

Development and Analysis of a Unified Mobile App for Coffee Shop Operations and Ordering Experience: A Proposal Review

Waleed Maulana

College of Engineering and IT, University of Dubai, Dubai, UNITED ARAB EMIRATES

e-mail: 'syatyrtybanduik@gmail.com

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Corresponding Autor: Waleed Maulana

Abstract

This study extends the exploration of ordering apps in the context of coffee shop owners, specifically focusing on the utilization of popular apps like Grabfood and Foodpanda. With the increasing number of coffee shops adopting ordering apps, there arises a clear necessity for a coffee-focused app that can effectively address the unique demands of establishments. The objective of this study is to conduct a comprehensive review of a mobile app specifically designed to streamline the process of ordering coffee in advance, with a paramount emphasis on ensuring its reliability. By developing an app that caters to the specific needs of coffee shops, both owners and customers can benefit greatly. The app will serve as a dedicated platform, connecting coffee enthusiasts with quality coffee shops, while offering a seamless and convenient ordering experience. By providing a high-quality ordering system that encompasses the full range of customization options for beverages, the developed app is expected to significantly enhance the customer experience and ultimately boost sales for the coffee establishments listed on the platform. With a focus on reliability, the app will enable coffee shop owners to efficiently manage orders, minimize errors, and improve overall operational efficiency. Moreover, by fostering a user-friendly interface and intuitive design, the app will engage customers and encourage them to explore new coffee shops, further promoting the growth of the coffee industry. This study will contribute to the existing body of knowledge by highlighting the importance of tailored ordering apps for coffee shops and providing insights into the development and implementation of such apps. The findings will be valuable not only for coffee shop owners seeking to enhance their business operations but also for app developers looking to cater to the specific needs of the coffee industry. Ultimately, the study aims to bridge the gap between technology and the coffee business, fostering innovation and growth in the ever-evolving digital landscape.

Keywords— Customer experience, Mobile app, Streamline process, Customization, User-friendly interface

1 Introduction

In today's digital era, the widespread usage of smartphones has revolutionized various aspects of our lives, including the way we interact with coffee shops. Coffee shop owners now have the opportunity to capitalize on this technological advancement by leveraging mobile apps that offer a plethora of features such as digital payment, online ordering, and customizable drink options [1]. Recognizing the immense potential for growth and convenience in this domain, this paper aims to propose the development of a new coffee shop platform app. The proposed mobile app seeks to redefine the coffee ordering experience by providing users with a seamless and efficient process. Customers will have the convenience of browsing and ordering their favorite coffees from a diverse range of coffee shops, all within a single app. By integrating a streamlined payment method, users can easily complete their transactions, eliminating the need for cash or card payments at the point of collection. One of the key features of this mobile app is its emphasis on customization [2]. Recognizing that coffee preferences vary widely among individuals; the app will enable users to modify their drinks according to their specific preferences. Whether it's selecting the perfect espresso shot, adjusting the sweetness level, or adding unique flavorings, the app will empower users to personalize their coffee orders with ease. Furthermore, the app will provide users with the

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flexibility to choose their preferred collection location, allowing them to conveniently pick up their orders from a nearby coffee shop or even from a designated pick-up point. This flexibility enhances the overall convenience and accessibility of the app, catering to the needs of busy individuals on the go. By developing this coffee shop platform app, the proposal aims to bridge the gap between technology and the coffee industry, creating a seamless and enhanced coffee ordering experience for both coffee enthusiasts and coffee shop owners alike. The app has the potential to attract a larger customer base to coffee shops, increase customer loyalty, and ultimately drive revenue growth for participating establishments. In summary, this study proposes the development of a new mobile app that integrates digital payment, online ordering, and customization options for coffee orders. By offering a streamlined and convenient ordering process, the app aims to transform the way customers interact with coffee shops, fostering a mutually beneficial relationship between coffee enthusiasts and coffee shop owners.

2 Background of Study

2.1 Coffee Shops in the digital age

One of the earliest and most popular coffee apps was released in 2011 by Starbucks [3]. The app allows customers to order coffee in advance and pick up their order at stores. During Covid-19, customers benefit from using the Starbucks app to maintain social distancing by ordering ahead and having contactless pickup. A serious drawback for these apps is that consumers must download multiple apps for different coffee chains. Consumers may choose to not install new apps because of storage limitation or learning curve of a new app. In a recent study, Liu et al. [4] investigated users' reaction when asked to install an app to complete an order or use a service. Liu et al. [4] further studied the likelihood of the users installing the app in such circumstances. The study found that more than 60% of users find it frustrating when a business requires an app installation to place an order. When forced to install a brand's app, almost 80% of users admit this has caused them to stop a transaction. In recent years, the growth of expatriate communities in UAE cities [5] has had an unexpected yet significant impact on the country's coffee consumption and, subsequently, its coffee shop culture. This trend has resulted in an increased interest in high-quality coffee among Dubai customers, who now pay close attention to brewing processes and ingredient specifications. This market size reflects the strong domestic interest in coffee consumption, as evidenced by the rising popularity of well-known café chains such as Starbucks, San Francisco Coffee, and The Coffee Bean & Tea Leaf. These establishments have successfully capitalized on the growing demand for quality coffee experiences in Dubai. The surge in expat communities has played a significant role in shaping UAE [5] coffee culture. These communities have brought with them diverse coffee preferences and a penchant for specialty coffee. As a result, local coffee shops and chains have had to adapt to meet the evolving tastes and expectations of their clientele. Dubai now expects not only a great cup of coffee but also an immersive experience that celebrates the art of coffee-making. One notable aspect of the Dubai coffee scene is the emphasis on brewing processes. Customers appreciate the attention to detail and precision required to create a perfect cup of coffee. From the careful selection of beans to the skillful extraction methods, Dubai coffee enthusiasts value the craftsmanship that goes into every cup. This focus on quality has propelled the coffee industry forward, fostering innovation and raising the bar for coffee shop owners and baristas. Additionally, ingredient specifications have gained prominence in the Dubai coffee landscape. Customers are increasingly conscious of the origin, roast level, and flavor profiles of the coffee beans used in their favorite brews [6]. This demand for transparency and knowledge about coffee sources has compelled coffee shop owners to source their beans responsibly and provide detailed information to their customers. This consumer-driven trend has created a market for specialty coffee shops and micro-roasters that prioritize sustainability and ethical practices. The continued growth and popularity of coffee chains in UAE illustrate the enduring allure of coffee as a beverage and cultural phenomenon. As the interest in coffee consumption remains high, it presents opportunities for both local and international coffee businesses to thrive in the Dubai market. By embracing the preferences and expectations of their customers, coffee shop owners can create unique experiences that cater to the diverse tastes of Dubai and contribute to the vibrant coffee culture that has taken hold in the country. In conclusion, coffee has become more than just a drink in Dubai—it has become a cultural phenomenon and an integral part of the daily lives of people in Dubai. The influx of expats and their affinity for high-quality coffee has greatly influenced the local coffee scene, leading to a surge in coffee consumption and the rise of popular café chains. The Dubai market for coffee chains is projected to continue growing, showcasing the enduring appeal of coffee among people in Dubai. As the coffee industry evolves to meet the demands of discerning customers, the future looks bright for coffee shop owners and coffee enthusiasts alike in Dubai.

