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CakeMeUp App: an E-commerce Solution for a Cake Shop

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Abstract

This study introduces CakeMeUp, an innovative Flutter and Firebase-based e-commerce app for cake shop, offering sleek UI, real-time order tracking, secure payments, and cake customization. Integrating RazorPay and ikChatbot enhances functionality. It tackles e-commerce challenges, delivering a scalable platform for seamless online cake ordering. Implementation details, advantages, and key features are explored. CakeMeUp addresses common challenges faced in the e-commerce space by delivering a robust and scalable platform tailored for online cake ordering. The integration of RazorPay and ikChatbot further boosts its functionality by ensuring secure transactions and providing responsive customer support. This comprehensive approach not only sets CakeMeUp apart from competitors but also provides a scalable platform that can adapt to the evolving demands of the e-commerce industry. This study examines the implementation specifics of CakeMeUp, emphasizing its benefits and the distinctive features that differentiate it in the competitive e-commerce landscape. Utilizing the strengths of Flutter and Firebase, CakeMeUp seeks to transform the online cake shopping experience, providing a complete solution for both cake shops and their customers.

Keywords: CakeMeUp, cake shop, chatbot, e-commerce, Firebase, Flutter

INTRODUCTION

CakeMeUp is an innovative e-commerce solution designed to revolutionize the way customers order and customize cakes for their celebrations. Leveraging the power of Flutter and Firebase, this app aims to deliver a seamless and visually captivating experience, catering to the unique needs of a modern cake shop.

At the core of CakeMeUp is Flutter, a cutting-edge framework that enables the creation of natively compiled applications for multiple platforms using a single codebase. This approach ensures a consistent and high-performance user experience across Android, iOS, and the web. Complementing Flutter's capabilities is Firebase, a comprehensive mobile and web application development platform, providing a robust backend infrastructure with features such as real-time database, secure authentication, and cloud functions.

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The innovative aspects of CakeMeUp extend to the incorporation of a chatbot. This conversational assistant, developed using Flutter's widget library and Firebase's real-time database, provides customers with a personalized and interactive experience, answering inquiries, offering suggestions, and guiding them through the ordering process with ease.

LITERATURE REVIEW

The paper "*A Study of Consumer Behavior Towards Food Ordering and Delivery Platform*"

presents the study aimed to understand consumer preferences and identify factors influencing consumers' decision to order food online. 129 respondents who utilize food delivery systems provided information to the study via surveys, Google forms, research papers, journals, magazines, and websites. The study found that social media has a great influence on customers. According to the research, in order to maintain customer satisfaction, delivery platforms should fix technical issues, enhance site speed, loading times, and delivery windows, and provide attractive offers and practical services. The study concludes that the food delivery platform market continues to grow, particularly in India, where Swiggy, Zomato, and Uber Eats have become competitors [1].

"*Emerging Trends Towards Online Food Delivery Apps in India*" paper focuses on the origin, present scenario, and future scope of online food delivery apps. The data has been collected from various online portals and journals. According to the Cornell Hospitality research, electronic ordering is being progressively used by the US restaurant business, with the benefit of higher sales. The use of smart devices has helped the restaurants in managing orders from customers immediately. A study found that system quality, firm-generated information, and user-generated information all had an impact on perceived usefulness. Perceived usability was strongly impacted by system and design quality, which raised perceived utility. The study examines the advantages of online food delivery apps for both businesses and customers, as well as the drawbacks and future possibilities of these services [2].

The paper "*Chatbot based Human Interaction model for Food Ordering System*" introduces the Chatbot based Human Interaction model for Food Ordering System. Chatbot uses AI and machine learning to provide personalized recommendations. By deploying this Chatbot to the website, the system collects customer data through various means, including customer feedback, order history, and user preferences. Additionally, the Chatbot can be configured to respond to certain client concerns or questions. However, there are potential drawbacks to relying solely on a Chatbot for customer interaction. For example, the Chatbot may not be able to handle complex customer inquiries or complaints, which could lead to customer dissatisfaction. To address these potential drawbacks, it is important to ensure that the Chatbot system is used in conjunction with human interaction. The chatbot records data of individuals who order from the website using HTML and CSS, and API is used to allow communication between the application and chatbot. The information gathered will be used to target people with the newest deals in an effort to keep them as prospective clients in the future [3].

