

Prototype Development of Mobile-Based Commodity Exchange Information Application for Indonesian Companies

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Informasi Artikel

Riwayat Artikel

Diserahkan : 08-06-2023

Direvisi : 15-06-2023

Diterima : 21-06-2023

Kata Kunci:

Prototipe, Aplikasi Seluler, Extreme Programming, UAT.

Keywords :

Prototype, Mobile Application, Extreme Programming, UAT.

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ABSTRAK

Bursa komoditas adalah pasar tempat perdagangan berbagai jenis komoditas, seperti logam, energi, pertanian, dan lain-lain. Ini adalah tempat di mana para pedagang, produsen, dan investor dapat membeli dan menjual kontrak berjangka atau kontrak spot komoditas. Berdasarkan studi literatur yang dilakukan pada penelitian sebelumnya dan interaksi pribadi serta pertemuan tatap muka dapat membangun hubungan bisnis, menjalin kepercayaan, dan memahami secara mendalam kebutuhan dan preferensi pelanggan. Dalam perdagangan terjadi keterbatasan komoditas secara daring menyebabkan interaksi langsung dapat terbatas. Untuk mengatasi masalah tersebut, penggunaan teknologi dan media komunikasi elektronik secara mobile dapat memudahkan akses dan pertukaran informasi, interaksi manusia yang langsung dapat berkurang. Platform dirancang berupa sistem perdagangan online yang dapat diakses melalui komputer, laptop, atau perangkat seluler. Salah satu Aplikasi berbasis seluler untuk Informasi Pertukaran Komoditas yang dibuat menggunakan pendekatan Extreme Programming adalah aplikasi yang penyebaran informasi yang paling sukses dan efektif. Dengan indikator yang kuat dan kebutuhan pengguna, metode User Acceptance Test (UAT) dan langkah terakhir model pengujian aplikasi menghasilkan skor 93,75%.

ABSTRACT

Commodity exchanges are markets where various types of commodities are traded, such as metals, energy, agriculture, and others. It is a place where traders, producers and investors can buy and sell commodity futures contracts or spot contracts. Based on literature studies conducted on previous research and personal interactions and face-to-face meetings can build business relationships, establish trust, and understand deeply customer needs and preferences. In trade, there are limitations to online commodities causing limited direct interaction. To overcome this problem, the use of mobile technology and electronic communication media can facilitate access and exchange of information, direct human interaction can be reduced. The platform is designed in the form of an online trading system that can be accessed via a computer, laptop or mobile device. One of the mobile-based Applications for Commodity Exchange Information created using the Extreme Programming approach is the most successful and effective information dissemination application. With strong indicators and user needs, the User Acceptance Test (UAT) method and the last step of the application testing model produce a score of 93.75%.

INTRODUCTION

PT Indonesia Commodity and Derivatives Exchange (ICDX) is a commodity futures exchange in Indonesia. This exchange was founded in 2013 and inaugurated by the Badan Pengawas Perdagangan Berjangka Komoditi (BAPPEBTI), as Indonesia's first commodity futures exchange in 2014. The main objective of ICDX is to facilitate transparent, efficient and secure commodity futures trading in Indonesia. This exchange provides an electronic trading platform that enables its members to trade futures contracts online (F. Hukum et al., 2021).

PT Indonesia Commodity and Derivatives Exchange (ICDX) is a multilateral trading and derivatives exchange in Indonesia. PT ICDX provides commodity trading exchange services, including gold, silver, palm oil, coffee, tin and foreign exchange. PT ICDX is directly supervised by Badan Pengawas Perdagangan Berjangka Komoditi (BAPPEBTI), a trade supervisory body that regulates the interests of all parties involved in futures and commodity trading transactions (C. Kirana et al., 2018).

Application development in the context of the Indonesia Commodity and Derivatives Exchange (ICDX) has been the main focus in recent research. According to research conducted by Riani and Wibowo (2022), the implementation of information technology in the form of applications has brought about significant changes in the efficiency and transparency of commodity trading on ICDX. They found that the use of electronic trading applications integrated with the ICDX trading system increased the speed of execution and accuracy of transactions, as well as allowing traders to access real-time market information. In addition, the study by Pranowo et al. (2023) highlighted the importance of developing user-friendly mobile applications to facilitate commodity trading access for traders in remote areas. The results of their research show that with the user-friendly ICDX mobile application, the number of participants and the volume of transactions in the commodity market increases significantly. Overall, these studies confirm that application development in the field of ICDX has great potential to increase the efficiency and accessibility of commodity trading in Indonesia (Riani & Wibowo, 2022; Pranowo et al., 2023).