2.2 Issues with Current System

The current system of coffee shop apps, predominantly offered by major chains like Starbucks and Costa Coffee, presents certain limitations. These apps confine customers to ordering exclusively from specific coffee chains, creating a fragmented experience. The inconvenience of having to download multiple apps for different coffee shops poses a significant barrier [7]. Consequently, customers may choose not to install new apps due to concerns about device storage limitations or the effort required to learn and navigate each app. Consequently, this weakness in the current system can potentially hinder customer transactions. The reliance on separate apps for each coffee shop not only consumes valuable device storage but also presents a steep learning curve for customers to adapt to different interfaces and features. This complexity can discourage potential customers from engaging with coffee shop apps, leading to decreased usage and transaction volume. Managing multiple apps with varying user interfaces and account setups becomes a significant obstacle for customers seeking a seamless and streamlined coffee ordering experience [7]. To address this challenge, a more integrated and user-friendly solution is necessary. A centralized coffee shop app that encompasses a wide range of establishments would alleviate the burden on consumers, providing the convenience of accessing multiple coffee shops within a single platform. By consolidating various coffee shop offerings into one app, customers can enjoy a hassle-free experience, placing orders and exploring diverse coffee options without the need to switch between different applications. By eliminating the need for multiple app downloads and simplifying the user experience, this enhanced system has the potential to increase customer engagement and drive higher transaction rates. Customers would be more inclined to utilize a single app that grants them access to a variety of coffee shops, expanding their choices and enhancing overall satisfaction. Moreover, a unified coffee shop app could offer additional benefits such as personalized recommendations, loyalty programs, and exclusive offers, further incentivizing customers to use the platform [8]. In addition to the advantages for customers, a centralized coffee shop app would also benefit coffee shop owners. By participating in a common platform, coffee shop owners can reach a broader customer base and tap into new markets, potentially leading to increased sales and greater brand exposure. The app could provide valuable analytics and insights on customer preferences and behaviors, enabling coffee shop owners to refine their offerings and marketing strategies. In conclusion, the current system of coffee shop apps, which requires separate downloads for different coffee chains, poses challenges for both customers and coffee shop owners. The fragmented experience and associated inconveniences can discourage customers from utilizing such apps, resulting in decreased transactions. To overcome these limitations, it is crucial to develop a centralized coffee shop app that integrates multiple establishments into a single platform. This unified approach would offer customers a seamless and user-friendly experience while benefiting coffee shop owners through increased visibility and customer engagement. By addressing the weaknesses of the current system, this enhanced coffee shop app has the potential to revolutionize the way customers interact with coffee establishments and drive growth in the industry.

2.3 Existing Coffee Shop Platforms

Based on Table 1, the three most popular coffee shop platforms have been selected to be examined in this review, namely COFE, Joe Coffee, and Odeko [9].

Table 1. Overview of Coffee Shop Apps and Platforms Available for Download

	App	Apple Store: Number of Ratings	Play Store: Number of Downloads	Total
Branded Apps	Starbucks	3,900,000	10,000,000	13,900,000
	Costa Coffee	2,000	1,000,000	1,002,000
	The Coffee Bean & Tea Leaf	737	100,000	100,737
Platforms	COFE	4,100	100,000	104,100
	Joe Coffee	1,000	50,000	51,000

	Odeko	2,100	10,000	12,100
	Th3rdwave	1,200	10,000	11,200

2.4 Cofe

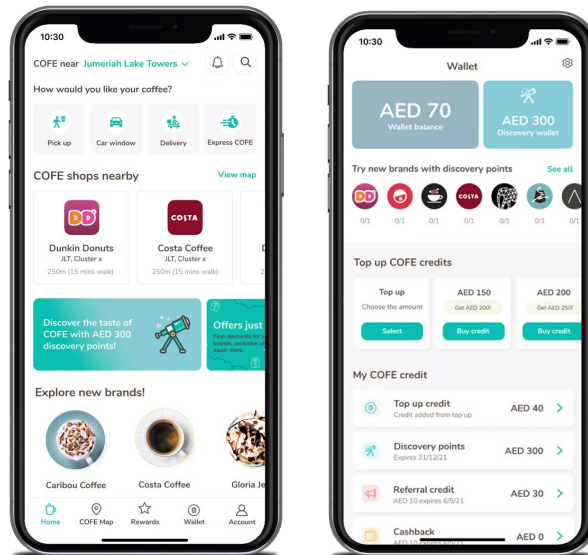


Figure 1. User interface of COFE app [10]