The paper "*Implementation E-Commerce in Cake Shop*" discusses the concept of an online cake ordering system that simplifies the process of buying a cake for customers. Customers can use the system to browse through various cakes, buy them, and pay for them online. The paper argues that one of the best strategies for making a business work is to make it accessible on the internet. It suggests that by providing great products 24 h/day, along with online customer service, businesses can expand their product ranges. The paper highlights the benefits of online businesses, such as being open 24/7, making it easier for customers to access the products [4].

The paper "*Developing an E-Commerce Application Using Flutter*" presents a compelling case for using Flutter in e-commerce application development for B2B companies. It highlights Flutter's cross-platform capabilities, cost-effectiveness, and ability to create engaging user interfaces. The authors discuss Flutter's architecture, reactive programming model, and how it differs from traditional frameworks by using its own rendering engine. The literature review covers Flutter's advantages, such as interoperability, native functionality, and customizable UI components. The methodology outlines steps for developing an e-commerce app with Flutter, including user interface design, payment integration, and real-time synchronization. Overall, the paper provides a comprehensive overview of Flutter's proven advantages and its suitability for developing e-commerce applications [5].

"*Flutter and Firebase Making Cross-Platform Application Development Hassle-Free*" explores the challenges of cross-platform mobile development and how Flutter and Firebase can address them. The

authors discuss Flutter's reactive programming model, architecture, and advantages over traditional approaches. The literature review compares Flutter's popularity and interest among developers with React Native, another cross-platform framework [6].

The paper introduces Firebase, a robust Backend-as-a-Service platform, and its suitability for handling real-time data synchronization and storage. The authors present a compelling case for using the Flutter and Firebase combination, highlighting their strengths in addressing common development challenges. The paper provides a thorough comparison of Flutter and React Native, making it a valuable resource.

IMPLEMENTATION DETAILS

User Workflow

The user workflow as shown in Figure 1 for the CakeMeUp app begins with the user's interaction with the login interface. A user can choose to either create a new account or log in if they already have one. For new account creation, the user is required to provide their phone number and their name and address details. Upon successful registration or login, the user is directed to the main System User Interface (UI).

Within the System UI, users can navigate through a variety of cake items. As they browse, they have the option to add selected cakes to their cart. Once they are ready to make a purchase, they can proceed to the 'Buy' option. This leads them to the payment methods section.

Two primary payment methods are offered to the user: Cash on Delivery (COD) and UPI/Net banking. The user can choose their preferred mode of payment. After completing the payment process, the user is presented with the 'Track Order' feature, enabling them to monitor the real-time status and location of their cake delivery.

Application Architecture

1. *Backend:* The backend of the system is built on a cloud-hosted Firestore Database, a NoSQL document database provided by Firebase [7]. The database is logically partitioned into multiple collections to store different types of data:
   i. *Ratnagiri cakes and chiplun cakes:* These collections are dedicated to storing information related to cakes from the Ratnagiri and Chiplun regions, respectively. This separation allows for efficient data management and retrieval based on geographical locations.