The company directs its development towards developing mobile-based applications (M. Multazam, 2020) by developing a mobile application for the ICDX exchange. These mobile apps will provide information about ICDX and its trading activities, especially commodity exchanges. In line with the background problems of PT. IDCX, the purpose of making this application is so that the process of providing information online and reducing face-to-face meetings can be done accurately and quickly, increasing effectiveness and efficiency in the process of sharing information and face-to-face agreements between clients.

RESEARCH METHODS

In this study, researchers employed the with Extreme Programming, which emphasises coding as the primary activity at all phases or cycles of system development (R.I. Borman et al., 2020). This method was the most effective for solving the challenges addressed. According to Beck, Beck, Matter, Fowler, and Fowler (2000), Extreme Programming has the advantage that the phases are quick to complete and may be repeated in different ways depending on the focus of the system development goals. Additionally, the Extreme Programming methodology becomes more adaptable and versatile by developing a system that streamlines each process in each stage. The stages of Extreme Programming in system development are as follows (Wella & Fauzan, 2016).

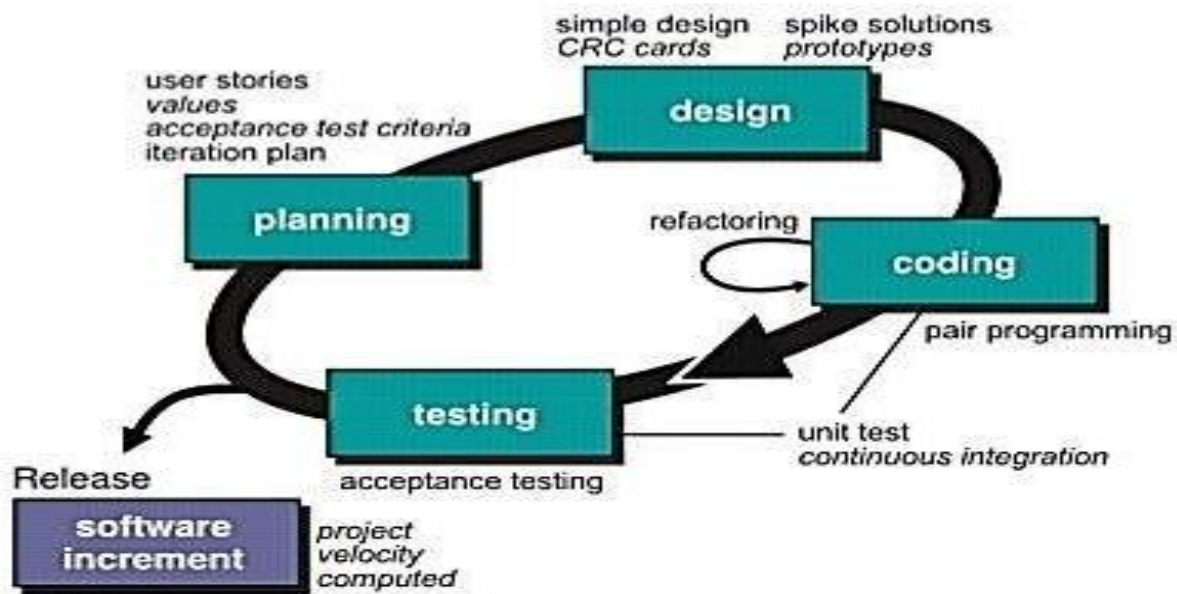


Figure 1. Extreme Programming Model

The stages or phases of the system development model utilising the Extreme Programming methodology are depicted in Figure 1 (Gunadi, 2021). The basis of the Extreme Programming method is a software development method that focuses on features and speed in building software [5]. In the Extreme Programming method there are successive stages starting from System Planning, System Design, Code Writing, and System Testing (K. Beck, 2019). Planning is the initial phase of this research. Interviewing the Director of PT served as the primary method of data collecting at this point. The company's location was then observed by ICDX, who then turned their attention to functional and non-functional requirements. The pages that ICDX website users visit the most frequently are displayed by device user presentations, and you can also see which devices are commonly used to access the ICDX website on this dashboard.

☐ Device Category	Users ▼	Users
	4,263 % of Total: 100.00% (4,263)	4,263 % of Total: 100.00% (4,263)
☐ 1. ■ mobile	2,418	56.71%
☐ 2. ■ desktop	1,821	42.71%
☐ 3. ■ tablet	25	0.59%

Figure 2. Percentage of Device Users

In Figure 2, it can be seen that the use of mobile devices gets 56.71% of its use. Nowadays, the majority of people use smartphones for their daily activities. Therefore, a mobile application is needed to provide information about the ICDX exchange. Information provided such as Articles, markets, Bulletin, Reports and others. From that need, interns are free to make the interface display of the ICDX mobile application. Apprentices are asked to make, based on the ideas of ordinary people about the exchange, the need for information that ordinary people want to see about commodity exchanges.