COFE app is a click and collect service for coffee consumers in the Middle East and the UK [10]. After completing developments in Silicon Valley, the beta version of COFE was launched in 2018 in Kuwait by a group of coffee enthusiasts [11]. The motivation of the app comes from the frustrating experience of inefficient process when ordering coffee [11]. Consequently, streamlining the coffee ordering process became the aim of the COFE app, which is acronym for “Coffee Ordering Fast and Efficient”. COFE [12] mentions three reasons why a coffee platform is needed, namely: lack of coffee platform in the market, high growth rates in coffee market, and high growth rates in mobile app industry. Through the app, customers can choose between the option of express delivery, counter pick up, or drive through for their coffee order [11]. However, pickup service remains a preference of COFE app users as it ease the ordering process and cut down waiting time [12]. Both consumers and shop owners benefit from the COFE app as it speed up the to-go process, improve pickup efficiency, and allow coffee shops to dedicate more care to those wishing to enjoy the sit-in experience. Users can view up-to-date menus and the app features extensive drink customization options. In line with the app’s objective to become an online coffee marketplace, users can also purchase coffee machines, accessories, merchandise, and roasted beans. For coffee shop owners, COFE app acts as a comprehensive digital platform and as a tool to grow customer base and service offerings on an industrial level. The app provides the ability for shop owners to create promotions for repeating customers and customize their in-app store design, increasing their potential to transform revenue streams [12]. It is worth highlighting that the app also offers a backend system for inventory management, price settings, and menu and service customization. The app’s homepage pinpoints the user’s geolocation, offers a quick overview of nearby participating coffee shops, and a personalized coffee offer banner. With the goal to attract users, the app carries out referral programs and gift card options. In addition of userbase expansion, the development of the app also focusses on expanding its number of coffee shop partners. Every month, a new version of the app is released with upgraded user flow[11].

2.5 Joe Coffee

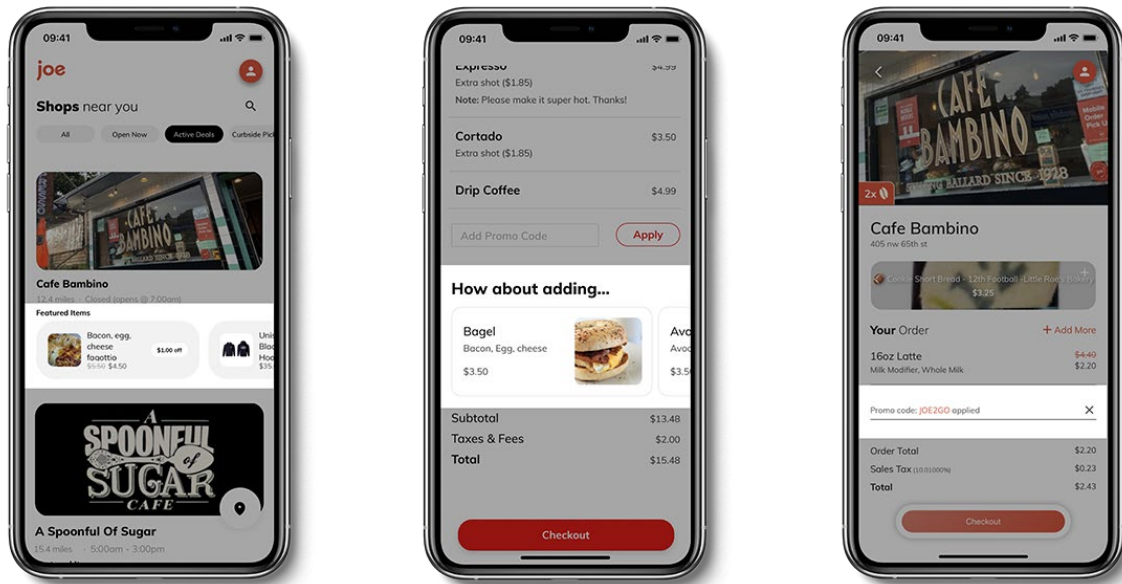


Figure 2. User interface of Joe Coffee app [13]

Joe Coffee is a startup operating an online ordering platform for independent coffee shops in the US. Joe Coffee was launched in 2014 by former baristas who had first-hand experience of operating coffee shops [13]. In the early stage, the motivation of the app originates from the founders' experience of lengthy waits at coffee shops and drive-thru [14]. The founder pointed out that drive-thru, a process which supposedly offer speed and convenience for consumers, are "failing" its objectives and consequently, negatively affects consumer experience [15]. On the consumer side, Joe Coffee provides both a mobile app and a web interface for pickup orders [13], [15]. The app's homepage displays a list of partnered coffee shops to the user based on distance. Reward programs are usually offered by large coffee chains like Starbucks, who has the financial backing to fund these programs in order to entice customers. However, independent coffee shops often lack the financial and technological resources needed to put forward these promotions [15]. To counter this problem, Joe Coffee utilizes its revenue and funding provided by angel investors and venture capitalist to help smaller coffee shops compete [14]. Users of Joe Coffee are automatically included in its loyalty program, which works with a points system that rewards users based on their purchases in the app. The points system operates to encourage orders during slow hours and increase pre-order sales. For coffee shop owners, Joe Coffee provides a tablet interface for baristas to receive orders and order payment [13], [14], [15]. Additionally, owners have the option to offer promotions. Joe coffee provides business analytics and reporting for owners to gain insights on its customer and business. Joe Coffee's aims to provide a consistent experience for consumers by promising no waiting times for consumers when they arrive at a shop to pick up freshly made beverages. The app's "pickup order" approach is chosen as it provides a smaller chance for errors to occur, compared to delivery apps. In an effort to ensure a user-friendly experience, Joe Coffee's interface was designed from the ground up [15]. Development of the app is based on prioritizing consumer experiences and tightly regulating its coffee shop partners, instead of expanding its number of partners too fast. In terms of payment options, Joe Coffee incorporates the payment processor Stripe. Additionally, Stripe's history of working with bigger apps like Lyft would mean Joe Coffee can continue working with Stripe as it expands. To elevate user experience, the app works closely with coffee shop owners and utilizes data collected to analyze coffee-specific behavior in consumer transaction. With coffee as a focus, Joe Coffee stands out as an app that delivers higher value for both coffee shop owners and coffee consumers.

