive levels.

Moreover, in the recent existing Automatic Question Generators, one area for improvement is the naturalness of the questions generated by these systems. These generators generate question that sound awkward and unnatural. Another is semantic relevance of the generated questions. Enhancement of semantic understanding and reasoning capabilities would generate more contextually relevant questions. Extraction of meaningful information is also a limitation of current systems. Some of the systems' questions fails to target most salient points. And lastly, the lack of integration of multiple modalities are present. Most of the system focuses on generating questions based on text. They forgot to incorporate other modalities such as images, audio, and videos (Mulla & Gharpure, 2023).

While there are indeed several Exam Question Generators available, they often come with certain limitations, one of which is the restricted range of features they offer. These generators might lack comprehensive functionality or fail to cover a broad spectrum of question types and formats. This limitation can be problematic for educators or organizations looking for versatility and customization in their assessment creation process.

For instance, some generators may focus solely on multiple-choice questions, neglecting other important formats like short answer, essay, or practical application questions. This narrow

focus can restrict the types of assessments that can be generated, limiting their usefulness across various subjects and educational levels.

Moreover, there might be limitations in terms of the customization options available. Users may find themselves unable to tailor questions to specific learning objectives or adjust parameters such as difficulty level, topic coverage, or question style. This lack of flexibility can hinder the effectiveness of the generated assessments in accurately gauging students' understanding and mastery of the material.

Additionally, some generators may lack integration with other educational tools or platforms, making it difficult for educators to seamlessly incorporate generated questions into their existing teaching methodologies or learning management systems.

Theoretical Framework

The purpose of this study is to investigate the factors affecting the effectiveness of EaseExam which was used by the 3rd year BS Computer Science 2nd semester in the academic year 2023-2024 at NEU CICS. Researchers use a number of theoretical references to achieve a comprehensive understanding.

Researchers incorporate Convergence Theory to examine the formation and development of professors and students' attitudes and behaviors related to technology adoption (Adhiarso et al., 2019). This theory suggests that innate environmental factors, such as technology acceptance in NEU CICS, influence personality development. Considering convergence theory, the aim of the study is to understand how professors and students' daily lives integrate with the use of EaseExam based on the characteristics and environmental factors that influence their adoption.

The researcher uses the Technology Acceptance Model (TAM) to explore professors and students' attitudes and perceptions towards EaseExam. TAM pertains to accepting new technology information by the users (An et al., 2023). Through one-on-one testing with NEU CICS students and professors, the study aims to identify factors affecting adoption of EaseExam, which privacy and flexibility influence adoption, thus improving its acceptance and use in NEU CICS. Analysis of data collected through unit acceptance tests will be used to assess the effectiveness of EaseExam in meeting the needs of professors and students.

Integrating these theoretical frameworks, the study aims to provide insight into how EaseExam can be effectively implemented and used in NEU CICS to improve collaboration and knowledge-sharing among professors and students.

Conceptual Framework

The conceptual framework is a visual representation of the key ideas and connections that drive the research effort. It visually describes the research article along with the factors that led to the research, and provides a map that shows the direction of the research. The conceptual framework of this study draws from two theoretical frameworks: Convergence Theory and Technology Acceptance Model (TAM).

The study's conceptual framework is displayed in a diagram format, as depicted below:
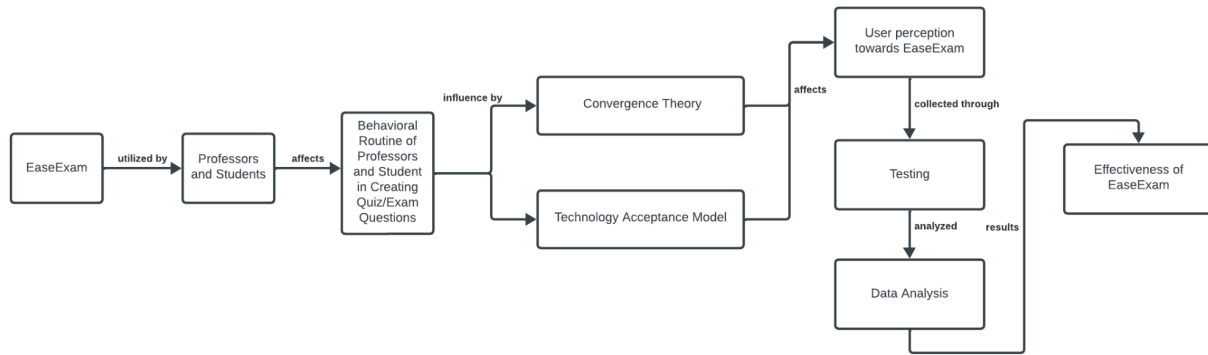