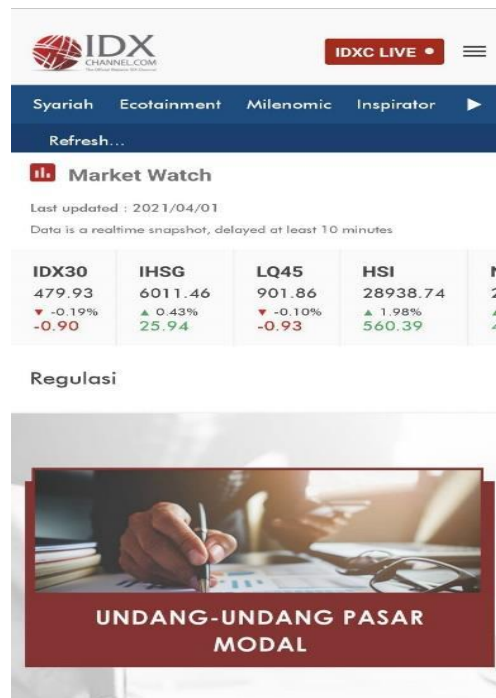


Figure 3. IDX application

In Figure 3. Figure 3 shows that the company already has an information website and still needs development towards mobile applications.

The following phase of system design will be continued from the planning stage, and the next step, system design, will be continued. Use case diagrams, activity diagrams, and system interface design are all part of the UML diagrams used for system design at this level (Wichmann, 2017). After the system design stage, it is continued to the code writing stage. This stage will implement the design form at the system design stage into the form of program code which will then be compiled into a system prototype. At the product configuration and generation stages, system prototypes were tested using the black box method, user instruments and running time. If there is a revision in the test, the configuration is carried out and tested again until the results are as expected. After the prototype has passed the test, the results are analysed, and conclusions are drawn.

RESULTS AND DISCUSSION

Planning

The initial user requirements—or user stories in XP—are gathered during this phase. This is essential so the developer can use how to create this Android-based commodity exchange information application. Following Table 1 of the planning, the strategy is implemented as follows:

Table 1. Planning

No	Requirements	Planning
1	Interviews the users	Observe and evaluate the interview findings
2	Use Case Diagram for an Application	Creating a Use Case Diagram
3	Create an Activity Diagram of an application	Create an Activity Diagram based on the Use Case
4	Application User Interface	Create a Figma prototype for the application
5	Application Development	Develop the Application using Flutter
6	Database Development	Utilising the MySQL DBMS, create the database.
7	Application Testing	UAT testing the application

System Design

This study will continue based on user stories, spikes, and iteration outcomes with the steps in the Extreme Programming Model that have been completed, starting from the initial stage to the iteration stage (Zuhri Halim, 2021). The use case diagram, which explains the application's primary purpose of the application for class scheduling, is described in this part. When that happens, the use case diagram will evolve into an activity diagram (T. A. Kurniawan, 2018):

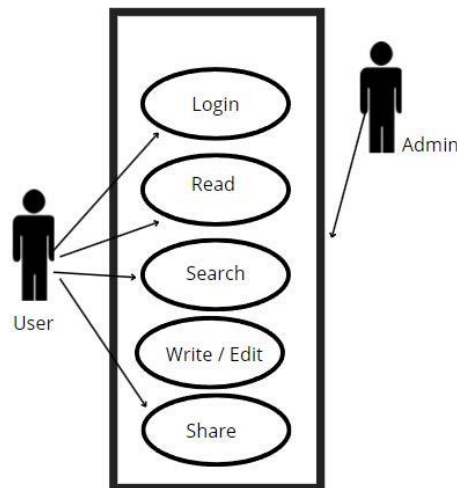


Figure 4. Use Case Diagram

The User and the Admin are the two actors depicted in Figure 4. Admin and User are combined into a single actor because they perform the same task. The use case diagram lists the seven key features each user in information-based commodity applications uses. These capabilities include reading, looking up information, writing and editing, and sharing.