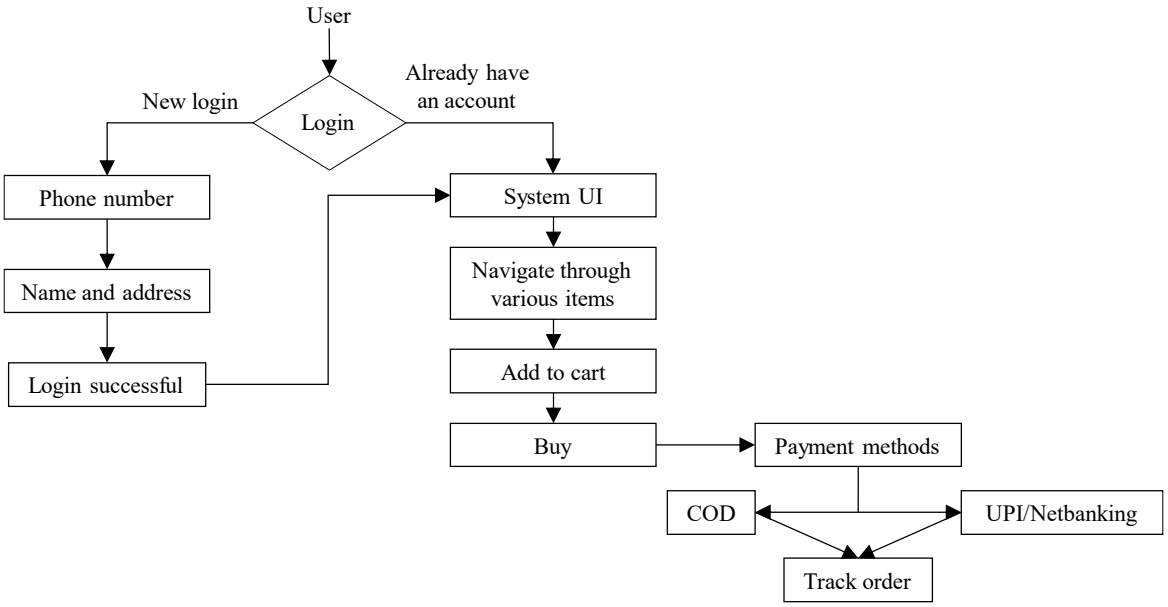

Figure 1. User workflow flow diagram.

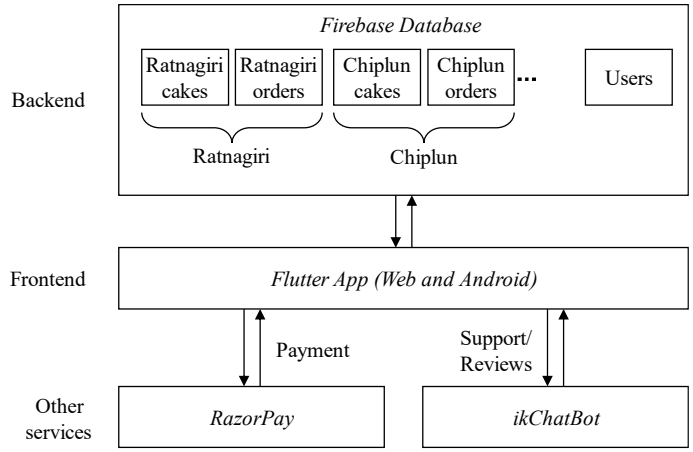

Figure 2. High level architecture of the proposed system.

   ii. *Ratnagiri orders and chiplun orders:* Similar to the cake collections, these collections are designed to store order data specific to the Ratnagiri and Chiplun regions. This segregation ensures efficient order tracking and management based on the respective regions.
   iii. *Users:* This collection is responsible for storing user-related data, such as user profiles, preferences, and order histories. This facilitates personalized experiences and maintains a record of user interactions with the system.
2. *Frontend:* The frontend of the CakeMeUp app is developed using Flutter, a cross-platform framework for building mobile applications. Flutter enables the creation of a responsive and visually appealing user interface (UI) that can be deployed on both web and Android platforms [8]. The Flutter app serves as the primary interface for users to browse cakes, place orders, and interact with the application.
3. *Other Services:* To enhance the functionality and user experience of the cake shop app, two third-party services are integrated:
   i. *RazorPay:* It is a popular online payment gateway service in India, which is incorporated into the system to facilitate secure online payments for cake orders placed through the app. This integration ensures a seamless payment experience for customers, reducing the risk of abandoning the purchase process due to payment-related issues [9].
   ii. *ikChatbot:* The ikChatbot service is integrated into the app to provide customer support and address user queries or reviews related to the cake shop's products and services. This chatbot functionality aims to enhance the overall customer experience by offering real-time assistance and addressing potential concerns or questions that may arise during the ordering process.

The proposed architecture as shown in Figure 2 leverages the strengths of cloud-based databases, cross-platform mobile development frameworks, and third-party services to deliver a comprehensive and user-friendly cake ordering system [10].

Problems Encountered

1. *Dependency upgrades with breaking changes:* As the Flutter framework and Firebase packages evolved, upgrading to newer versions introduced breaking changes that were not backwards-compatible with the CakeMeUp app's existing codebase. This resulted in code conflicts, deprecated methods, and altered behaviors that required careful modifications to ensure the app's functionality remained stable and up-to-date with the latest features and security patches.
2. *Real-time order and inventory synchronization:* Managing state and ensuring consistent data flow between the CakeMeUp app and Firebase's real-time database or Firestore was challenging due to Flutter's reactive programming model and the use of streams and providers. Keeping order information and inventory levels synchronized across devices in real-time while maintaining a seamless user experience required careful implementation of state management techniques.

3. *Efficient image loading and caching:* As a visually-driven e-commerce app for cake ordering, the CakeMeUp app required efficient loading and displaying of high-quality cake images. Flutter's UI-centric nature necessitated thoughtful handling of image assets to prevent performance bottlenecks. Issues like slow image loading times and improper caching of cake images could have negatively impacted the user experience.
4. *Seamless chatbot integration and testing:* Integrating a user-friendly chatbot feature into the CakeMeUp app required addressing challenges related to the user interface, user experience, and conversational flow. Ensuring that the chatbot accurately understood user queries about cake orders, customizations, and inquiries, and provided relevant responses, involved rigorous testing and iterative refinement. Additionally, handling potential scenarios where the chatbot might misinterpret or fail to comprehend user inputs required thoughtful consideration during development and testing phases.
5. *Platform-specific customizations:* While Flutter aims to provide a consistent experience across platforms, there were instances where platform-specific nuances or dependencies needed to be addressed in the CakeMeUp app. This was particularly relevant when integrating with native functionality or third-party libraries for features like secure payment gateways or platform-specific push notifications or third-party libraries as well as the online version.

ADVANTAGES

1. *Seamless online ordering experience:* CAkeMeUp app's responsive UI capabilities and Firebase's real-time database will enable a seamless online ordering experience for customers. Orders can be processed and synchronized in real-time, ensuring that customers have up-to-date information about product availability and order status.
2. *Secure and convenient payment options:* The integration of secure payment gateways and the option for Cash on Delivery (COD) facilitated by Firebase's authentication and authorization features will provide customers with a secure and convenient payment experience, catering to their preferred payment methods.
3. *Personalized cake customization:* The CakeMeUp app's cake customization feature, powered by Flutter's user-friendly interface and Firebase's Cloud Functions, will allow customers to personalize their cake orders according to their preferences, adding a unique and tailored touch to their celebrations.
4. *Efficient order management and inventory tracking:* The combination of Firebase's real-time database and the admin panel developed using Flutter's cross-platform capabilities will enable efficient order management and inventory tracking for the cake shop. Administrators can monitor and manage orders, update inventory levels, and ensure a seamless operational flow.
5. *Enhanced customer engagement with chatbot:* The user-friendly chatbot feature, will provide customers with a conversational and responsive way to inquire about products, place orders, or seek assistance, enhancing their overall engagement with the cake shop app.
6. *Real-time order tracking and updates:* The app can provide customers with real-time updates on their order status, from order placement to preparation and delivery. This transparency and up-to-date information can improve customer satisfaction and trust in the cake shop's services.

RESULTS

Features of the App

1. *Attractive and user-friendly UI:* The app will feature a visually appealing and intuitive user interface, designed using Flutter's extensive collection of customizable widgets, ensuring a polished and engaging experience for users.
2. *Hassle-free order process:* The app will provide a seamless order process, leveraging Firebase's real-time database to synchronize order information and inventory across devices in real-time, ensuring a smooth and efficient experience for customers.
3. *Secure payment gateway with COD available:* The app will integrate secure payment gateways, including the option for Cash on Delivery (COD), facilitated by Firebase's authentication and authorization features for implementing robust access control and user roles.