2.6 Odeko

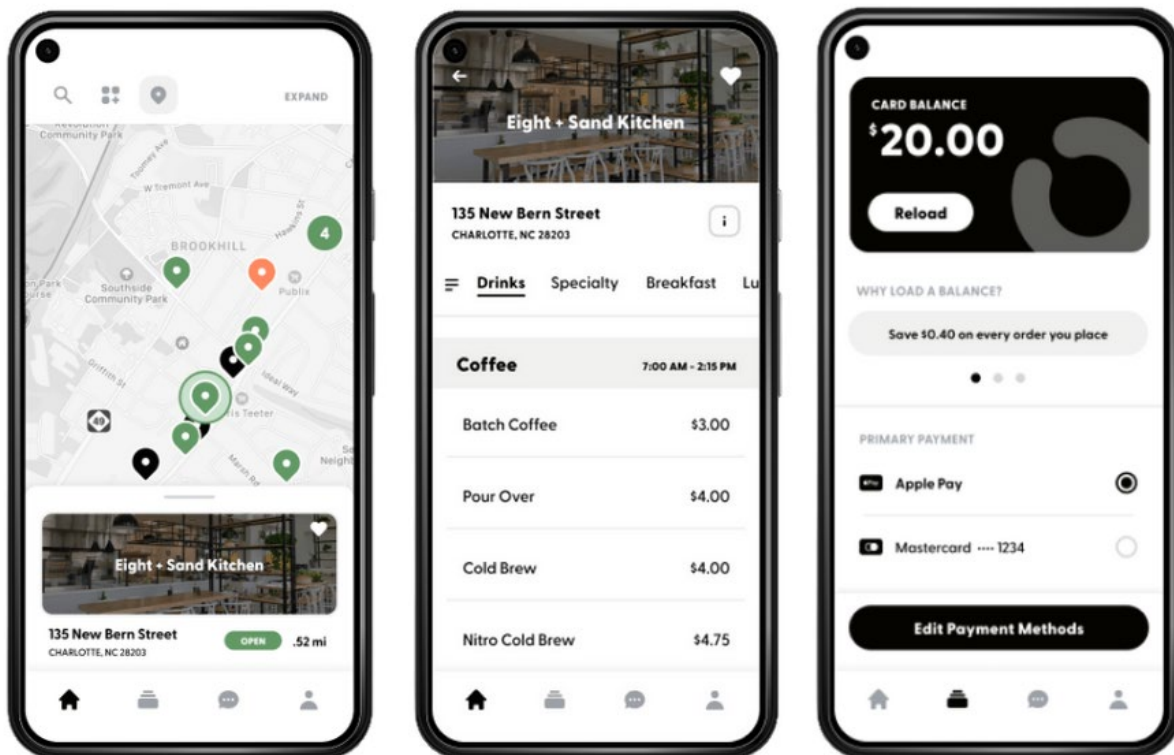


Figure 3. User interface of Odeko app

Odeko is a combination of an ordering app for customers and an inventory system for café owners in the US. The platform is a result of a merge of two different companies: Odeko and Cloosiv [16]. Odeko is an inventory management system for cafes launched in 2019 [16]. While Cloosiv is an order pickup app launched in 2017, serving coffee shops, cafes, and bakeries. The resulting platform acts as a supply and demand system for small businesses, with the vision to help shop owners increase customer growth and compete with chains. Odeko app offers features that enables customers to order ahead for pick-up, pay with contactless in-app payment, and earn rewards for their orders. Like COFE and Joe Coffee, the app also highlights coffee shops based on distance and has features that allow customizations for drinks [14], [16]. Unique to this app however, is the built-in wallet feature for users to pre-load money as credit. However, users can still choose other digital payment methods. Odeko does not offer an interface for baristas to process orders. Instead, orders received from users are integrated into existing point of sales system typically used by merchants [16]. To help shop owners measure business performance, Odeko incorporates AI to analyze sales data. The resulting analytics can predict sales volume and subsequently, coffee shops can know how much to order in terms of supplies and ingredients. This feature addresses the problem of inventory waste, an issue commonly faced by business in the F&B industry [17]. Additionally, Odeko offers a catalog of essential café supplies that shop owners can order for delivery to their shop. This supply catalog is integrated with a smart-ordering system which notifies the shop owners what deliveries are expected, and measure expected consumption [17]. During the Covid-19 pandemic, many small and independent coffee shops suffered financially and struggled to stay in business. With that in mind, the app incorporates virtual tip jars in coffee shop menus as a convenient way for users to support small business. To cut down time taken for users to find quality coffee, Odeko carefully vets its coffee shop partners to ensure they actually are specialty coffee shops. As a platform that incorporates supply chain, Odeko stands itself apart from other coffee platforms.

3 Available Features Between COFE, Joe Coffee, and Odeko

3.1 *Pre-ordering coffee*

This feature usually requires the user to set up an account before being able to place an order. Order tracking that shows the user the real time order preparation progress is a nice feature present in some apps. COFE app stands out as the only coffee shop platform that provides delivery to specific address requested by users, in addition of pickup services.

3.2 *Customize and Save order*

This feature allows the user to choose between tweaks such as brewing methods, choice of milk, and choice of bean. As coffee orders get increasingly sophisticated, accompanying this feature usually is a save order function. This allows the user to make repeat orders with a single tap.

3.3 *Payment in app*

This feature enables cashless transaction either via digital banking, credit card integration, digital wallet, or an “in-app” wallet. The most common feature is the first two, but other payment options are increasingly popular in coffee apps.

3.4 *Location finder*

The feature usually shows up as a location map that shows the user’s immediate vicinity. Alternatively, this feature can also show up as a list of shops sorted by the shortest distance of the user to the coffee shop.

3.5 *Rewards program*

This feature works by giving virtual points or digital rewards for each time an order is made via the app. Rewards program usually works by giving promotions when a user reach a certain number of orders.