Figure 1: Conceptual Framework for Effectiveness of EaseExam within 3rd Year BS Computer Science Professors and Students in NEU CICS

The conceptual framework emphasizes connections between design foundations, software usability, behavioral models, user logic, and effort measurement. This illustrates a dynamic relationship in which design frameworks guide software development, thus shaping user experience and intention.

Understanding these patterns can provide guidance for developers to improve the design and implementation of EaseExam to better meet the needs and expectations of professors and students.

Furthermore, this framework emphasizes the importance of acknowledging the human dimension of the adoption and use of technology in educational settings. It emphasizes the importance of user-centered design, and the need for continued research to ensure that

educational tools such as EaseExam effectively advance teaching and learning objectives, and thus for professors and students experience increases.

CHAPTER 3

METHODOLOGY

This chapter describes the research methodology used in this study, including the action research techniques used, the details of the development system implementation and the methods of data collection and analysis. This includes the research design, data collection methods, data analysis methods, implementation of the application and the evaluation of the application. This chapter plays an important role to determine the effectiveness of the EaseExam towards 3rd Year BS Computer Science 2nd semester academic year 2023 - 2024.

Research Design

Action research is a research method that aims to simultaneously investigate and solve a problem. In other words, as the name suggests, action research is doing research and taking action at the same time (George, 2023). The purpose of this research project is to increase the effectiveness and efficiency of exam and quiz question preparation for 3rd Year BS Computer Science 2nd semester academic year 2023 - 2024.

Data Collection Methods

The researchers used user acceptance testing in the research for professors and students in the 3rd year BS Computer Science academic year 2023 - 2024. Specifically, the user acceptance test (UAT) is the final test before a software update or change goes live. When researchers ensure that the software behaves as it should in real-world situations (Elazar, 2018).

Data Analysis Methods

Researchers use descriptive statistics as a critical data analysis method to evaluate the effectiveness and reliability of EaseExam: AI-Powered Exam Prep via API in creating test questions from lectures or modules. Descriptive statistics serve as a foundational tool for summarizing and interpreting the characteristics of the generated questions, offering insights into the distribution, difficulty level, and topical coverage. By utilizing descriptive statistics, researchers aim to provide a quantitative understanding of the quality and relevance of the questions produced by EaseExam.

The researchers used central tendency measures such as mean, median, and mode to examine the typical characteristics of the generated questions, such as the interpretation of the factors affecting the effectiveness of the application. With this analysis, researchers are able to determine the general focus and structure of the questions, which makes it easier to determine how well the questions match the uploaded modules' content. This study uses descriptive statistics to provide valuable insights into the effectiveness of EaseExam in assisting professors at New Era University in creating exam questions, allowing for more informed decision-making about its integration into educational practices.

Implementation of the Application

System Requirements

These system requirements are essential to ensure the smooth and secure operation of the EaseExam application. The hardware should meet the necessary resources for the expected load and storage requirements, and the operating system should be compatible with the application.

Additionally, a database and web server are necessary to store and serve EaseExam's data and pages. The following requirements should be met to deploy and use EaseExam effectively:

1) Server Requirements

Component	Requirement
Operating System	Any operating system supported by Python and Flask, including Windows, macOS, and Linux.
Python	Python 3.7 or later installed on the system.
Flask	Flask 2.0 or later, a lightweight WSGI web application framework, used to build the web application.
OpenAI API Key	An OpenAI API key for using the GPT-3.5 turbo model for generating exam questions.
Libraries	Any additional libraries used in the application, such as PyPDF2 and docx for PDF and docx processing.
Hardware	A basic system with sufficient RAM (4GB) and processing power to handle the workload.