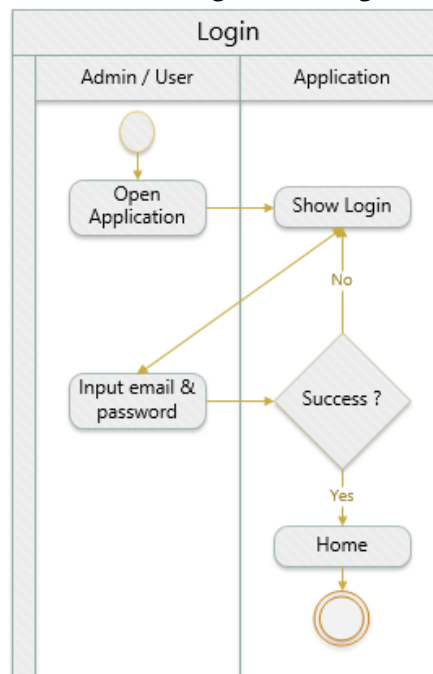


Figure 5. Activity Diagram of Activity login

Once a use case diagram has been created, it will be converted into an activity diagram to explain the user scenario activity of application usage, as shown in Figures 3, 4, 5, 6, and 7. These figures show how the activity diagram is produced from the use case diagram to define the program's primary functions. In Figure 5, the administrator or user initially logs in, followed by entering their email and password. It will proceed to the home page if successful.

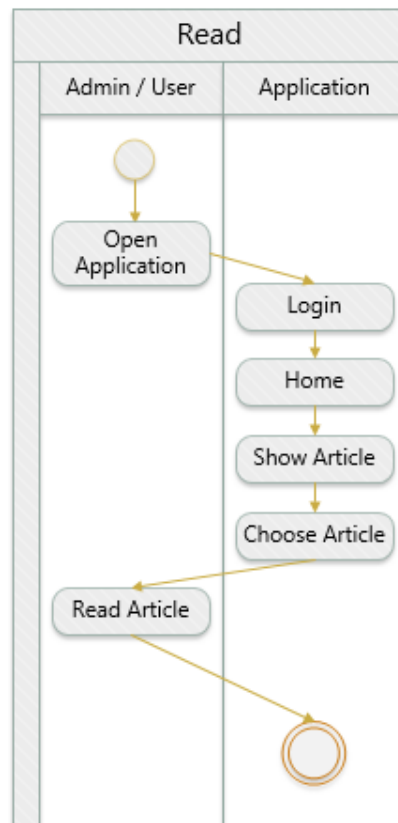


Figure 6. Activity Diagram of Activity Read

Figure 6 shows the step where users access and read the articles they select or find. After searching or navigating to the article of interest, the user opens the article page and starts reading the content. They can use navigation features such as scrolling or clicking to continue reading to the end of the article. During the reading process, users can retrieve relevant information, understand the article's contents, and take additional actions such as leaving comments or marking articles as favourites. In Figure 3.18 Activity Read, after logging in, the user can select the article to be used then the application will display the selected article.

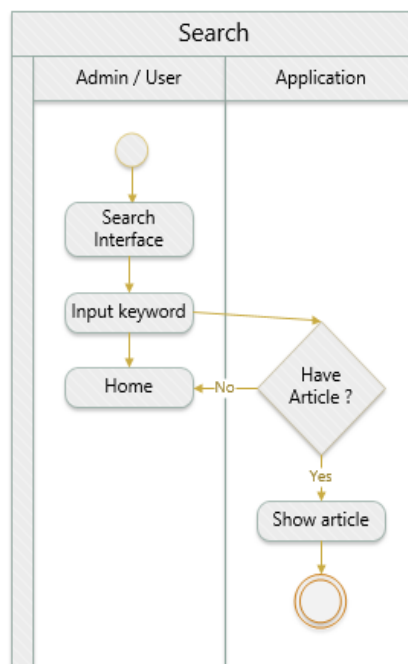


Figure 7. Activity Diagram of Activity Search

The search activity in the activity diagram is the process by which the user searches for specific information or executes a specific query to get relevant results. This search is usually done using the search feature provided in the application or platform. Users can enter specific keywords or filter criteria to narrow the search scope. Next, the system will process the search query and produce relevant results displayed to the user. In Figure 7 Activity Search, the admin/user enters the search keywords then the application performs a search. The application will display the article in question if the keywords are found.