3.6 *Receive orders and orders payment*

This feature generally shows the barista the order, its requested modification, and its pickup time. Usually, this feature also allows baristas to update the preparation progress of the order.

3.7 *View sales figures*

This feature shows up in the form of either an analytics dashboard or an admin dashboard. The most common feature enables owners to view sales data sorted by date or menu item. However, some apps like Odeko incorporate smart AI to provide better business insight.

4 The Proposed Mobile App

This study introduces a novel coffee shop platform as a practical solution to the aforementioned issues [18]. The proposed platform takes the form of a mobile app, enabling users to conveniently order coffees from various shops through a streamlined payment method. Customers can place their orders through the app and collect their desired coffees from their chosen location, providing a seamless and efficient coffee ordering experience. Firstly, this platform effectively reduces the number of apps users need to download while facilitating the exploration of different coffee shops. As a result, coffee shops can establish a digital presence without the burden of creating an entirely new app. Furthermore, this study thoroughly examines the strengths and limitations of existing coffee shop platforms. With these considerations in mind, this paper focuses on two key aspects that aim to address the following research question:

1. Which existing coffee shop platforms offer similar functionalities to the proposed coffee app?
2. What are the distinctive features of these platforms?
3. Which mobile development framework is suitable for implementing this app?

5 The Proposed Mobile Application

In this study, the proposed mobile app is named KoffeeDay, designed to serve as a comprehensive online ordering platform for coffee enthusiasts. KoffeeDay offers a seamless and convenient experience by allowing customers to explore a network of coffee shops, personalize their coffee preferences, place orders, and make secure online payments. With a focus on minimizing face-to-face interactions, the app ensures a safe and efficient ordering process. KoffeeDay brings several advantages to customers, including access to up-to-date and comprehensive information about various coffee shops, their diverse menu offerings, and the availability of specific items. This empowers customers to make informed choices based on their preferences and easily discover new coffee shops that align with their tastes. Furthermore, KoffeeDay incorporates a valuable order tracking feature, enabling users to monitor the progress of their orders. This functionality significantly reduces waiting times and proves particularly beneficial for individuals with busy schedules, such as commuters heading to work. By knowing the status of their orders, customers can plan their time more effectively and enjoy their coffee without unnecessary delays. By presenting coffee shops digitally through the app, coffee establishments can increase their sales without solely relying on physical foot traffic. This digital presence broadens their customer reach and fosters growth in the competitive coffee industry. In summary, the proposed KoffeeDay app offers a convenient and comprehensive online ordering platform for coffee lovers. It empowers customers to explore coffee shops, customize their orders, track their deliveries, and enjoy a seamless coffee experience. By embracing digital solutions like KoffeeDay, coffee shops can enhance their sales potential and cater to the evolving preferences of customers in an increasingly digital world.

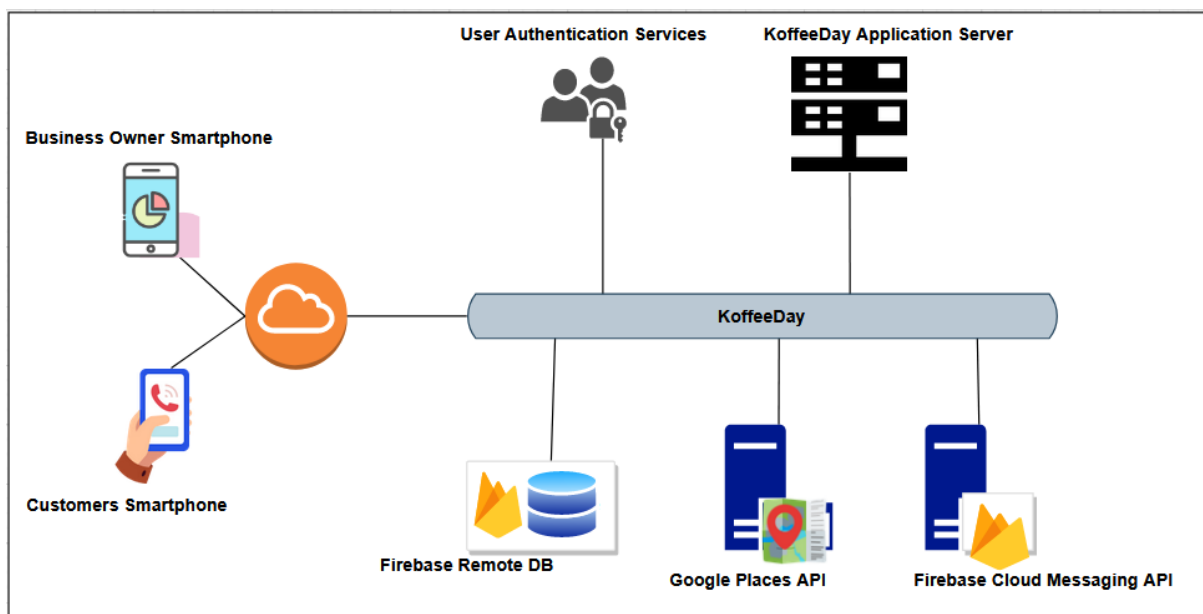


Figure 4. KoffeeDay Network Diagram

Figure 4 showcases the network diagram of the KoffeeDay app, which is designed with a user-friendly interface to facilitate seamless online ordering. The app's architecture enables anyone to easily place orders from their mobile devices. The proposed app serves as a connecting platform for both users and coffee shop owners, allowing them to sign up and log in using their email credentials. To ensure efficient data management, the app utilizes Google Firebase as its database, enabling secure storage and retrieval of information. Each time the app is accessed, data is loaded from the Firebase database, ensuring real-time availability and accuracy. Furthermore, the KoffeeDay system incorporates Google API integration for location searching purposes, enhancing the app's convenience and enabling users to discover coffee shops based on their desired locations [19], [20], [21]. This integration streamlines the process of finding nearby coffee shops and provides users with accurate directions. To facilitate seamless and secure online payments, the KoffeeDay app integrates with a trusted payment gateway, such as the Stripe gateway. This integration ensures a smooth and reliable transaction process, allowing users to make in-app payments with ease while maintaining the security of their financial information [21]. Overall, the network

diagram of the KoffeeDay app demonstrates the efficient connectivity between users and coffee shop owners. The app leverages technologies like Google Firebase, Google API, and payment gateways to provide a user-friendly experience, enabling users to order coffee conveniently, locate nearby coffee shops, and make secure online payments within the app.