Table 1: EaseExam Server System Requirements

2) Client Requirements

Component	Requirement
Operating System	Windows (7 or later), Linux, macOS (10.14 or later), Android (6 or later), iOS (11 or later).
Supported Browsers	Microsoft Edge, Mozilla Firefox, Google Chrome, Apple Safari.
Desktop Sync Clients	Windows 7 or later, macOS 10.14 or later.
Mobile Clients	Android 6 or later, iOS 11 or later.
Mobile Apps	iOS 14.0 or later, Android 6.0 or later.

Table 2: EaseExam Client System Requirements

Regarding the tables above, the server requirements include having Python and Flask installed, along with any additional libraries used in the application. The client requirements include supporting various operating systems and browsers, as well as specific versions for desktop and mobile clients. These requirements ensure that the EaseExam application can be deployed and used effectively on a variety of systems and devices.
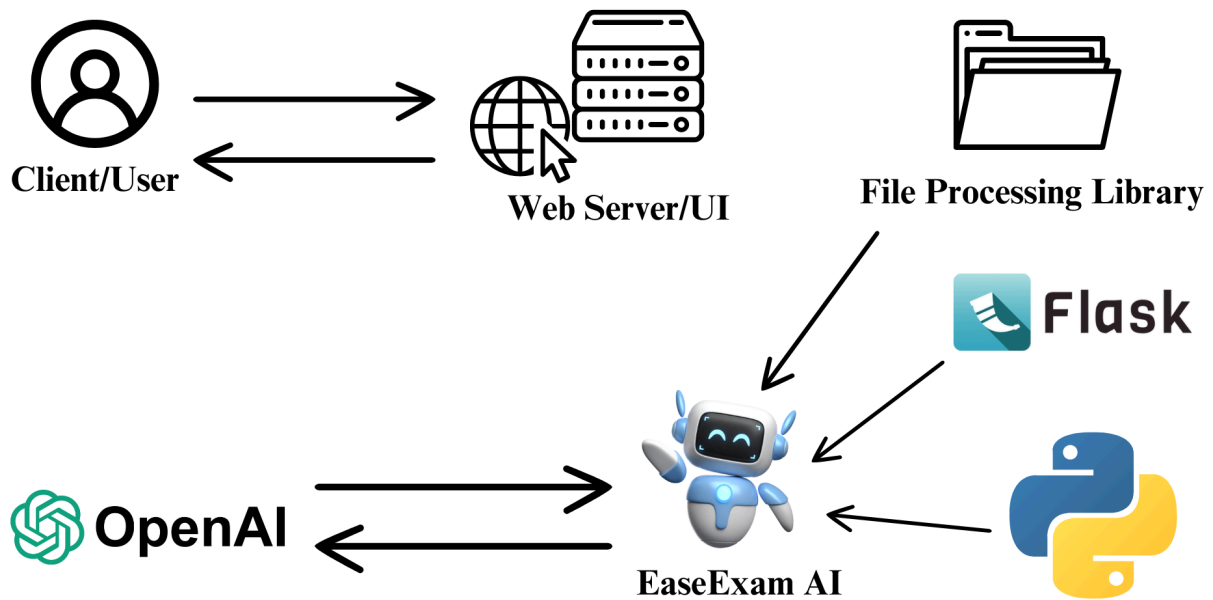
System Design

Figure 2: High-level overview of EaseExam design

As shown in Figure 2, the application has several key components that work together to provide a reliable and efficient test preparation experience The following components are important to EaseExam's operation:

- **Client/User:** The end-users of EaseExam, who interact with the application through the frontend user interface. They can input text, upload files, and generate exam questions.

- **Frontend User Interface:** Using HTML, CSS, and JavaScript, the EaseExam frontend offers customers a simple, user-friendly interface for text entry, file uploading, and

answering exam questions. Users can easily utilize the program because of the front end design's emphasis on simplicity and usability.

- **Server Environment:** EaseExam runs on a powerful server to ensure it performs well and stays reliable. It can run operating systems such as Windows, macOS and Linux. EaseExam allows for many uses and a wide range of operating systems. The application is hosted on a server with sufficient capacity to handle the required workload, ensuring reliability and efficiency.

- **OpenAI API Integration:** The EaseExam and OpenAI APIs are integrated and integrated through the GPT-3.5 Turbo instance to create exam quizzes. This integration enables EaseExam to generate high-quality exam questions based on user input and uploaded files, enhancing the overall exam preparation experience.