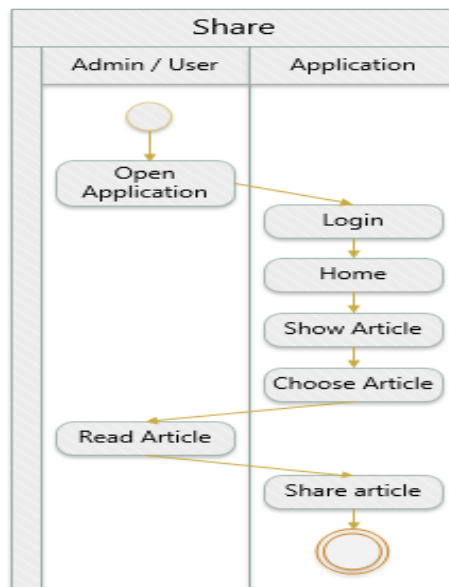


Figure 8. Activity Diagram of Activity Share

In Figure 8 Activity Share, the admin/user can select the articles of interest and then share the application. Articles can be shared with other applications using a link. the step in which users share articles with others through various channels or communication platforms. After reading an interesting article, users can use the sharing options provided in the mobile application to share the article with friends, family or the general public.

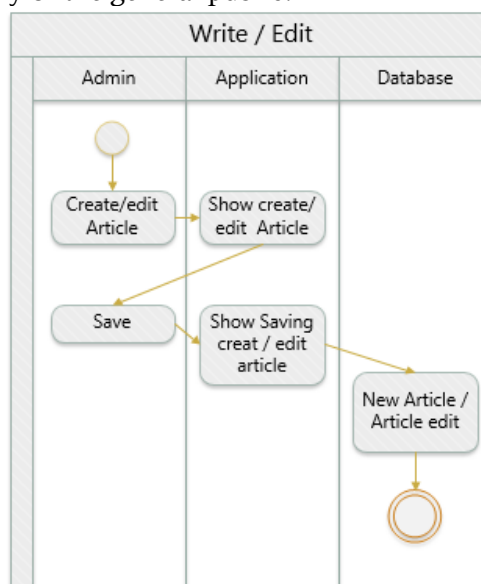


Figure 9. Activity Diagram of Activity Write / Edit

In Figure 9, Activity Write/Edit can only be carried out by the admin; the activities include making articles to be included in the application or editing changes. After entering or making changes to the article, the admin saves it from detecting in the database with new data.

Making UI/UX views of mobile applications with references from three applications. The UI/UX of the ICDX mobile application has 7 UI views to provide an overview of the company's application results.

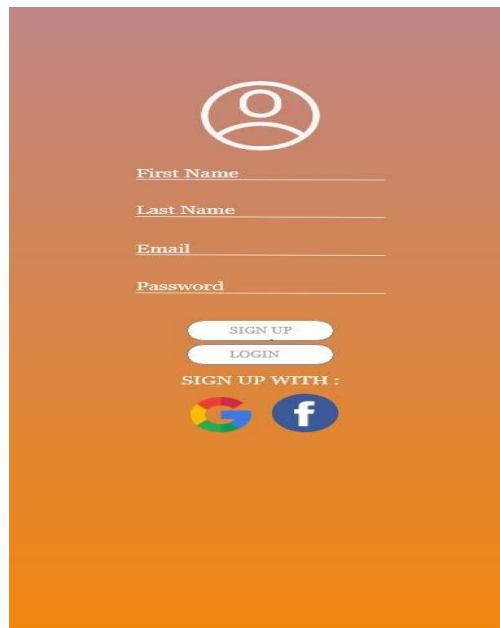


Figure 10. UI Sign Up

The next phase is to develop the user interface after creating the use case diagrams and activity diagrams case diagrams and activity diagrams are produced. A smartphone with a screen size of 5 inches was used as the basis for the user interface designed for this study using Flutter technologies. According to the arrows, some buttons on the login form pages and home screen are connected. Users can log in on the input form page by entering their usernames and passwords; users can log in on the input form page. The mobile PT ICDX application was created using Adobe XD tools, as shown in Figure 3.22. Figure 10 depicts the Sign Up display, the first screen a user sees after registering or logging in to the ICDX program.

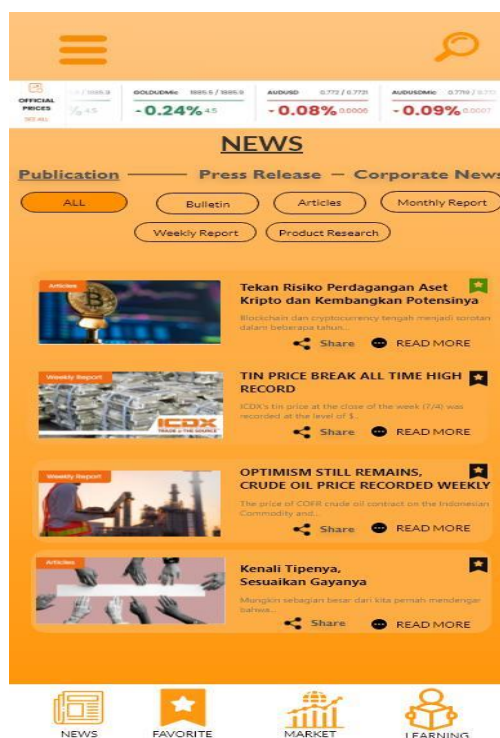


Figure 11. Home Display

Figure 11, the home view, is the initial view of the ICDX mobile application. On the home screen, there is a burger button on the top left to display the side menu from ICDX then there is a search button on the top right. Under the burger button and search, market data will be displayed live later. The home view focuses on displaying information about commodities in Indonesia. The home screen also has news, favourite, market, and Learning buttons.

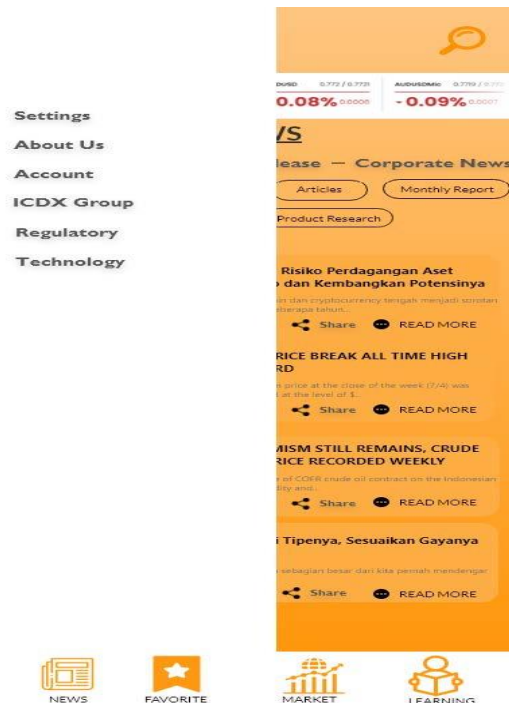


Figure 12. Side Menu

Figure 12 is a Side Menu display intended for additional information about ICDX. On the Side, Menu has settings options, about us, account, icdx group, regulatory, and technology.

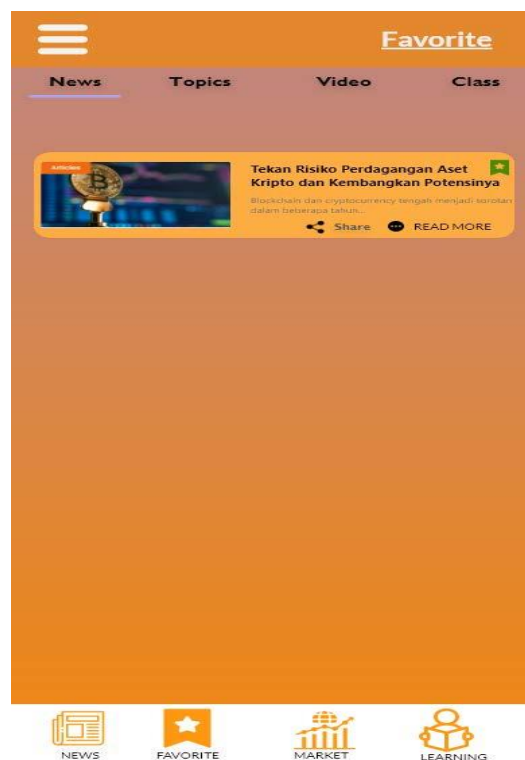


Figure 13. Page Favorite

Figure 13 displays Page Favorites, a feature for storing news or other information that has been marked. On this page, the user can save various articles and news which can be easily read later.

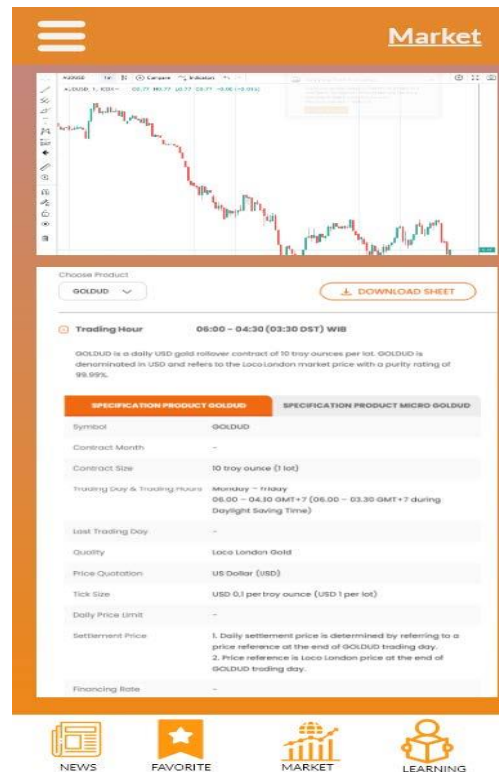


Figure 14. Tab Market

Figure 14 is a display of the Market Tab. This tab provides information on market movements of the desired commodity and Trading Hours, Contracts, Prices, and other information about these commodities. In the ICDX mobile application, the user cannot make trading transactions; to carry out trading activities, the user must use the MetaTrader 5 application.

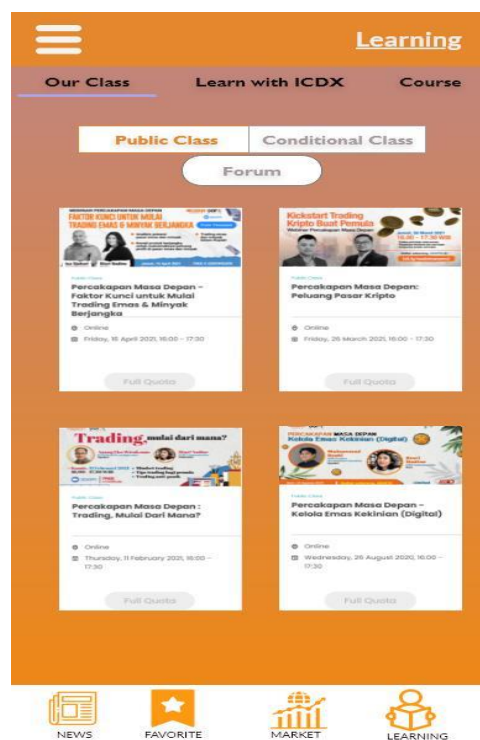


Figure 15. Tab Learning

Figure 15 displays the Learning Tab, which provides information about Classes, Training, Seminars and Forums owned by ICDX. Here users can get training from ICDX on trade and the commodity itself. Learning is a menu explicitly requested by the ICDX Academy division to introduce commodity exchanges to the broader community.



Figure 16. Forums

Figure 16 depicts a forum display where users can respond to ongoing discussions by leaving comments on the posts of other users. The analysis of the feature needs for the intended commodities exchange information application will be used to build use cases and activity diagrams, which will be used to carry out application design at this stage. Performing a User Acceptance Test (UAT) is the next step once the application has been successfully designed. Testing follows test scenarios when reading and sharing news, as well as other possible methods when using the program reading and sharing news, and reading and sharing information, as well as in other possible systems when using the program; testing follows test scenarios.

Coding

Stages of mobile application development by applying the Extreme Programming (XP) rules from the database to the finished program:

Database Design: The development team will design the database structure for the mobile application. They will consider data requirements, relationships between tables, and application performance. Some database technologies that are commonly used in mobile application development are SQLite, MySQL, or Firebase.

Feature Analysis and Design: The development team with stakeholders will collaborate to identify features and user requirements. Based on this analysis, they will create a development plan that involves iteration and priority of features.

Programming: The team will implement mobile application features by starting with the creation of unit tests first. The "test-first" principle in XP means that developers write tests first before implementing code. In developing mobile applications, the programming languages commonly used are Java or Kotlin for the Android platform.

Continuous Integration: Whenever new features are added or changes are made, developers will integrate their code into the shared repository. This ensures that code developed

by various team members can work in harmony. In addition, the continuous integration process also involves automated testing to check whether changes made cause problems in existing applications.

Testing: The development team will conduct thorough testing of the mobile application. They will test each feature, perform functionality, performance, security, and cross-platform compatibility (if applicable) tests. In addition, testing by beta users can also be done to get valuable feedback before the official release.

Improvements and Refactorizations: Based on the test results and user feedback, the team will make improvements and refactorizations of the code to improve the quality and reliability of the application. This could include bug fixes, performance improvements, or user interface improvements.

Delivery and Iteration: After testing and fixing is complete, the team will ship or release the app to distribution platforms such as the Google Play Store or Apple App Store. Furthermore, the team will continue to iterate to update the app with new features or improvements based on user feedback. By applying the Extreme Programming rules, the mobile application development team can produce products that are responsive, of high quality, and in accordance with user needs.

Testing

Program testing starts once it is complete. The testing method concentrates on the logical internals of the software, ensuring that all statements have been tested, and on the functional externals, meaning executing tests to find errors and guaranteeing that constrained input will create on the logical internals of the software, ensuring that all statements have been tested, and on the functional externals, meaning executing tests to find errors and guaranteeing that constrained input will create actual outputs that match the necessary results. According to A, installing this software straight into the Android device is how the testing process has carried out this software straight into the Android device is how the testing process is carried out; according to Black box testing is a test that is executed while keeping an eye on the execution results through test data and functional instruments (A. Verma et al.,2020).

Application testing, which employs the User Acceptance Test methodology, is the concluding phase of this study. Ten program users were involved in the feature testing at this point consists of several clients and staff as well as several managers of PT ICDX. This test method's result can be evaluated using five value criteria: very good or strongly agree to, suitable or agree, neutral, not good, and very bad or strongly disagree. The evaluation criteria for the UAT testing method are listed in the table below. The UAT's outcomes, which are shown in Table 2, are as follows:

Table 2. UAT Results

No	Questions	Score				
		SA	A	N	NG	SD
1	Does this mobile application for commodity exchange information have a nice appearance?	6	4	0	0	0
2	Do this application's backdrop, text, other colours text, and different colours used in this application fit the context?	7	3	0	0	0
3	Is it simple to understand the application's UI and menus?	8	2	0	0	0
4	Does this program have working buttons and cards?	8	2	0	0	0
5	Is it simple to grasp this application's Mobile-Based Commodity Exchange Information detail page?	7	3	0	0	0
6	What practical benefits does the application offer for mobile-based commodity exchange information?	7	3	0	0	0
7	How user-friendly is the accessibility of this program?	8	2	0	0	0
8	Does the information on this application's mobile-based commodity exchange serve as sufficient disclosure?	4	6	0	0	0

The respondents' scores will be divided by the total respondents (10 respondents) to determine the average score for the UAT. The average value will be multiplied by 100% and then divided by 5 for a value presentation.

This can be seen in the formula below:

$$\text{Percentage} = \frac{\text{Average score}}{\text{Maximum weight}} \times 100\%$$

As for the results of the presentation of questions can be seen in table 3.

Table 3. UAT Overall Calculation

Q1 Total = 46. (46/10 = 4.6). (4.6/5) *100%=92%.	Q2 Total = 47. (47/10 = 4.7). (4.7/5) *100%=94%.	Q3 Total = 48. (48/10 = 4.8). (4.8/5) *100% = 96%.	Q4 Total = 48. (48/10 = 4.8). (4.8/5) *100% = 96%.
Q5 Total = 47. (47/10 = 4.7). (4.7/5) *100% = 94%.	Q6 Total s= 47. (47/10 = 4.7). (4.7/5) *100% = 94%	Q7 Total = 48. (48/10 = 4.8). (4.8/5) *100% = 96%.	Q8 Total = 44. (44/10 = 4.4). (4.4/5) *100% = 88%.

By dividing all percentage computations by the total number of questions asked, it is possible to determine the answers to the eight questions of all percentage computations by the total number of questions asked, it is possible to determine the answers to the eight questions were provided to responders. The total is calculated as follows:

$$(92\% + 94\% + 96\% + 96\% + 96\% + 88\%) \div 8 = 750\% \div 8 = 93.75\%$$

According to the average total calculation obtained, the application tested by the User Acceptance Test has an excellent indicator, which is 93.75%, as shown in Table 2.

CONCLUSION AND RECOMMENDATION

Conclusion

The following are the findings from using the Extreme Programming (XP) method and UAT testing to create a mobile-based prototype for PT Indonesia Commodity & Derivatives Exchange (ICDX) that contains commodity exchange information:

UAT testing of the generated prototype for mobile devices produced very positive results. The total calculation average of 93.75% shows that users who have tested the User Acceptance Test (UAT) applications give them very high ratings.

The Extreme Programming (XP) method's application in developing this prototype has brought satisfactory results. This method encourages team collaboration, iterative development and is responsive to changing user needs. This enables fast, adaptive and high-quality application development.

In the UAT test, users give an excellent assessment of the application being developed. This shows that the application effectively provides information on commodity exchanges according to user needs. This success proves that this mobile-based prototype can be an efficient and effective solution in providing users access to commodity exchange information.

Recommendation

Maintain data security and user privacy by ensuring the application has a robust security system. In commodity exchange information, data security is critical to protect sensitive information and build user trust. Optimising the features and functionality of mobile-based applications and constantly updating and improving the user experience by adding relevant features, an intuitive interface and good speed in accessing and updating commodity exchange data.

ACKNOWLEDGMENT

The research was completed thanks to Universitas Multimedia Nusantara's assistance and backing to Universitas Multimedia Nusantara's help and backing; the study was conducted. I want to express my gratitude for all of your assistance and support during the preparation of this post.

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