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Making a Mobile-Based Social Media Information System for Environmentalists with Flutter and AWS

Mohamad Alvin Renaldi[1*]
[1*]Software Engineering Technology, Faculty of Vocational School, IPB University
renaldialvin@apps.ipb.ac.id

Ester Angeline[2], **Fiona Kharismatunnisaa**[3], **Fiqri Nurfadillah**[4], **Firdayanti**[5], **Ivan De Nerol**[6], **Muhammad Danang Mukti Darmawan**[7], **Nanda Octavia**[8], **Riyo Putra Syam Satria**[9], **Yourdan Saputra**[10]
[2456789]Computer Engineering Technology Study Program, Faculty of Vocational School, IPB University
[2]esterester@apps.ipb.ac.id, [4]fiqrinurfadillah@apps.ipb.ac.id, [5]100302yantifirdayanti@apps.ipb.ac.id, [6]Ivandenerolivan@apps.ipb.ac.id, [7]danangmukti@apps.ipb.ac.id, [8]naocavianand a@apps.ipb.ac.id, [9]riyoputrasyam@apps.ipb.ac.id
[310]Software Engineering Technology, Faculty of Vocational School, IPB University
[3]kharismafiona@apps.ipb.ac.id, [10]yourdan28yourdan@apps.ipb.ac.id

Abstract

This research explores an effective role in environmental conservation through technological innovation. This study aims to design and develop a mobile-based social media application by utilizing Flutter technology and AWS architecture. The research focuses on managing user data securely and efficiently through AWS services. This research uses an applied method based on the Scrum framework, emphasizing technology integration for environmental preservation and AWS implementation for data security. The results showed successful application development in line with the company's environmental sustainability mission. The data management system ensures safe and efficient handling of user information. The study concludes with a summary of findings, emphasizing the positive impact of technology on environmental initiatives.

Keywords: social media, flutter, AWS, scrum

INTRODUCTION

Climate change and environmental degradation have become urgent and critical global issues. This phenomenon not only affects temperature and rainfall, but also various aspects of the environment, causing serious impacts. A recent study (Nurul Fajar & Lilis Chaerowati, 2021) highlights the importance of addressing this issue. In addition, climate change also brings negative impacts on people's lives, such as rising sea surface temperatures, extreme weather intensity, changes in rainfall patterns, and large waves (Ulfa, 2018) . This is the background that underlies the urgency of this research.

The urgency of this research is emphasized by the increasing impact of climate change and environmental change on human life. The fact that climate change is an urgent and critical global issue, with dire impacts, requires collective and innovative efforts to respond to this challenge (Nurul Fajar & Lilis Chaerowati, 2021) .

Previously, (Meilinda, 2018) highlighted the role of technology, especially the internet, as a new opportunity for humans. The internet, as a form of media convergence, provides a platform for social media, which now has a key role in disseminating information and influencing behavior (Hidayatullah & Sutarso, 2023) . In this context, environmental changes that are increasingly concerning have led to the environmental responsibility action movement through social media (Gede Wiryawan et al., 2021) .

As pointed out by (Lestari, Siskandar, et al., 2020) internet is one of the most impactful information technologies. Internet usage can play a key role in enhancing public awareness of environmental issues.

While there is a well-established understanding of the impact of the environment and climate change, previous research has not fully explored the potential of technology companies in supporting environmental conservation initiatives through the development of mobile-based applications. This research seeks to fill this gap by detailing the contributions of technology companies in mitigating environmental issues through the application of current technologies and innovative approaches.

This research aims to bridge the existing gap in prior studies that have addressed the impacts of climate change and the environment. It focuses on the contemporary role of technology companies, highlighting their contribution to addressing environmental challenges through technological advancements. Specifically, by concentrating on the development of mobile-based applications using Flutter technology and AWS architecture, this research provides an additional contribution to the current understanding of technology companies' roles in environmental conservation efforts. It offers a more integrated and up-to-date perspective to address the ever-growing environmental challenges.