6 Coffee Shop Platform and Apps

6.1 Frameworks for Cross-Platform Mobile App Development

6.1.1 React Native

React Native, introduced by Facebook in 2015 [22], is a powerful framework that enables the development of native applications using the JavaScript programming language. Initially an extension of the React library for web applications, React Native has grown into a robust framework in its own right [22], [23]. In its early stages, React Native emerged as an internal project during a Facebook hackathon, with the primary objective of simplifying iOS and Android app development [23]. At the core of the React Native framework are components, the fundamental building blocks of the framework. Developers have the flexibility to utilize pre-built components or customize them to align with the desired app design. While React Native is widely known for its capabilities in Android and iOS development, it also offers the potential to build desktop and web applications using the same codebase. However, as Temirgaliyev [23] highlights, integrating external third-party libraries may be necessary when targeting different platforms. React Native has gained significant popularity and is utilized by some of the most prominent apps globally. Developers have employed React Native in the development of applications such as Facebook, UberEats, Flipkart, and Skype. The framework's versatility and widespread adoption are a testament to its power and effectiveness in building robust and feature-rich applications.

6.1.2 Flutter

Introduced by Google in 2018, Flutter is a UI toolkit that empowers developers to build natively compiled apps using a single codebase. It is constructed based on the Dart programming language and has undergone regular updates, incorporating developer feedback to ensure optimal performance and quality [24]. The primary objective of Flutter is to deliver applications that exhibit the same design and performance characteristics as native apps [25]. The core building blocks of Flutter are widgets, which developers can leverage to create their app interfaces. Flutter provides a wide array of ready-made widgets that can be customized to achieve the desired look and feel of the app design, emphasizing the creation of visually appealing applications. In addition to Android and iOS platforms, Flutter enables the use of the same codebase for developing progressive web apps (PWA). However, there have been instances where Flutter for web development has encountered some challenges and errors. A standout feature of Flutter is its hot reload functionality, which allows for quick rebuilding of the app's structure. The reload speeds up the development cycle by rendering changes to the app's structure faster than traditional app builders. This feature is a crucial element in enhancing the development process. Despite being a relatively new technology, Flutter has gained remarkable popularity, surpassing that of React Native. Flutter's rapid growth and widespread adoption have contributed to its stability and maturity as a platform. Flutter has been embraced by notable apps worldwide, including the BMW app, Grab Merchant app, and Google Assistant app [24], [25]. Trends from Google from 2016 to 2022 confirms the rising popularity of Flutter as a preferred choice for app development.

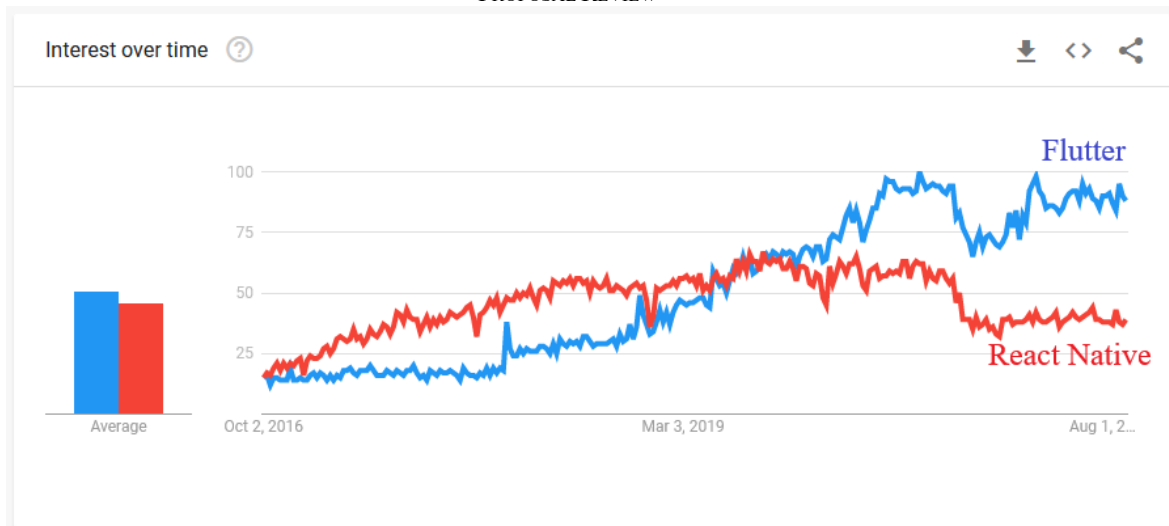


Figure 5. React Native and Flutter interest based on Google Trends from 2016 to 2022

6.1.3 Xamarin

Xamarin, a framework introduced by Microsoft in 2011, has played a significant role in cross-platform app development [26]. However, Microsoft has made a strategic decision to deprecate Xamarin.forms, a key component of Xamarin, as of November 2022, Microsoft has announced the development of a new framework called Multi-platform App UI (MAUI), which will replace Xamarin.forms [27]. The introduction of MAUI signifies Microsoft's commitment to advancing cross-platform development and addressing the evolving needs of app developers. MAUI aims to provide a more streamlined and efficient approach to building applications that can run on multiple platforms, including Android, iOS, Windows, and macOS. With the deprecation of Xamarin.forms, developers will transition to MAUI, benefiting from an improved development experience and enhanced capabilities. MAUI is expected to offer a more unified and flexible framework, empowering developers to create consistent user interfaces and seamlessly share code across different platforms. Microsoft's decision to introduce MAUI reflects their commitment to supporting the cross-platform development community and their dedication to providing cutting-edge tools and technologies. By discontinuing active support for Xamarin.forms, Microsoft is paving the way for the next generation of cross-platform app development with MAUI. As the technology landscape continues to evolve, it is crucial for developers to stay up-to-date with the latest frameworks and tools. The introduction of MAUI opens up new possibilities and opportunities for developers to create powerful and feature-rich applications that can reach a wider audience across multiple platforms [26], [27].