4. *Cake customization options:* Users will have the ability to customize their cake orders through a user-friendly interface, with the backend logic for processing customization requests handled by Firebase's Cloud Functions.
5. *User-friendly chatbot:* The app will incorporate a chatbot feature, developed using Flutter's widget library and Firebase's real-time database, to provide users with a conversational and user-friendly experience for inquiries and assistance.
6. *Refi admin panel:* An administrative panel will be included in the app, leveraging Flutter's cross-platform capabilities and Firebase's real-time database, allowing administrators to manage orders, inventory, and user data efficiently.

ikChatBot

The ikChatbot integration in the cake shop app serves the following purposes:

1. *Getting user reviews:* Collecting feedback and reviews from customers about the app, ordering process, and cake quality.
2. *Providing support:* Offering real-time assistance, troubleshooting, order status updates, and guidance on app features.
3. *Recommending cakes/flavors:* Suggesting cakes or flavors based on user preferences, dietary restrictions, or occasions.
4. *Answering user queries:* Addressing a wide range of user inquiries related to products, services, pricing, and more.
5. *Getting feedback:* Gathering user feedback on specific aspects of the app, such as UI, navigation, or new features.

Output

- Opening the app for the first time takes the user to the login page prompting them to enter the phone number and other details if they are not already registered as shown in Figure 3.
- Once the user is logged in, they can view the entire catalogue of the bakery and also view details of each item as shown in Figure 4.
- The user can add items to the cart, make customizations to the quantity and then proceed to checkout as shown in Figures 5 and 6.

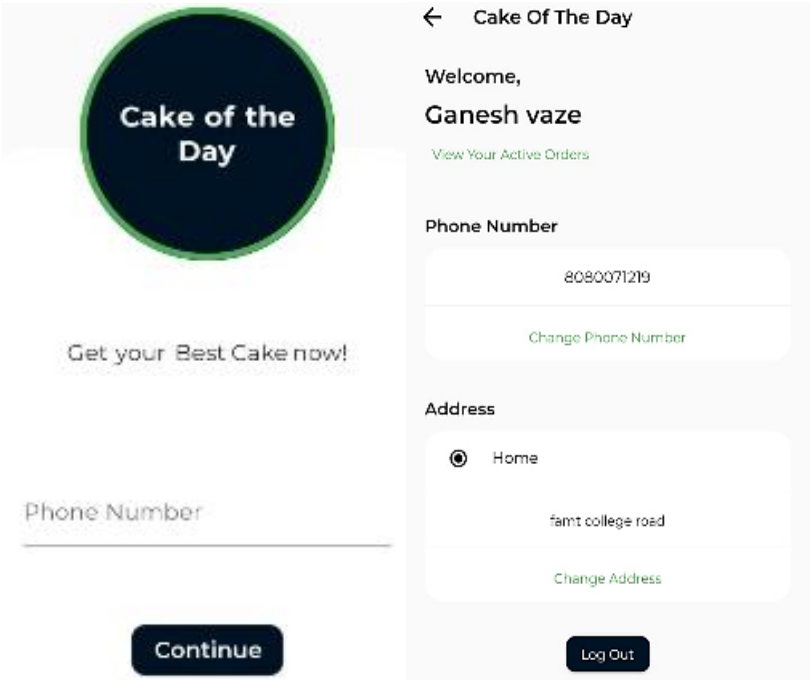

Figure 3. Login and personal details.

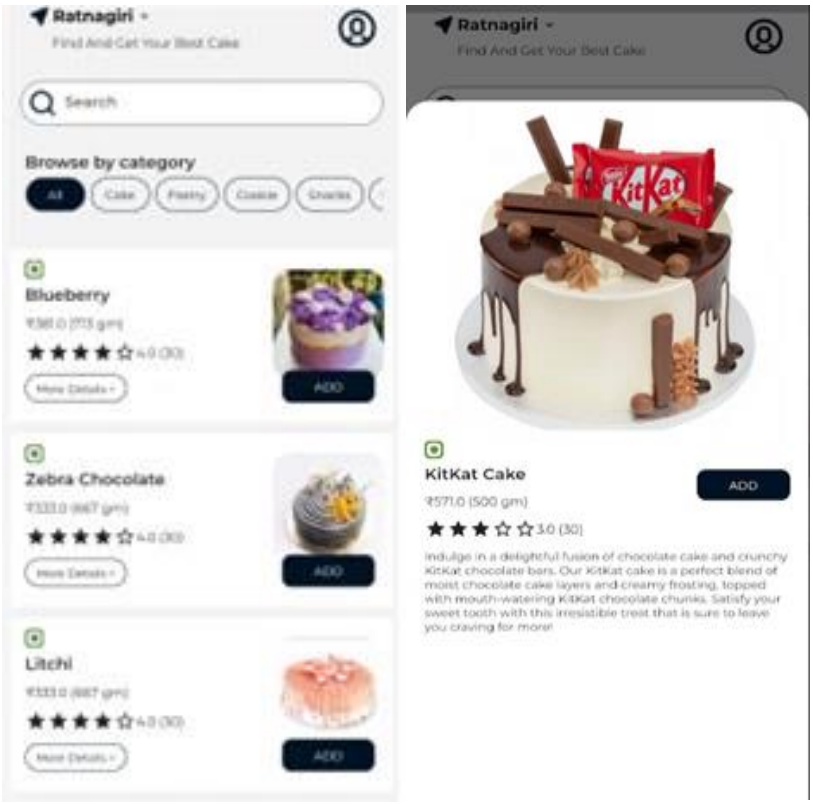

Figure 4. Bakery catalogue and cake details.

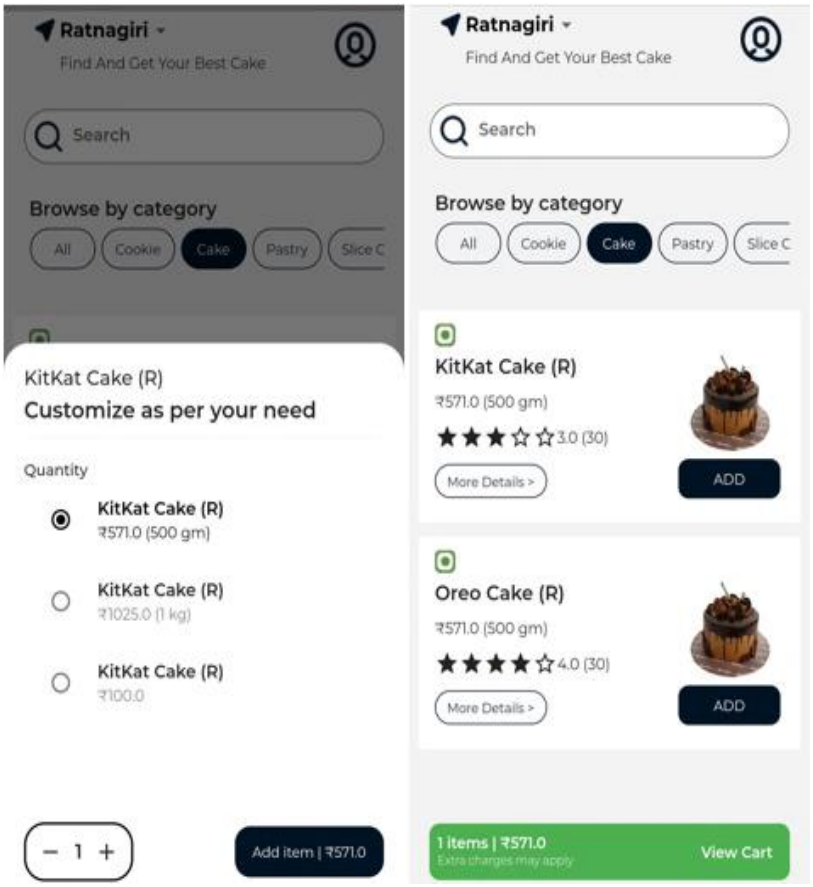

Figure 5. Adding cakes to the cart.

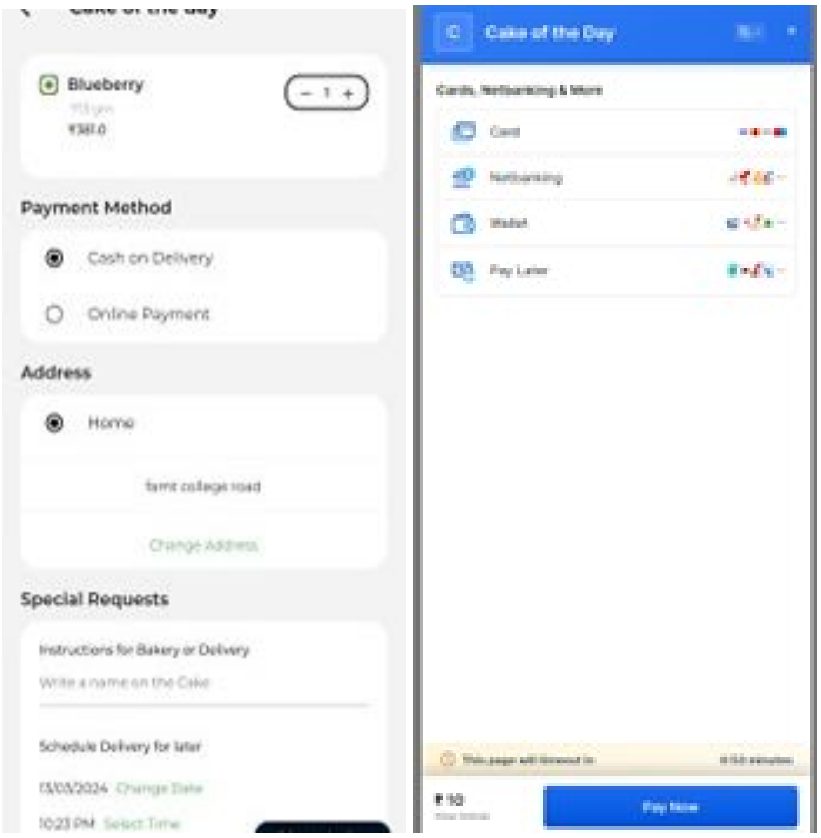

Figure 6. Proceeding to checkout and payment gate way their equivalent in SI.

EVALUATION AND VALIDATION

The CakeMeUp app underwent rigorous testing and evaluation to ensure its functionality, usability, and performance. Unit tests were conducted to validate individual components, while integration tests were performed to assess the seamless interaction between different modules. Additionally, user acceptance testing was carried out with a diverse group of users to gather feedback on the app's user experience, design, and overall satisfaction. The evaluation process helped identify and address potential issues, contributing to the delivery of a polished and reliable product.

FUTURE DIRECTIONS

The CakeMeUp app presents several opportunities for future enhancements and expansions. Incorporating advanced machine learning algorithms could enable personalized cake recommendations based on user preferences and purchase history. Furthermore, integrating with social media platforms could facilitate sharing and promoting cake designs, fostering user engagement and driving social commerce.

COMPARISON WITH EXISTING SOLUTIONS

While popular food delivery apps like Swiggy and Zomato primarily focus on restaurant meal deliveries, the CakeMeUp app caters specifically to the cake ordering and customization needs of customers i.e. shop specificness. Unlike these generalized platforms, CakeMeUp offers a tailored experience with specialized cake customization options, enabling users to personalize their orders according to their preferences and occasions. Additionally, the integration of a dedicated chatbot and real-time order tracking capabilities further differentiates the CakeMeUp app, providing a more comprehensive and user-friendly solution for cake enthusiasts.

CONCLUSION

In conclusion, the CakeMeUp app showcases the powerful combination of Flutter and Firebase in developing feature-rich e-commerce applications. Through meticulous implementation and addressing

challenges, CakeMeUp delivers a seamless online cake ordering experience with a user-friendly interface, secure payment options, real-time tracking, and personalized customization. The integration of the ikChatbot further enriches user engagement through responsive assistance. As technology advances, continuous improvements will be crucial to maintain CakeMeUp's competitiveness and align with evolving user needs. Overall, CakeMeUp exemplifies the capabilities of Flutter and Firebase in transforming e-commerce, providing innovative solutions that cater to the unique requirements of businesses in the digital era.

Declaration of Interest

Authors should reveal any possible conflict of interest in their submitted manuscripts. A competing interest exists when professional judgment concerning the validity of work is influenced by a secondary interest, such as financial gain. The author(s) declare(s) that there is no conflict of interest regarding the publication of this manuscript.

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