- **EaseExam AI:** This component represents the AI-powered engine of EaseExam responsible for generating exam questions based on the input provided by the user. It interacts with the OpenAI API for question generation.

- **File Processing Library:** EaseExam uses a file processing library to handle files for exam generation. This library enables EaseExam to extract relevant text and data from an uploaded file..

- **Flask Web Framework:** The foundation of EaseExam is the Flask web framework, a versatile and lightweight framework for creating Python web applications. The basis for handling user input, routing, and HTTP requests is provided by Flask.

- **Python Programming Language:** EaseExam is primarily designed in Python, taking advantage of the simple and readable nature of the language. Python's extensive

standards library and rich ecosystem of third-party libraries make it ideally suited for developing AI-driven applications like EaseExam.

All in all, the combination of these features and features makes EaseExam a robust and reliable solution for AI-driven exam preparation. Utilizing Flask, Python, the OpenAI API, and file management libraries, EaseExam delivers a simple and efficient test preparation experience for professors and students.

System Development

The development of EaseExam utilized the Flask framework for server-side development, chosen for its simplicity and flexibility. Python was the primary programming language due to its readability and extensive libraries, facilitating rapid development and integration with other tools and APIs. The PyPDF2 and docx library was employed for efficient PDF and docx processing, extracting text from uploaded PDF and docx files.

The development process followed a structured approach, starting with requirements gathering and analysis, followed by system design, implementation, testing, and implementation The interface was created using HTML, CSS, and JavaScript, providing an interactive user-friendly for input and uploading file objects. The backend logic responsible for processing user input and interacting with the OpenAI API to execute test queries was implemented in Python using Flask.

Testing played a crucial role in ensuring functionality and reliability. User acceptance testing gathered feedback to ensure the application meet the user needs and expectations.

Challenges were encountered, particularly in integrating the OpenAI API for exam question generation and handling different file formats for exam content. Ensuring compatibility with various operating systems and web browsers was also challenging but was addressed through thorough testing and debugging.

System Testing

In developing the EaseExam application, a comprehensive and systematic testing program was implemented, similar to the meticulous research conducted by experts before introducing a new product.

The developers used **user acceptance testing**. The creation was handed over to real users and exposed to the world for inclusion. Their input was invaluable in ensuring the application met their needs and expectations. Through this extensive testing program, the EaseExam application has been refined and optimized to fulfill its intended purpose.

By incorporating **black box testing**, the researchers aim to determine the effectiveness of the application based on the evaluation of the user by testing. These changes will further enhance the quality and reliability of EaseExam, making it more aligned with user needs and expectations.

System Deployment

To deploy the EaseExam web application, the researchers used PythonAnywhere, a platform that supports Python and allows for easy installation of Python libraries and uploading of files for the application. The researchers will organize all the necessary files, including

program files and assets, within the PythonAnywhere account. The researchers then used Anaconda, a distribution of Python, to manage dependencies and ensure compatibility.

PythonAnywhere provides a web-based interface for managing Python applications, making it easy to deploy and manage the EaseExam application. Researchers can upload their Flask application files to PythonAnywhere, configure application configuration, and launch applications with just a few clicks.

Once the application is deployed, users can access it through the provided PythonAnywhere URL. PythonAnywhere also offers additional features such as scheduled tasks, a MySQL database, and SSH access, allowing for further customization and enhancement of the EaseExam deployment. Using PythonAnywhere for deployment ensures that the EaseExam web application is easily accessible and can be efficiently managed and updated by the developers.

System Evaluation

The researchers conduct a thorough evaluation of the EaseExam system's functionality, usability, and effectiveness in assisting professors and students in the 3rd Year BS Computer Science 2nd semester academic year 2023 - 2024 in generating exam questions.

The researchers evaluate the system's functionality by examining its basic features, such as question generation based on uploaded PDF or docx modules or lectures. The researchers assess the accuracy and relevance of the generated questions by comparing them to the uploaded content and seeking feedback from users. Additionally, the researchers evaluate the efficiency of the question-generation process, taking along factors such as processing time and resource utilization.

Furthermore, the researchers evaluate EaseExam's usability by analyzing the user interface design, navigation experience, and overall satisfaction of users. Researchers conduct user tests to obtain feedback on system simplicity, clarity of instructions, and ease of use. The results of this study will allow the researchers to identify applicable topics and areas for improvement with the ultimate goal of optimizing the user experience for professors and students in the 3rd year BS Computer Science 2nd semester academic year 2023 - 2024.

Evaluation of the Application

User Acceptance Testing (UAT) was used to evaluate the effectiveness of the EaseExam intervention. Surveys and interviews were conducted with users including 3rd Year BS Computer Science 2nd semester academic year 2023 - 2024 to gather the respondents when it comes to the experiences with the app, focusing on user satisfaction, ease of use and the use and application of formulating test questions.

The development of survey strategies involved the development of survey questions that focused on key aspects of the intervention, such as standardized question design, ease of navigation, and overall user experience

Overall, the evaluation methods proved effective in providing valuable feedback on application functionality and usability. Feedback gathered from users helped identify areas for improvement and guided future improvement efforts to improve EaseExam's overall user experience.

CHAPTER 4

PRESENTATION AND ANALYSIS

This chapter presents the results of the research and analyzes the information gathered through usability tests and surveys. It provides a detailed evaluation of the developed system application, including its effectiveness, efficiency, usability, scalability and security. The purpose of this study was to answer the following research questions:

Q1. How effective is the EaseExam application in assisting professors and students in the 3rd Year BS Computer Science 2nd Semester academic year 2023 - 2024 in creating exam questions based?

Q2. What are the key usability factors that influence the adoption and use of the EaseExam application by professors and students in the 3rd year BS Computer Science academic year 2023 - 2024?

Q3. How does the integration of the OpenAI API enhance the efficiency and accuracy of exam question generation within the EaseExam application?

Data Collection and Analysis

In the data collection process, the researchers conducted User Acceptance Testing (UAT), a total of 25 respondents, consisting of professors and students in the 3rd year BS Computer Science academic year 2023 - 2024. Participants were asked to use the EaseExam application and provide feedback on its functionality and usability. The action research methodology was applied by iteratively testing and refining the application based on user feedback.

For data analysis, the researchers employed both qualitative and quantitative techniques. Qualitative analysis involved identifying common themes and issues raised by users in their feedback. Quantitative analysis focused on examining the frequency of certain behaviors or responses, providing insights into usage patterns and preferences among professors and students.

Overall, the data collection and analysis process allowed the researchers to gather valuable insights into the effectiveness and usability of the EaseExam application, helping the researchers identify areas for improvement and refinement.

Findings

Research Question 1: How effective is the EaseExam application in assisting professors and students in the 3rd Year BS Computer Science 2nd Semester academic year 2023 - 2024 in creating exam questions based?

Factor	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied	Interpretation
Time and Energy Effectiveness	88%	12%	0%	0%	0%	**Very Satisfied**
User-Friendliness	60%	32%	4%	4%	0%	**Very Satisfied**
System Scalability	60%	36%	0%	4%	0%	**Very Satisfied**

Table 3: User Satisfaction Levels for Critical Success Factors of the EaseExam Application.

Table 3 presents the factors that determine the effectiveness of EaseExam in helping professors and students with exam questions for 3rd year BS Computer Science 2nd Semester

2023-2024. Firstly, respondents are very satisfied when it comes to time and energy efficiency as 88% were very satisfied and 12% were satisfied. Then, for user-friendliness, respondents were very satisfied as 60% were very satisfied, 32% were satisfied, 4% were neutral and 4% were dissatisfied. Lastly, for the system scalability, the respondents are very satisfied, 60% were very satisfied, 36% were satisfied and 4% were dissatisfied.

This depicts that the respondents' level of satisfaction is high when it comes to assisting the professors and students in the 3rd Year BS Computer Science 2nd semester academic year 2023 - 2024 in creating exam questions which are proven to be effective.

Research Question 2: What are the key usability factors that influence the adoption and use of the EaseExam application by professors and students in the 3rd year BS Computer Science academic year 2023 - 2024?

Factor	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Interpretation
Interface Design	52%	36%	8%	4%	0%	**Strongly Agree**
System Performance	56%	44%	0%	0%	0%	**Strongly Agree**
Ease of Navigation	68%	28%	4%	0%	0%	**Strongly Agree**

Table 4: User Agreement with Key Usability Factors

Table 4 presents the key usability factors that influence the adoption and use of the EaseExam application by professors and students in the 3rd year BS Computer Science academic year 2023 - 2024. Respondents strongly agreed for interface design as 52% strongly agreed, 36% agreed, 12% were neutral, and 4% disagreed. System performance was also strongly agreed by the respondents as 56% strongly agreed, 44% agreed, and 0% were neutral. Regarding ease of navigation, respondents strongly agreed as 68% strongly agreed, 28% agreed, and 4% were neutral.

This depicts that the key usability factors including the interface design, system performance, and ease of navigation are strongly agreed by the respondents and proved to be effective with the use of the EaseExam application.

Research Question 3: How does the integration of the OpenAI API enhance the efficiency and accuracy of exam question generation within the EaseExam application?

Factor	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Interpretation
Question Accuracy	56%	32%	12%	0%	0%	**Strongly Agree**
Question Relevance	68%	20%	12%	0%	0%	**Strongly Agree**
Question Diversity	52%	32%	16%	0%	0%	**Strongly Agree**

Table 5: Evaluation of OpenAI API Integration for Exam Question Generation

Table 5 presents the enhancement factors of efficiency and accuracy of exam question generation within the EaseExam application when it comes to integration of the OpenAI API. Respondents strongly agreed for question accuracy as 56% strongly agree, 32% agree, and 12% were neutral. Regarding question relevance, respondents strongly agreed as 68% strongly agree, 20% agree, and 12% were neutral. For question diversity, respondents strongly agreed as 52% strongly agree, 32% agree, and 16% were neutral.

This depicts that there is a strong agreement on the positive impact of the OpenAI API on question accuracy, relevance, and diversity.

Analysis and Discussion

Research findings shows that the EaseExam application was found to be very effective in assisting the professors and students in the 3rd Year BS Computer Science 2nd semester academic year 2023 - 2024 prepare exam questions. Assistance of professors and students are highly effective by determining the effectiveness of critical success factors such as time and energy efficiency, user-friendliness, and system scalability in the application. The key usability factors influencing adoption are interface design, system performance and ease of navigation, all of which are strongly agreed by professors and students. The integration of the OpenAI API has greatly improved the efficiency and accuracy of EaseExam's exam question generation, especially the question accuracy, relevance and diversity which are strongly agreed by professors and students.

This study focused on the significant impact of the EaseExam project on the creation of exam questions for professors and students of 3rd Year BS Computer Science 2nd semester

academic year 2023 - 2024. The effectiveness of the application is determined by the effectiveness of the factors such as time and energy efficiency, user-friendliness, and system scalability, interface design, system performance and ease of navigation. The integration of the OpenAI API enables the application to be further enhanced, especially to improve question accuracy, relevance, and diversity. Furthermore, continuing to focus on the critical success factors and increased usage will ensure that the EaseExam service remains a valuable tool, and improves both the learning and assessment experience for professors and students.

Presentation

The findings of the study were presented using tables. The tables provided a summary of the data, especially the percentages associated with privacy and security concerns related to EaseExam. The visual aids were relevant to the research questions and objectives because it helped to quantify and visualize participants' attitudes and perceptions towards EaseExam, providing an understanding of the research findings.

Implementation of KM Application

The implementation of a knowledge management application, the EaseExam service, focused on providing a simple and efficient way for professors and students to develop exam quizzes. The project used AI technology to analyze uploaded lecture materials so it just made the relevant test questions. The testing and evaluation of the EaseExam application involves conducting user acceptance testing (UAT) with the professors and students of 3rd Year BS Computer Science 2nd Semester academic year 2023 - 2024. Participants used the application

and provided feedback on its functionality and usability, which was generally positive. Users have responded well to the app's features and functionality, suggesting that it can improve test preparation and knowledge application in educational settings.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

This chapter discusses the summary of what study is all about. It summarizes research findings, discusses implications and applications, and makes recommendations for further research and practice. It also reflects the strengths and limitations of the study and provides recommendations to improve the developed system application.

The objective of this study was to investigate the effectiveness of the EaseExam implementation in assisting professors and students in creating exam questions for the 3rd Year BS Computer Science 2nd semester academic year 2023-2024 at NEU CICS. It sought to demonstrate the impact of AI-enabled tools, in particular the OpenAI API, on query generation efficiency and accuracy.

Key Results

Research has shown that EaseExam is highly effective in helping professors and students develop exam questions. Respondents expressed high levels of satisfaction with critical success factors such as time and energy efficiency, user friendliness, and scheduling flexibility. The inclusion of the OpenAI API significantly increased the performance and accuracy of query generation, resulting in a variety of related and distinct queries.

Implications of Findings

The research findings indicate that the EaseExam application is highly effective in assisting professors and students in creating exam questions. Respondents expressed high levels of satisfaction with critical success factors such as time and energy efficiency, user-friendliness, and system scalability. Additionally, key usability factors including interface design, system performance, and ease of navigation were strongly agreed upon by respondents, indicating high adoption potential and usability of the application.

The findings of the study indicate that the EaseExam is very effective in assisting professors and students in creating exam questions. Respondents expressed high satisfaction levels when it comes to the critical success factors such as time and energy efficiency, user-friendliness, and system scalability in the application. The respondents expressed strong agreement for key usability factors influencing adoption like the interface design, system performance and ease of navigation. When it comes to the integration of the OpenAI API, the respondents strongly agreed regarding the improvement of the efficiency and accuracy of EaseExam's exam question generation, based on the question accuracy, relevance and diversity.

All in all, the findings depict that the EaseExam very effectively assisted the behavioral routine of creation of quiz or exam questions by professors and students in the 3rd Year BS Computer Science 2nd semester academic year 2023 - 2024 at NEU CICS. This indicates that the EaseExam is a very effective tool for enhancement of creation of quiz or exam questions.

Considerations for Future Investigations

This study has several limitations, including that it only focuses on a specific academic department and semester, which are the professors and students in the 3rd Year BS Computer Science 2nd semester academic year 2023 - 2024 at NEU CICS, which can limit the support of the study. Future research could include other departments or colleges regarding EaseExam, when it comes to the effectiveness of the other respondents that are not included in this research. Another is that the features of the current EaseExam application are limited due to time limit and limited-cost in the creation process, which leads that future research could investigate additional features or enhancements to further improve the EaseExam. Lastly, the EaseExam only used OpenAI API as an API for the creation of quiz or exam questions, wherein future research can improve potential further enhancement of the creation of quiz or exam generation. Therefore, future research should consider addressing the limitations to provide a better understanding of the effectiveness of the EaseExam.

Next Steps and Recommendations

Based on the findings of the study, the following recommendations are suggested:

- Provide appropriate training and support to users to ensure successful adoption and use of the EaseExam application, emphasize its benefits and address any concerns.

- Further exploration of the integration of AI-enabled tools such as the OpenAI API to increase the efficiency and accuracy of question generation.

- Future development of the EaseExam application should focus on improving the user interface to make it more intuitive and user-friendly.

- Advanced features need to be considered to make the application work properly, this may include eliminating questions, allowing questions where the answer keys do not indicate them, adding an explanation of each answer, accepting images as questions, adding difficulty in question, and integration of other platforms to further extend the EaseExam.

- Future research should aim to further develop the EaseExam application to meet the changing needs of professors and students.

Conclusion

In conclusion, the EaseExam application with AI assistance has shown a great future in assisting professors and students in the 3rd Year BS Computer Science 2nd semester academic year 2023 - 2024 at NEU CICS with exam question creation. The application effectiveness and functionality, as reflected in user satisfaction and key usability factors, make it a valuable tool to enhance the test preparation process. The continued use and exploration of AI-enabled tools can further improve application efficiency and accuracy, and benefit professors and students.

The findings of this study indicate that the EaseExam implementation has the potential to significantly improve the question design process in test preparation at NEU CICS. The app's ability to simplify these processes, along with its easy-to-use and flexible interface, makes it a valuable tool for professors and students. Continuation to invest in the app, and further integration of AI-supported tools can be implemented. Furthermore, positive feedback from users on the usefulness and efficiency of the application indicates good acceptance among students. This indicates that the application has the potential to be used successfully in other

academic institutions, and also highlights its usefulness and potential impact of test preparation programs in higher education.

Therefore, the EaseExam application has shown the potential to improve test preparation processes and enhance the academic experience of professors and students. By continuing to demand advanced features and integrations that address core use cases, the application can continue to evolve and meet the changing needs of professors and students in the digital age.

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