6.2 Comparison between React Native and Flutter

6.2.1 Framework stability

React Native, released three years prior to Flutter, has undergone significant improvements and refinements by the Facebook developer team, resulting in a stable and issue-free framework over time. React Native has achieved a relatively mature level of stability. However, they also point out that Flutter benefits from more up-to-date resources and tutorials. They caution that React Native has a high percentage of low-quality package libraries despite its large quantity. One notable advantage of Flutter is its rendering process, which ensures a stable UI even in the event of OS UI updates. The visual details of Flutter UI remain consistent across both new and old devices, unaffected by UI updates [22], [24], [25], [26], [27]. This attribute contributes to Flutter's reliability and consistency across various platforms. Both React Native and Flutter benefit from extensive package and library support from their respective developer teams at Facebook and Google. According to a survey of 31,743 software developers, Flutter and React Native are nearly equally prevalent and widely used [23], [25]. Overall, while React Native has a longer history and stability, Flutter offers a more modern set of resources and tutorials. Flutter's rendering process ensures a stable UI despite OS updates, and both frameworks enjoy significant support from their developer teams. The choice between React Native and Flutter ultimately depends on specific project requirements and developer preferences.

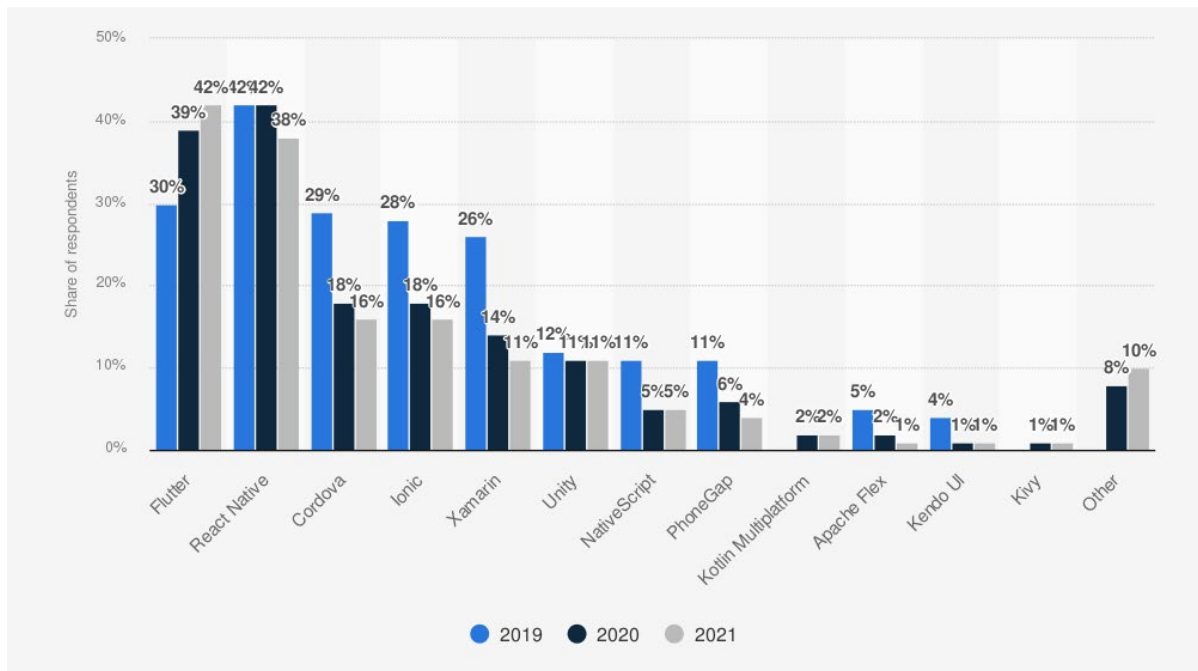


Figure 6. Cross-platform mobile frameworks used by software developers globally between 2019 and 2021

6.2.2 Performance

A paper [28] sheds light on the performance disparities between apps built with React Native and Flutter. Khan et al. [28] emphasizes that Flutter, with its bottom-to-top architecture, is designed to deliver more efficient performance while requiring fewer resources. In Khan et al. [28] investigation of performance, a key metric employed is the number of frames per second (FPS), which serves as a direct indicator of app smoothness. FPS measurements are recorded during user scrolling, animation rendering, and user input processing. The study's findings indicate that Flutter apps exhibit more stable FPS compared to their React Native counterparts. To assess the frameworks' efficacy in file exchanges, Khan et al. [28] examines their input and output (I/O) speeds. React Native demonstrates a faster write time, averaging approximately 10ms faster than Flutter, as observed. Overall, the study by Khan et al. [28] highlights the contrasting performance characteristics of apps developed using React Native and Flutter. Flutter, with its efficient architecture, displays more stable FPS, enhancing the overall smoothness of the app. On the other hand, React Native showcases faster write times in I/O operations. These distinctions in performance factors contribute to developers' considerations when selecting between React Native and Flutter based on specific project requirements.

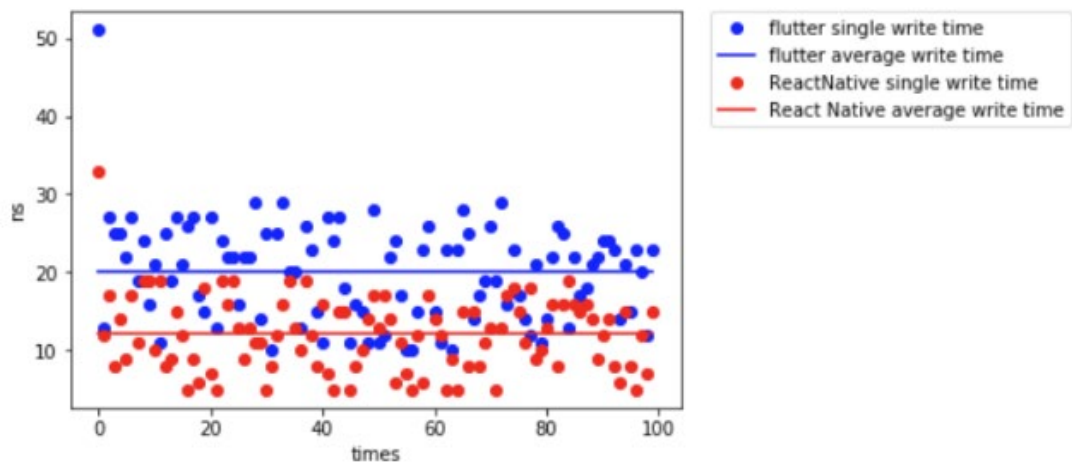


Figure 7. Chart showing time taken for Flutter and React Native to write files

7 Conclusion and Future work

In conclusion, considering the performance capabilities and development efficiency of Flutter, it emerges as the most suitable framework for the project at hand. The framework's integration of the Material Design UI toolkit is particularly advantageous, as it enables the project to meet its tight deadline while ensuring visually appealing aesthetics. The time saved by leveraging Flutter can be allocated towards enhancing other aspects of the project, such as scope and quality. Moving forward, the future work of this study entails the development of a coffee shop app that seamlessly connects both coffee shop owners and customers on a single, convenient platform. The objectives of this development include:

1. Creating Android and iOS apps that enable customers to search for coffee shop details and browse their menus.
2. Implementing an order function that empowers customers to customize their orders, save them for future reference, and seamlessly place them.
3. Designing a comprehensive dashboard for coffee shop owners, allowing them to view sales figures, process incoming orders, and manage their menu items.
4. Developing a secure and efficient payment system that enables customers to prepay for pickup orders and ensures coffee shop owners receive the payments seamlessly.

By achieving these objectives, the developed coffee shop app will provide a user-friendly experience for customers while empowering coffee shop owners to efficiently manage their operations. This project encompasses both the customer-facing and business management aspects, ultimately facilitating enhanced customer satisfaction, operational efficiency, and growth opportunities for coffee shop businesses.

BIBLIOGRAPHY

- [1]. "TRANSFORMING INDIA'S PAYMENT LANDSCAPE: AN ANALYSIS OF DIGITAL PAYMENT UTILIZATION," International Research Journal of Modernization in Engineering Technology and Science, Apr. 2023, Published, doi: 10.56726/irjmets37288.
- [2]. K. Y. Lee, "Information Processing of Mobile Messenger App Advertising: With Emphasis on Entertainment, Informativeness, and Intrusiveness of Mobile Messenger App," Korea Journal of Communication Studies, vol. 29, no. 1, pp. 177–196, Feb. 2021, doi: 10.23875/kca.29.1.8.
- [3]. C. V. Lombardi, N. T. Chidiac, and B. C. Record, "Starbucks coffee corporation's marketing response to the COVID-19 pandemic," Innovative Marketing, vol. 17, no. 2, pp. 177–188, Jun. 2021, doi: 10.21511/im.17(2).2021.16.
- [4]. Y. Liu, Y. Ma, X. Xiao, T. Xie, and X. Liu, "LegoDroid: flexible Android app decomposition and instant installation," Science China Information Sciences, vol. 66, no. 4, Mar. 2023, doi: 10.1007/s11432-021-3528-7.
- [5]. C. Miao, H. Gaggiotti, and C. Brewster, "Popping the 'bubble' metaphor: separation and integration of expatriate communities," Journal of Global Mobility: The Home of Expatriate Management Research, vol. 11, no. 1, pp. 110–124, Oct. 2022, doi: 10.1108/jgm-05-2022-0016.
- [6]. D. Simedru and A. Becze, "Complex Profiling of Roasted Coffee Based on Origin and Production Scale," Agriculture, vol. 13, no. 6, p. 1146, May 2023, doi: 10.3390/agriculture13061146.
- [7]. H. Parmar, F. Davis, and E. Walden, "Understanding the neurodynamic process of decision-making for mobile application downloading," PLOS ONE, vol. 17, no. 12, p. e0278753, Dec. 2022, doi: 10.1371/journal.pone.0278753.
- [8]. Y. Ouyang, B. Guo, Q. Wang, Y. Liang, and Z. Yu, "Learning Dynamic App Usage Graph for Next Mobile App Recommendation," IEEE Transactions on Mobile Computing, vol. 22, no. 8, pp. 4742–4753, Aug. 2023, doi: 10.1109/tmc.2022.3161114.
- [9]. G. B. Celli and A. C. de Camargo, "What is in a cup of joe? From green beans to spent grounds: a mini-review on coffee composition and health benefits," Journal of Food Bioactives, vol. 6, Jun. 2019, doi: 10.31665/jfb.2019.5184.

- [10]. S. M. Lee, "Relationships among Festival Quality, Festival Trust, Satisfaction, and Word of Mouth : The Case of World Coffee Festival in Gangwon Province," *Journal & Article Management System*, vol. 16, no. 3, pp. 265–281, Aug. 2020, doi: 10.31927/asec.16.3.14.
- [11]. "COFE App acquires Sippy Beans to target at-home coffee consumers," *World Coffee Portal*, Feb. 02, 2022. <https://www.worldcoffeeportal.com/Latest/News/2022/February/COFE-App-acquires-UAE-based-Sippy-Beans-to-grow-e>
- [12]. "COFE Story - Coffee ordering fast & efficient with COFE App," *Coffee ordering fast & efficient with COFE App*. <https://www.cofeapp.com/about-us/>
- [13]. "Coffee Shop Point-of-Sale, Loyalty + