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Development of BlockScholar as an Educational Mobile Application on Blockchain Technology

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ABSTRACT

In the ever-evolving landscape of technology, blockchain emerges as a transformative force, reshaping digital transactions and decentralized systems. This revolutionary technology, initially synonymous with cryptocurrency, has transcended its roots, becoming a pivotal element in industries spanning finance, supply chain management, healthcare, and more. However, understanding blockchain's intricacies can be daunting, especially for newcomers. This project addresses the need for an accessible and engaging platform to introduce individuals to blockchain technology. Traditional educational resources like textbooks have lost their appeal in today's digital era, leaving learners seeking interactive and mobile-friendly alternatives. While online educational platforms like Udemy and Coursera offer diverse courses, they often lack the immediacy and interactivity that modern learners crave. In the mobile landscape, a noticeable gap exists in educational apps dedicated to blockchain technology. Existing options tend to focus on cryptocurrency, falling short in delivering immersive learning experiences. This project aims to bridge this gap by developing an educational mobile app centered on blockchain technology. The app's primary objective is to offer an interactive and engaging environment for users to explore blockchain's fundamentals, applications, and advantages in a user-friendly manner. By harnessing the ubiquity and convenience of mobile devices, our project seeks to empower learners to delve into the world of blockchain technology. In doing so, we aspire to foster a more informed and tech-savvy community, equipped to comprehend the far-reaching implications of blockchain on various industries. In summary, this project endeavors to unlock the potential of blockchain technology to revolutionize education by creating a mobile app that facilitates the exploration of this transformative field. Through interactive learning experiences and accessible content, we aim to empower individuals to grasp the significance of blockchain and contribute to a more knowledgeable and technologically adept society.

1. Introduction and Motivation

Facebook, Instagram, LinkedIn, YouTube, and Twitter are among the most widely used internet services in Malaysia [21]. The abundance of information available increases a number of security and

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privacy problems. It is also possible to question the veracity and correctness of the information in this virtual environment. According to statistics provided by the Cyber Crime and Multimedia PDRM Investigation Division, cases of the African Scam, also known as the cyber-love scam, are on the rise [22]. Compared to 2012, when just 814 cases of internet fraud were reported in Malaysia, there were 1095 cases reported in 2013. To prevent game addiction, cybersecurity education is also necessary. Certainly, this addiction has a bad effect. Teenagers spend a lot of time on computers and interact with one another through technology. Teenagers' valuable time is consumed by addiction to their gadgets over time, and playing online games becomes an addiction that cannot be ignored. Teenagers are severely impacted by this. Teenagers frequently use the internet at night, which will make matters worse and might even result in health issues. Users are not always aware that they are being attacked, and these threats and attacks might take many different forms. To create a culture of cyber safety, it is crucial to inform and empower users about the responsible and safe use of online tools and platforms [23].

Cybersecurity is an essential thing in Information Technology (IT). Every computer, system, electronic system, website, network, or mobile application needs security to protect it from unauthorized persons or threats. Cybersecurity can be divided into a few common categories: application security, information security, and operational security. The learner community nowadays generally accepts learning on mobile devices [5]. Lecturers should allow the use of mobile devices in the classroom because they are beneficial in content creation, student-centered learning, authentic learning, and differentiation of instruction, as well as assessment and reflection. Additionally, the portability of mobile devices provides users anywhere and anytime access to course material.

One of the most implemented security technologies nowadays is blockchain. Recognizing the potential of blockchain technology to revolutionize different industries, including education, this project proposes the development of an educational mobile app focused on blockchain technology. This app aims to provide an interactive and engaging platform for individuals to learn about the fundamentals, applications, and benefits of blockchain in a user-friendly manner. By taking advantage of the convenience and ubiquity of mobile devices, this project will hopefully help contribute to empowering learners to comfortably explore the world of blockchain technology and its impacts on the world, therefore cultivating a more knowledgeable and tech-savvy community in general.

1.1 Objectives

The following are the project objectives that will be achieved at the end of the project:

- i. To create an educational mobile app on blockchain that offers comprehensive and engaging learning experiences. We will incorporate interactive learning materials, quizzes, user progression tracking, gamification elements, and enhanced interactivity to enhance the user experience and ensure a comprehensive understanding of blockchain concepts.

2. Related Works

2.1 Mobile Learning

Mobile learning technologies now have a greater impact on classroom instruction and connect formal and informal learning, work, and leisure [1]. Students can improve their knowledge and learn from mobile applications. Learning using mobile applications can be anywhere, anytime, whenever

the students want to. The portability of platforms and devices that make use of internet technology allows for both the learner's and the course materials' mobility [2] and [3]. The practice of using portable electronic platforms or gadgets to enhance learning is known as mobile learning. It is additionally described as a development of electronic learning using the internet and mobile technology [4]. The design of mobile learning (m-learning) is based on both mobility and electronic learning (e-learning) [5]. It is thought to be a fascinating and effective way to enhance learning [6].

Accessing and using mobile platforms or devices on one's own does not automatically entail having had mobile learning experiences [7]. The minimum requirement for learners to successfully adopt mobile learning is adequate knowledge and understanding of how modern technology is applied in educational environments and, most importantly, for the purpose of learning.

The way in which students view the use of mobile learning is extremely important since attitudes have a big impact on behavior [8]. If students believe that mobile learning is worth little or nothing, they may be less likely to adopt its utilization. It is critical to note that impressions can be biased towards traditional methods and firmly rooted in them. Numerous researches [3,7,9,10,29] discuss how teachers and students perceive mobile learning. On all test items included in the usability questionnaire, more than 88% of specialists have agreed to participate, according to [9].

Similar to this, Ismail *et al.*, [7] stated that students expressed a desire to learn more about mobile learning platforms and to use them in all academic areas. More than 59% of respondents, according to Park *et al.*, [3], have good acceptance of mobile learning platforms for their learning processes. About 80% of respondents to a survey conducted by Ciolacu and Beer [10] who used a mobile learning platform with an adaptive course user interface expressed interest in approaching their topic in a similar manner. Additionally, as a complement to the content area covered, over 94% of the students learned about the relevant subject through the mobile learning platform training.

The effects of technological and societal advancement brought about by mobile learning technologies and platforms are currently being felt more keenly than ever before [12]. These technologies and platforms enable worldwide access to information anytime, anywhere using the Internet, increasing the mobility of knowledge. The learner community now generally accepts learning on mobile devices [11]. Since mobile devices help with content development, student-centered learning, authentic learning, differentiation of instruction, assessment, and reflection, teachers must permit their use in the classroom. Additionally, teachers and students can access course materials anytime and anywhere.

As the focal point of the learning environment, the student interacts with the educational institution, the curriculum, and the teacher via mobile devices and the Internet in a virtual classroom setting known as a mobile learning platform [13]. Mobile applications enable students to access e-learning materials from anywhere and to further their academic objectives online. M-LMS (mobile learning management system), M-content (mobile learning), MCMS (mobile content management system), M-testing (evaluation of learning outcomes), and M-students (a group of users studying lessons in the system) are the components of mobile learning [14].

The potential effects of mobile learning on student engagement, motivation, critical thinking, and knowledge acquisition have been investigated using a variety of methods [15]. The analysis of the usage of mobile devices in teaching practice shows that research on distance education supports the advantages of mobile learning to the learning environment. Mobile technologies, for instance, aid student motivation [16], promote responsibility [17], foster commitment [18], and enhance learning and retention [18].

The effectiveness and efficiency of achieving educational goals, the competitiveness of educational structures and their innovative capacity to provide high-quality education, and the usability of the educational content are all taken into consideration when deciding whether to

integrate mobile approaches into the educational cycle. The primary characteristic of contemporary mobile learning is integration with already-existing Massive Open Online Courses (MOOC) by using publicly accessible mobile technology to access cloud services [19]. Enhancing academic performance through mobile learning is one of the most significant issues in educational research [20].

2.2 Cybersecurity

The development of the internet has given people access to both the actual world and the virtual one [20]. With the use of search engines like Google and Yahoo and video-sharing websites like YouTube, anyone can easily access any information. However, the expanding cyberspace could also harm internet users, for example, by encouraging cybercrime. Therefore, such problems ought to be handled quickly to prevent them from having a significant effect. Internet users' adoption of cybersecurity is crucial in this situation. Because cybercrime instances can happen everywhere, regardless of people, organizations, or locations, cybersecurity education is essential.

Information and communications systems, as well as the data they hold, can be protected from and/or defended against damage, unauthorised use or alteration, or exploitation [24]. This is known as cybersecurity. One's knowledge is unquestionably increased via the internet. For instance, to grasp the settings and mechanics of online computer games, players must have a high level of English proficiency. This will inadvertently promote the improvement of English speaking, reading, and writing abilities.

2.3 Blockchain

Nowadays, there is a new trend coming from a recently emerging field within technology, specifically in the realm of digital transactions and decentralized systems. This emerging field or technology is called blockchain. In its most basic form, a blockchain can be described as a connected list of blocks. Blockchain technology (BT) is an emerging technology that is implemented in a distributed manner, configured as a digital register, and distinguished by a shared block structure that eliminates the risk of data alteration due to the immutability of content [25]. The term "blockchain" was initially used in 1991 by Haber and Scott Scornetta [27] to describe a chain of blocks that is cryptographically safe. Each block in the blockchain has two main parts: a block body and a block header. The block body holds the transactional data. The block header contains the hash value from the previous block and links to it. As a result, the blocks are connected to one another to create a chain on which the complete history of each transaction is recorded. According to Hechler, Oberhofer, and Schaeck [26], BT primarily supports two operations: adding new transactions and letting recorded transactions be read.

All this information may seem intimidating and overwhelming to newcomers who are inexperienced in such topics or are just taking their first steps into getting to know about this trending new technology. As such, there is a need for a platform to guide newcomers to being introduced in this new field. Such available learning resources on the topic can usually be found in conventional educational resources such as textbooks which provide extensive knowledge on the topic. In today's age, however, books are no longer an effective and adequate tool for education, as students find them unengaging, boring, and non-interactive. Students nowadays often feel a heavy burden when they are required to read textbooks compared to learning something online through their digital devices. Hence, alternative resources are available such as educational platform websites (Udemy, Coursera, etc) which provide various courses on multiple topics including science, mathematics, as well as computer sciences topics.

However, these can be inconvenient to the students as they will need to access their laptops or notebooks to access the learning resources properly through the internet browser. On the other hand, in the mobile environment, there seems to be a lack of available educational apps that focus on blockchain technology. The ones that are available, are not providing the full immersive user experience as they lack engagement and interactivity. However, the abundance is usually in favor of cryptocurrency-related apps. From this, we can clearly see the available educational apps on the blockchain are not up-to-par or taking advantage of the full potential of what digital education and mobile e-learning can bring to the students.

3. Methodology

In developing the educational mobile application BlockScholar, the Rapid Application Development (RAD) model will be used as the methodology for the project. RAD is a dynamic and iterative approach that encourages collaboration between the developers and the end-user. Essentially, it aims to accelerate the process of application development while ensuring high flexibility and responsiveness when considering the possibility of constant constantly evolving requirements. Figure 1 shows the steps involved in the development process:

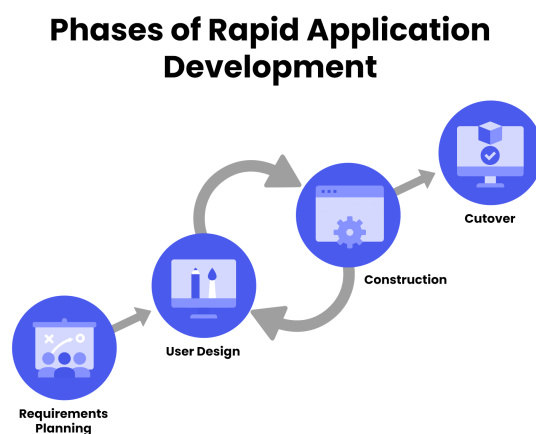


Fig. 1. Phases of Rapid Application Development (RAD) Model [28]

3.1 Planning Requirements

In the planning phase of developing an application, the first step is to establish clear objectives, and determine the target audience, educational content, and the essential features and functionalities of the application. It is also essential to identify and engage with the stakeholders such as educators, and students to gather valuable insights and requirements.

The planning phase continues with the creation of a comprehensive roadmap, which includes defining the project scope, setting milestones, and establishing a timeline for each development phase. Overall, the planning phase ends with making a detailed plan for the project. This plan includes setting goals, explaining what needs to be done, deciding what will be delivered, and creating a timeline. It acts as a valuable reference and guide for the next steps in developing the application, ensuring that everything is done smoothly and successfully.

3.2 User Design

Once we have collected all the information during the planning phase, we transform the information from the initial requirements gathered into visualizations such as wireframes or prototypes to get a basic idea of the app's layout and user interaction, ensuring a clear and user-friendly experience. Once the wireframes are approved, the focus shifts to the visual design. This includes choosing colors, typography, and graphical elements that match the educational theme and brand of the app. The aim is to create a visually appealing and user-friendly experience when using the application. The interfaces that will be designed are such as the user profile page and dashboard, pages for the learning materials and courses, and quizzes and assessments.

In addition to that, in this phase, close collaboration between developer, and end-users will take place to create engaging and intuitive designs. Iterative feedback loops will be established to incorporate end-user preferences, ensuring a user-centric design that enhances the learning experience. Overall, the goal of this phase is to establish the interfaces, input and output, functionalities, elements and components of the project.

3.3 Rapid Construction

In the implementation phase of the project, this is where actual coding and development will be done for the application based on the finalized designs and specifications. For this project, I will be using Android Studio as my tool in developing the system. This is essentially where the developers write the necessary code to bring the app to life. This involves creating the user interface, implementing the desired features and functionalities. Best practices such as coding standards and proper documentation will be ensured to maintain code quality and readability.

During the development phase, we will make use of rapid prototyping and agile development methods, which are flexible and efficient approaches. This means that we will create early versions of the app and gather feedback from users and stakeholders. Based on this feedback, we will make improvements and add new features to the app in quick iterations. By using pre-built components and frameworks, we can save time and effort in the development process. This allows us to make progress faster and continuously improve the app based on the valuable feedback we receive.

3.4 Cutover

The cutover phase is an important step before the app is ready to be deployed. It involves thorough testing, data migration, and final preparations to ensure a smooth transition to the live environment. Quality assurance activities are performed to ensure that the app functions as intended and meets the highest standards. This includes testing the app's functionalities, checking for any bugs or issues, and optimizing its performance. Additionally, data migration is carefully conducted to ensure that user progress and data are transferred seamlessly to the live version of the app. User training materials and resources are also developed to provide support and guidance to users as they begin using the app. By completing these essential tasks, we ensure that the app is well-prepared and ready to be launched with a high level of quality and user satisfaction.

4. Scope

The project scope will focus on the targeted user, the platform used in the system, and the functionalities provided in this system. This system will be developed as a mobile application for

Android platforms. The project is a system that will essentially provide a learning and assessment platform focused on the topic of blockchain technology, and all its submodules. Due to the complexity of the concepts of blockchain technology, the target users of this system will be college-level students with a computer science background. Nevertheless, the potential users could well extend beyond college students and include working adults who have a background in IT and computer science or tech enthusiasts who are interested in learning about this new technology.

The system will have account creation for users' progress tracking. The progress tracking will keep track of the ongoing courses that are still yet to be completed and display this information in a dashboard. In terms of the scope of the topics that will be covered, the topics will be within the boundary of blockchain technology. These topics would include an introduction and basics of blockchain technology, applications of the blockchain, cryptography, and more. Lastly, every educational application must contain some form of assessment or quiz in order to test the users on their newly acquired knowledge, and also give the users insight into their level of understanding of certain topics. There will be 2 types of assessments, which are small tests or revision tests that the user can take once they finish a submodule of a topic. The second type is the completion test that will be taken by the user once they finish a whole topic, to test the users on their knowledge of the whole topic and its submodules.

5. Results and Discussion

5.1 Educational Mobile Application

The primary deliverable is an educational mobile application specifically designed for learning about blockchain technology. The application should be available on major mobile platforms (such as Android) and offer a user-friendly interface. It should provide access to well-structured content, interactive learning materials, quizzes or assessments, and a platform for community engagement.

5.1.1 Comprehensive learning modules

The application should include a range of comprehensive learning modules that cover various aspects of blockchain technology. These modules should be well-researched, up-to-date, and presented in an easily understandable format. These will be microlearning styled which includes written content, infographics, videos, interactive exercises, and practical examples to enhance the learning experience.

5.1.2 Progress tracking and assessment features

The app should have features that enable progress tracking and assessment of learners. This includes the ability to track completed modules, monitor quiz or assessment results, and provide learners with insights into their performance and areas for improvement. The app should also offer personalized recommendations based on the learner's progress and performance data.

6. Conclusions

In conclusion, this project presents an innovative approach to address the gap in public awareness and knowledge about blockchain technology in the field of education. By developing an educational mobile application focused on blockchain technology, we aim to bridge the divide between traditional education and the ever-changing world of blockchain. The proposed application will

provide learners with access to specialized education, facilitating their understanding and utilization of blockchain's benefits and opportunities. Through the incorporation of features such as interactive microlearning modules, gamification, and progress tracking, the application aims to create an engaging and immersive learning experience. By empowering learners with blockchain literacy, this application seeks to equip them with the necessary skills and knowledge to thrive in the blockchain-powered future. Ultimately, this project holds significant potential to enhance blockchain education and contribute to the broader adoption and understanding of this transformative technology.

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