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SPENDGUARD: A FIREBASE-INTEGRATED ANDROID APPLICATION FOR CATEGORY-WISE EXPENSE TRACKING, INTERACTIVE GRAPHICAL VISUALIZATION USING MPANDROIDCHART

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ABSTRACT: Modern age demands people to properly maintain their budgets to stay in control of their expenditures. Spend Guard is the most robust mobile-based application for Android-based phones. It helps users keep track of earnings and expenditures under various heads. This also guarantees that the data remains safe and is accessible to the user on other devices, also User Interface is super friendly. It provides real-time synchronization with Firebase and storage facilities for data. A transaction module facilitates adding, modifying, deleting, and searching for transactions. Moreover, it also provides facilities like EMI calculations and income tax calculations.

Well Spend Guard is endowed with excellent visualization prowess, which is made possible by the MPAndroidChart package. Each user can interactively create dynamic bar charts that describe their spending by time and category. This can help users improve their budget, to locate trends, and to choose wisely.

Spend Guard is focused on custom reports and adaptability, permitting users to generate detailed visual reports and look up transactions by date or category. The app can also be used anywhere with insufficient connectivity by simply setting it to run offline, while also providing simple user interactivity. The application is highly scalable and effective as it is built using Java and XML in Android Studio, thus permitting a variety of Android devices to support it due to its light-weight architecture.

KEYWORDS: Android App, Firebase, MPAndroidChart, Budget Management, Income-Expense Categories, Data Visualization.

I. INTRODUCTION

In the accelerated rhythm of today's digital society, personal financial management has grown very prominent. With increasing costs and numerous income channels, people require a set of efficient tools to track and manage their spending habits. Spend Guard is an Android-based mobile software application that efficiently categorizes income and expenses for the purpose of personal expense tracking. The application provides the user with a complete view of his/her financial transactions by integrating with Firebase for real-time cloud data management and MPAndroidChart for interactive visualizations. Its user-friendly features include calculators, graphical reports, and search capabilities, which make it convenient to plan their budget. Spend Guard can assist a person in managing their money better and making wise decisions for a secure future.

II. LITERATURE SYRVEY

Over the past few years there has been a big evolution in applications of financial management, thereby giving the user strong tools for the tracking of costs and erection of budgets. One of the widely popular personal finance applications, Monefy, emphasizes an easy-to-use design and does so by providing a simple way to input a transaction. An analysis made by AppBrain [1] states that Monefy really does make budget tracking easy by representing expenses in pie

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charts. However, from an advanced experiences standpoint, features such as multi-account support and advanced analytics are very much lacking, and cross-device data syncing has been limited because of the absence of cloud integration. This speaks to the need for tools which combine simplicity with high-level capabilities that Spend Guard aims to provide through the dynamic MPAndroidChart-based visualizations coupled with Firebase integration.

A Han and Pei study on data management systems found that real-time database integration increases data dependability and accessibility [2]. Firebase is a Backend-as-a-Service (BaaS) that offers real-time data syncing, cloud storage, and authentication—all essential for developing responsive finance apps. Firebase apps benefit from seamless offline support, user-based data separation, and increased scalability. Spend Guard uses this strategy to ensure that user data is synchronized across multiple Android devices and that offline operations function seamlessly, offering the best usability in places with inconsistent internet connectivity.

Spending Manager is another well-liked program with a number of features, including budgeting tools, graphical reports, and regular spending tracking. However, according to a review in the International Journal of Advanced Computer Science and Applications (IJACSA), its interface is confusing and often frightening for inexperienced users [3]. Furthermore, the lack of customization options in category-based spending tracking limits its applicability for in-depth financial analysis. Spend Guard eases these concerns and enhances the user's financial awareness and control by offering a clear, modular user interface, customizable categories, and searchable date and type filters.

A 2020 study by Sharma et al. [4] examined the impact of visual analytics in mobile financial apps and found that users are more likely to adopt apps that provide engaging and intelligible visual representations of their data. Tools like MPAndroidChart increase user engagement by offering interactive, real-time graphs that show spending trends and category-by-category comparisons. Spend Guard puts this concept into practice by utilizing MPAndroidChart to provide visually appealing, real-time graphs that let users rapidly evaluate financial activity. Spend Guard's combination of real-time data access and analytical visualization positions it as a very helpful solution for modern spending management.

EXISTING SYSTEM

Wallet, Spending Manager, and Monefy are some of the personal finance apps that offer basic features like budgeting, tracking spending, and simple visualizations. Still, many of them don't have advanced features like secure data management, in-depth analysis by category, and real-time cloud syncing. Others don't have strong user authentication or offline access, and they rely on local storage, which puts data at risk. These problems show how important it is to find better solutions that include interactive visual tools and cloud integration. Spend Guard does this by combining Firebase with MPAndroidChart.

PROPOSED SYSTEM

The recommended solution, Spend Guard, is an Android app that integrates Firebase and attempts to offer a comprehensive and secure platform for managing personal finances. You can manage your expenses, income and search based on chosen date or category. Unlike existing systems, Spend Guard uses Firebase to provide real-time data synchronization across devices, ensuring data accessibility and security. Users can manage their finances without constant internet access thanks to its offline support. A key component of the system is the ability to generate dynamic and visually appealing graphs that display spending patterns and category-by-category analysis using MPAndroidChart. The software serves as a complete financial assistant with additional features like an EMI calculator and income tax estimate.

III. SYSTEM ARCHITECTURE

The system architecture diagram for Spend Guard illustrates how users engage with the program. Once the process is initiated, the user moves on to the next registration and login steps. The user is presented with a conditional decision point after authentication, where they can, among other things, view balance summaries (with the option to save them as PDF), add or update income and expenses, remove financial records, and access categorized income and expense data. Each function is modular, which improves efficiency and usability. After completing any of these steps, the user can safely sign out to end the session. This well-organized flow, which gives security, modularity, and easy navigation top priority, ensures a logical and user-friendly experience.

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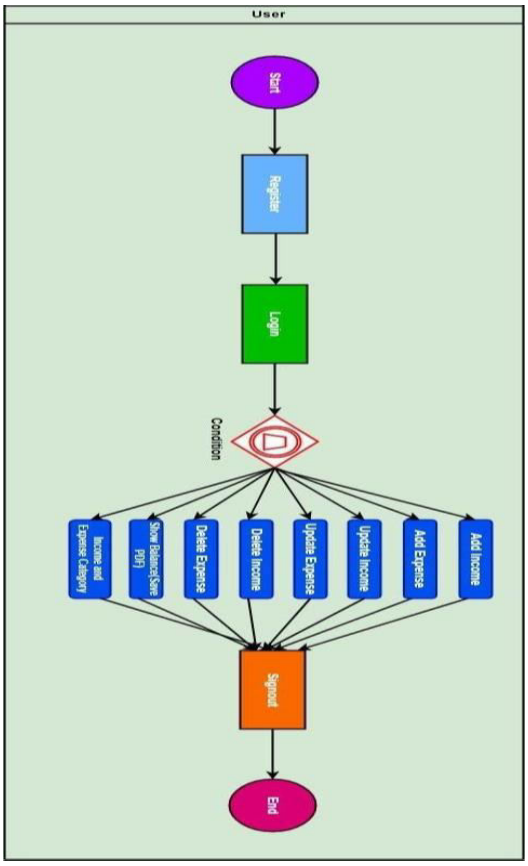

Fig 3.1 System Architecture

IV. METHODOLOGY

Spend Guard was created using a systematic, iterative software development process based on the Agile model. First, requirements were gathered by observing common user challenges with daily money management. The system was designed using UML diagrams, the interface was constructed using XML in Android Studio, and the backend logic was handled by Java. Firebase was used for authentication, data synchronization, and real-time database support. MPAndroidChart was used to create dynamic, interactive visual graphs. Modules for data display, income/expense management, login, and registration were separated out of the development. Each module was developed, assessed, and refined with continuous feedback. Functional issues were subjected to checks from team and system tests, while acceptance tests were carried out to validate the usability of the developed solutions.

V. DESIGN AND IMPLEMENTATION

The development and implementation of Spend Guard aimed to create a cost tracking application for Android that was secure, user-friendly, and efficient. The primary goal was to enable users to manage their personal finances by recording, categorizing, and visualizing income and expense data. The application was made using Android Studio, which uses Java as the main programming language and XML to create user-friendly interfaces. The app architecture ensures maintainability and concern separation through the use of a modular design approach.

UML diagrams, such as use case, class, and activity diagrams, were made at the beginning of the design phase to show user flows, object relationships, and system behavior. Clarity and usability were given top priority in the front-end design. Each screen, including registration, login, dashboard, add income, add spending, and graphical reports, was meticulously designed using XML to ensure a clear and responsive style across a range of Android devices.

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Because of its capabilities for real-time databases, cloud storage, and user authentication, Firebase was selected as the backend provider. It allows users to keep their devices synchronized while safely storing and accessing data. While Firebase Authentication oversees user registration and login processes, the Realtime Database contains structured data, including user profiles, income, and expenses. This backend integration ensures a seamless and secure user experience with support for offline data access that updates instantly when the user reconnects to the internet.

The implementation's use of the MPAndroidChart library for data visualization is one of its main features. Users can see interactive pie and bar charts that show how much they spend in different categories. Based on trends in revenue and expenses, this graphical representation makes financial analysis easier to understand and assists users in making wise decisions. The charts are updated in real time and are dynamically created using data that is retrieved from Firebase.

To maintain the app's scalability and flexibility, a structured activity-to-fragment architecture was used during implementation. All database and network operations were handled in background threads to maintain program responsiveness. We employed validation checks to diminish any chances of incorrect data entry while utilizing toast messages and dialogues for a user's visual feedback.

After unit testing each component independently during the testing process, integration testing was carried out to ensure seamless module interaction. Finally, user acceptance testing was done to evaluate the overall usability and functionality of the application. In response to feedback, UI changes and performance improvements were made.

VI. OUTCOME OF RESEARCH

Spend Guard's development produced a fully functional Android app with real-time capabilities and an intuitive design that makes managing personal finances easier. Authentication, Sync, and Safe Data Storage is firmly integrated into the app via Firebase. With the help of dynamic and perceptive representations, MPAndroidChart helps consumers comprehend their spending habits. Even when offline, the system makes it simple for users to add, edit, remove, and search income and expense information. Financial planning is improved by extra resources like EMI and income tax calculators. Overall, the study's findings show how well cloud and mobile technologies work together to provide more intelligent budgeting solutions.

VII. RESULT AND DISCUSSION

The implementation of Spend Guard produced a practical and efficient mobile application that might meet users' needs for tracking their finances. On a variety of Android devices, the app's usability, responsiveness, and functionality were all regularly assessed. User data can be easily stored and retrieved by integrating Firebase Realtime Database, ensuring device and session synchronization. Firebase authentication added an additional layer of security by preventing unauthorized access to financial information. The software also demonstrated flawless offline functionality, updating transactions completed without internet access as soon as the device was once more connected to the internet.

The utilization of pie and bar charts results in a better understanding of statistical data. By clearly displaying monthly income-expenditure comparisons and category-wise expense allocation, these graphics made the data more approachable and engaging. Seeing trends helped users make more informed financial decisions and encouraged improved budgeting techniques.

During testing, the add, update, remove, and search features all worked flawlessly and rapidly. Modules such as income tax and EMI calculators that functioned correctly and yielded accurate results made the program more useful. The interface's clarity and ease of use were praised by users who had never used a money app before.

Nevertheless, certain restrictions were observed, including the lack of support for multiple users and the restricted report export choices. Future updates can solve these problems. Overall, the project achieved its goals by producing a personal finance application that is safe, dependable, and easy to use. Mobile systems may successfully enhance financial awareness and planning, as evidenced by the successful integration of cloud and visualization technologies. Spend Guard stands out as a helpful resource for people looking to use accessible, contemporary technology to take charge of their spending.

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VIII. CONCLUSION

In conclusion, Spend Guard proves to be a practical and successful tool for handling personal money. The application integrates Firebase for real-time database operations and MPAndroidChart for interactive data display, making it simple for users to track their income and expenses. It offers standard features like search capabilities, category-wise tracking, secure login, and useful financial tools like EMI and tax calculators. Intuitive user interface and offline capabilities leverage user-friendliness for blowing more experienced users out of the park. All things considered, Spend Guard succeeds in its mission to offer a trustworthy mobile platform based on Android that helps users enhance their financial management, encourage savings, and make informed budgetary choices.

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