The efficiency and convenience driven by mobile applications allow users to access information and relevant services quickly and easily (Dwi et al., 2023). This aspect becomes particularly crucial in the context of environmental conservation, where timely access to information can empower individuals to make informed decisions and take collective action.

Furthermore, as highlighted by (Akram & Kumar, 2017), social media serves as an online platform used by people to build social networks and relationships based on shared interests, group activities, personal pursuits, or interactions related to similar career paths. In the realm of environmental responsibility, social media has emerged as a powerful tool, fostering connectivity and mobilizing individuals and communities for collective environmental action (Nindita et al., 2023).

The novelty of this research lies in its holistic approach to environmental issues, integrating elements of technology, social media, and environmental preservation. The study aims to pioneer the development of an application that not only serves as a traditional social media platform but also functions as an effective tool for disseminating environmental information and mobilizing collaborative action.

Supporting facts from previous research, (Ulfa, 2018) add the dimension that environmental change also brings negative impacts on people's lives. (Gritten et al., 2012) highlighted the important role of companies in social and environmental change with the ability to influence consumer behavior and support environmental initiatives.

(Ary Pratama et al., 2019) noted that although social media has positive potential in supporting environmental issues, unwise use can reduce the ability of social interaction, especially among teenagers, which leads to apathy towards the surrounding environment. (Riyanti & Dewi Eka Murniati, 2016) emphasized that social media, as a platform that focuses on user existence, can be utilized more wisely for environmental purposes.

As emphasized by (Ayub & Sulaeman, 2022), technology has evolved and increasingly influenced and benefited human life. This research aims to explore how technology, particularly mobile applications developed with Flutter and AWS, can contribute to environmental conservation efforts.

The purpose of this research is to design and develop a mobile-based application using Flutter technology and AWS architecture. This application is expected to be an effective platform for disseminating environmental information, encouraging collaboration, and mobilizing support for environmental conservation efforts.

METHODS

Data Collection Technique

The data collection technique that will be focused on is a literature study. According to (Putrihapsari & Fauziah, 2020), literature study is defined as research conducted by examining various literature studies needed in research. This technique will be used to gain a deep understanding of the concept of mobile-based application development, the Flutter framework, and the concept of AWS architecture in data and content management.

According to (Lestari et al., 2019) literature study is a very important approach in the planning stage and understanding of application development concepts. In this research, we will conduct a literature study to collect relevant information from existing sources. The literature study will help us in several important aspects:

- Concept Understanding: The literature study will help in understanding the basic concepts of mobile-based application development. It will explore the theories and frameworks that underlie modern mobile application development.
- Flutter Framework: The research will delve into the literature study related to the Flutter framework, which is used in the development of this application. This will help understand the features, capabilities, and development methods offered by Flutter.
- AWS Architecture: This research will also conduct a literature study on AWS architecture concepts in data and content management. This literature study will help understand how AWS services can be used to securely and efficiently manage application data and content.
- Formulate the Framework: The results of the literature study will be used to formulate a framework for mobile-based application development. This will be the main foundation in the app design and development phase.

The literature study will be a valuable source of knowledge to guide the entire app development process. With the information obtained through study, we will be able to plan, design, and develop the app with a strong understanding of the concepts and technologies used.the literature.

To enhance the analysis, this method includes the collection of application performance data from AWS, focusing on security and efficiency. The researcher will gather data such as user activity logs and security reports from AWS. This analysis will utilize statistical techniques to evaluate the effectiveness of security and efficiency of the application.

Data Analysis

Techniques In the data analysis stage, data collected through literature study data collection techniques will be organized and interpreted to understand the concepts and frameworks that support the development of this mobile-based application (Saputra et al., 2023).

a. Data Organization

   Data obtained through the literature study will be organized by classifying information based on topics, concepts, and frameworks relevant to the application development (Siskandar et al., 2020). This will facilitate access and understanding of the data.

b. Theme Clustering and Discovery

   The organized data will be analyzed to identify patterns, themes, and key findings. Correlations and relationships between concepts and frameworks found in the literature will be explored. These findings will aid the understanding of the basic frameworks that can be applied in mobile app development(Santosa et al., 2021b)

c. Data Interpretation

   The data interpretation process involves an in-depth analysis of the findings and information found in the literature. An attempt will be made to understand the implications of existing concepts and frameworks to the application development being

undertaken. This data interpretation will help in identifying the key parts that should be implemented in the app development.

This data analysis process will form a strong basis for formulating a suitable and effective application development framework. With a deep understanding of the concepts and technologies contained in the literature, better decisions can be taken in the development of mobile-based applications.

The researcher also conduct an in-depth analysis of the security and efficiency data from AWS. This includes evaluating user activity logs and security reports. Descriptive and inferential analysis methods will be used to provide insights into the security and efficiency of the application.

Work Procedures

The work procedures in developing this application will follow the principles of the Scrum methodology. According to (Sasmito & Fauzan, 2020), Scrum is a software development framework that emphasizes flexibility, team collaboration, and responsiveness to change.

The development of this application will use the Flutter framework.(Santoso et al., 2020) explain that Flutter allows developers to produce a single codebase that covers both aspects, which in turn simplifies the application development process and optimizes efficiency.

AWS architecture will also be used in the development of this application. According to (Kewate, 2022), the advantage of AWS lies in the various services offered to support privacy, maintain data integrity, and ensure customer data availability.

RESULTS AND DISCUSSION

The accountability to the problem formulation and research questions in the development of mobile applications based on Flutter and AWS architecture refers to a systematic process involving requirements analysis, concept design, prototype development, testing, and implementation using Scrum methodology. Each step in this process has a direct impact on solving the problem formulation and answering the research questions posed.

Application Development Process

1. Requirements Analysis

   The first step in the development process is a needs analysis that involves intensive communication with relevant parties(Fakhiratunisa et al., 2021). The results of this analysis became the basis for the formation of the Product Backlog, which contains a list of needs and features to be developed(Kharismatunnisaa et al., 2023).

Table 1. Product Backlog

Features	User Story
Login	As a user, I want to be able to log into the app using my account to access exclusive features.
Logout	As a user, I want to be able to log out of my account to maintain my security and privacy.
Posting Deeds	As a user, I would like to be able to post my good deeds to share environmental awareness.
Explore	As a user, I want to see posts from other users who are not just my friends, so that I can explore more positive activities.
Posting Post	As a user, I want to be able to post text and content unrelated to good activities, to share other information or experiences.

Chatting	As a user, I want to be able to communicate directly with friends or other users through the chat feature.
Timeline	As a user, I want to see posts only from my friends in order to better follow their activities.
Friend Profile	As a user, I want to see profiles of my friends to know more about them.
Comment	As a user, I want to be able to comment on other users' posts to interact further.
Like	As a user, I would like to be able to like other users' posts as a form of support or appreciation.
Profile	As a user, I want to be able to manage and edit my profile to share personal information and other settings.
Nofication	As a user, I would like to receive notifications about relevant friend activity, comments and other actions.

2. Concept Design

Once the user requirements are understood, the next process is to design the application concept (Ardelia Wirastuti et al., 2021). This design includes key features, user interface, and technical architecture. This concept not only guides the development but also shows a clear connection to the problem to be solved.

3. Prototype Development

Prototype development is done in fixed periods of time, called Sprints, lasting between 1 to 4 weeks (Alwahdi et al., 2023). Each Sprint results in a functional incrementation of the mobile application. In each Sprint, the team focuses on tasks selected from the Product Backlog, producing tangible results that can be tested and evaluated.

4. Testing and Improvement

Application prototypes are tested by developers with the aim of identifying problems and necessary improvements (S. Wicaksono et al., 2023). This testing process is crucial to ensure that the app meets the set quality standards and responds well to user needs.

5. Implementation and Launch

Once the prototype is deemed ready, the app is implemented and launched for use by the environmentalist community. This stage involves finalizing every feature and aspect of the app, ensuring its readiness for widespread use (Hatrinidinar Rasya et al., 2020a).

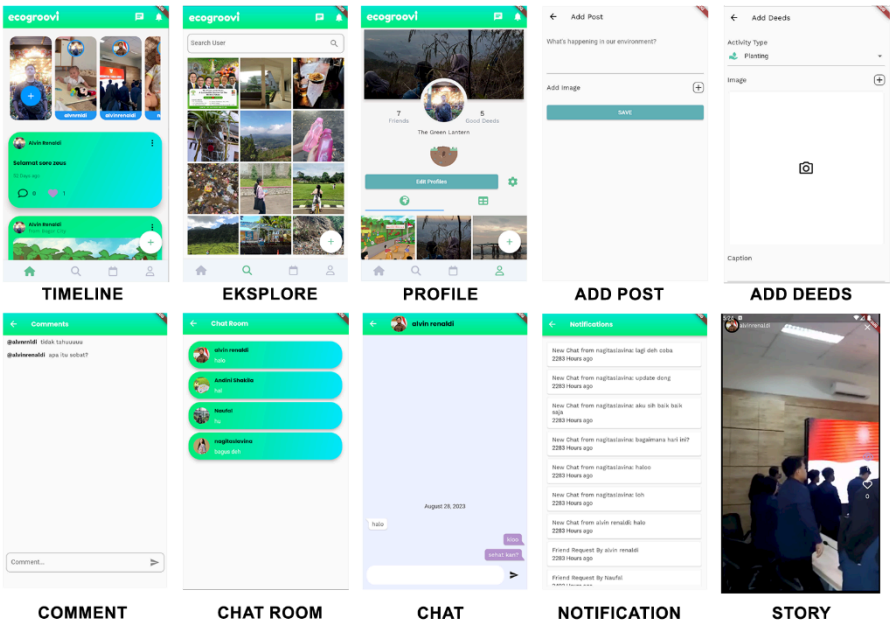


Figure 1. All developed features

6. Evaluation and Maintenance

Post-launch, the app is continuously evaluated. User feedback is taken seriously, and maintenance and improvements are made as needed (Lutfi Yustisyia et al., 2023). This process is ongoing to ensure that the app remains relevant, efficient and powerful.

Flutter Implementation and AWS Architecture

1. Flutter as a Frontend

In developing the mobile application for this project, the researcher chose to use Flutter as the frontend development framework. Flutter was developed by Google and has become a popular choice because it allows developers to create attractive and responsive user interfaces efficiently. With its widgetized structure, Flutter simplifies app development and maintenance.

Some of the Flutter features utilized in this project include:

a. Hot Reload for Fast Development

Flutter's Hot Reload feature allows developers to view live changes while coding without requiring a restart of the application. This speeds up the development cycle and makes it easier to identify and fix bugs. Hot reload feature in Flutter is called as Stateful hot reload and it is a major factor for boosting the development cycle. Flutter supports it during development. Stateful hot reload is implemented by sending the updated source code into the running Dart Virtual Machine (Dart VM) without changing the inner structure of the application (Tashildar et al., 2020)

b. Powerful Widget System

The widget-based structure of Flutter allows separation of duties and consistency of the user interface. Each element of the graphical interface is represented by a widget or a group of widgets. In Flutter, a widget represents a description of a graphical element that can be a structural element, styling element, and a schematic element (Tăbuşcă et al., 2022).

c. Support for Different Platforms

With a single codebase, Flutter supports app development for both Android and iOS platforms. This enables efficiency in app development and maintenance.

2. AWS Architecture as Backend

Flutter is used as a fast and consistent mobile app development framework. Using Flutter, you can create attractive and responsive user interfaces consistently across multiple platforms.

a. AWS Cognito for Authentication

Amazon Cognito is a User Management System used to manage user pools that controls user authentication and access for mobile applications (Choudhary et al., 2020). AWS Cognito plays a critical role in our application by providing a user identity management system that supports sign-up, sign-in, and access control to our resources. This enhances security by ensuring that all user data is securely managed and each user has appropriate permissions. In this project, user authentication is managed by the Cognito service with the following configuration:

```
"ecogroovi": {
  "customAuth": false,
  "frontendAuthConfig": {
    // ... (konfigurasi otentikasi)
  },
  "providerPlugin": "awscloudformation",
  "service": "Cognito"
},
```

Figure 2. Cognito service configuration

b. AWS AppSync for API and GraphQL

AWS AppSync accelerates application development by enabling seamless data synchronization and real-time updates across user devices. This GraphQL service simplifies the process of designing a scalable API, thereby improving system effectiveness. AWS AppSync provides API services that can be accessed using GraphQL. In this project, the API configuration is implemented as follows:

```
"ecogroovi": {
  "dependsOn": [
    {
      "attributes": ["UserPoolId"],
      "category": "auth",
      "resourceName": "ecogroovi"
    }
  ],
  "output": {
    "authConfig": {
      "additionalAuthenticationProviders": [
        {
          "authenticationType": "AWS_IAM"
        }
      ],
      "defaultAuthentication": {
        "authenticationType": "AMAZON_COGNITO_USER_POOLS",
        "userPoolConfig": {
          "userPoolId": "authecogroovi"
        }
      }
    }
  },
  "providerPlugin": "awscloudformation",
  "service": "AppSync"
},
```

Figure 3. API Configuration

c. AWS Lambda for Serverless Functions

AWS Lambda is a FaaS (Function as a Service) service that allows users to run code automatically in an environment managed by Amazon Web Services (Arifin et al., 2023). AWS Lambda revolutionizes backend processing by allowing user to run code in response to events without provisioning or managing servers. This serverless execution model boosts the system's efficiency and ensures that our security model is scalable and cost-effective. Various serverless functions are implemented using AWS Lambda, such as the "acceptfriend" function. Lambda provides flexibility in handling backend logic without the need to think about server management.

d. AWS Pinpoint for Analytics

AWS Pinpoint is used for analytics in your project. AWS pinpoint is forms the core of the solution and is leveraged for storing templates along with versions, sending and receiving communication to customers and providing basic transaction-based analytics (Rakshit & Shome, 2023). AWS Pinpoint is integral to the application's engagement strategy, providing targeted push notifications to improve user engagement. It collects data on user behavior, which is invaluable for crafting personalized, effective communication strategies, enhancing both the system's effectiveness and the security of user data. Configuration details can be found in the section:

```
"analytics": {
  "ecogroovi": {
    "providerPlugin": "awscloudformation",
    "service": "Pinpoint"
  }
},
```

Figure 4. AWS Pinpoint Configuration

Practical and Theoretical Implication

1. Practical Implications

The findings of this research have a direct impact on the development of the resulting mobile application. By integrating Flutter as the frontend framework and AWS architecture as the backend, the application offers advantages in responsiveness and security. The success of this integration has positive implications for user experience, ensuring an attractive interface and optimized performance.

In addition, the use of AWS services such as Cognito for authentication provides additional security, while the efficient implementation of Flutter accelerates the development cycle. This provides direct benefits to application owners in terms of savings in development time and costs.

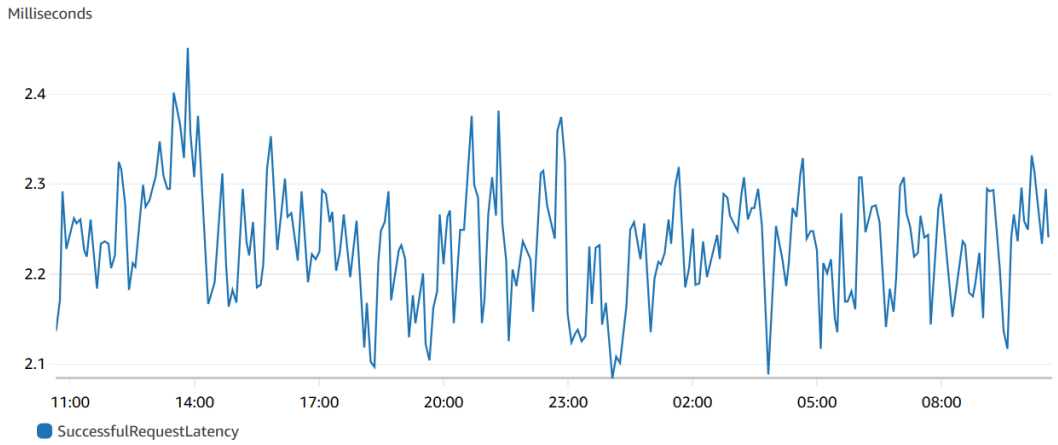
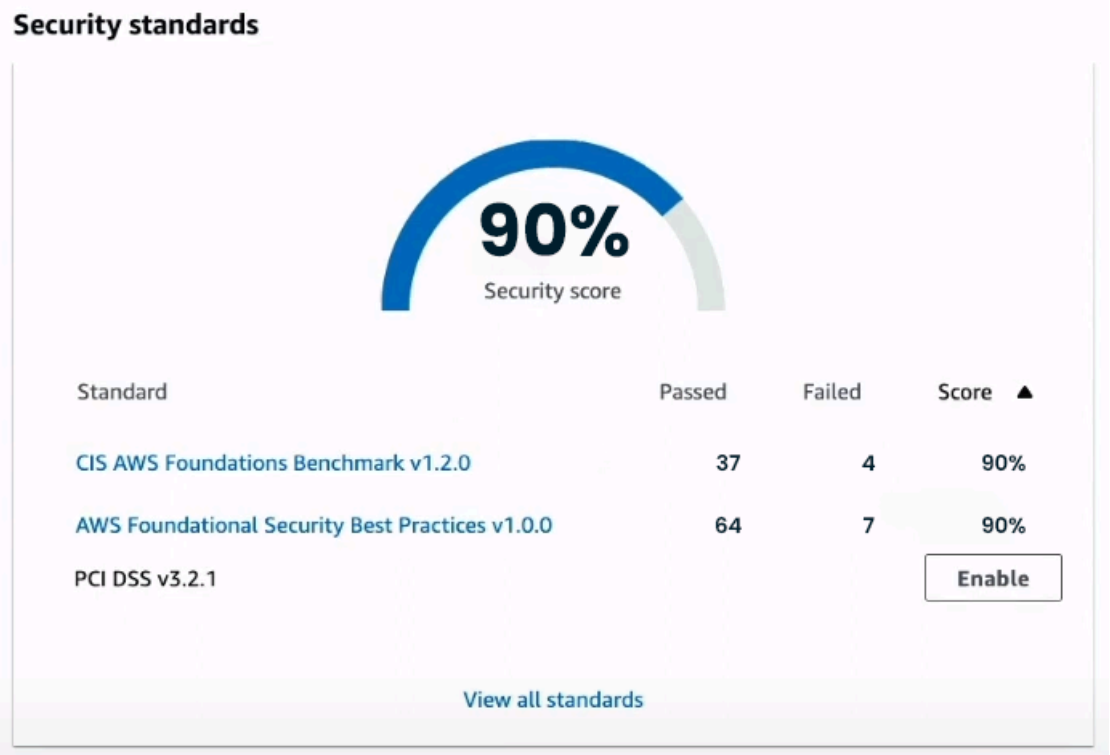


Figure 5. AWS CloudWatch metrics display the responsiveness of the mobile application's 'Post' latency measurements.

The AWS CloudWatch graph reflects that the latency for user 'Post' records is within an acceptable range, suggesting the mobile application's responsiveness is positively aligned with user expectations. Such an acceptable range is likely due to the optimized computing resources and efficient scaling policies provided by AWS, ensuring that increases in user activity do not degrade performance. This stable latency within a desirable threshold confirms that the backend architecture is adequately provisioned and well-configured to handle user requests without introducing significant delays, thereby maintaining a smooth and responsive user experience.



In the latest security assessment conducted via the AWS Security Hub, the system of mobile application configuration with AWS has showcased exemplary compliance with rigorous security benchmarks, attaining a notable 90% security score. This score is based on stringent standards, notably the CIS AWS Foundations Benchmark and AWS Foundational Security Best Practices, with the application successfully passing 37 of 41 and 64 of 71 checks, respectively. These checks span a comprehensive range of security aspects, including identity and access management, data encryption, logging and monitoring, and network configuration. Such a high achievement not only illustrates the application's strong defensive measures against cyber threats but also reflects a well-structured and secure architecture. The detailed attention to security

practices ensures the integrity and confidentiality of user data, establishing the application as a paragon of secure software development within the cloud computing sphere.

2. Theoretical Implications

Theoretically, these findings contribute to the understanding of best practices in developing modern mobile applications. The use of Flutter as a UI framework presents a cohesive approach to cross-platform interface development, while the integration with AWS provides a new perspective on managing a secure and efficient backend.

Interpretation of Research Findings

1. Interesting Finding

Significant improvement in interface response time after Flutter implementation and successful authentication with AWS Cognito service are the main highlights. The indicated development efficiency and high level of security provide an interesting dimension to the results of this study.


```
{
  "version": "1",
  "cognitoConfig": {
    "identityPoolName": "testAuthIdentityPool",
    "allowUnauthenticatedIdentities": true,
    "userPoolName": "ecogroovi",
    "autoVerifiedAttributes": ["email"],
    "mfaConfiguration": "OFF",
    "passwordPolicyMinLength": 8,
    "passwordPolicyCharacters": [
      "Requires Lowercase",
      "Requires Numbers",
      "Requires Symbols",
      "Requires Uppercase"
    ],
    "userpoolClientGenerateSecret": false,
    "userpoolClientRefreshTokenValidity": 30,
    "authSelections": "identityPoolAndUserPool",
    "serviceName": "Cognito",
    "usernameAttributes": ["email"],
    "useDefault": "manual",
    "usernameCaseSensitive": false
  }
}
```


Figure 5. AWS Cognito authentication backend configuration.

2. Development Potential

These findings open up significant development opportunities. Performance optimization, addition of features based on user findings, and exploration of further integration with AWS services are potential steps to take this application to the next level.

3. Significant Contributions

Significant contributions are seen in the strong unification of frontend and backend technologies. The implementation of these best practices can be a valuable guide for other developers and companies planning to introduce or enhance their mobile apps.

CONCLUSION

Overall, this research successfully designed and developed a mobile-based social media application that utilizes Flutter technology and AWS architecture with the aim of supporting environmental conservation efforts. Against the backdrop of the pressing global issue of climate change, this application is expected to be an effective tool for mobilizing community support in maintaining environmental sustainability. The research findings show that the use of applied methods,

particularly by integrating the Scrum framework, provides a strong foundation in the development of this application. With a focus on managing user data securely and efficiently through AWS services, the app introduces a holistic approach to environmental issues, combining aspects of technology, social media, and environmental conservation. In conclusion, this research makes a significant contribution to understanding the role of technology companies in supporting environmental initiatives and offers innovative solutions to this increasingly pressing global challenge.

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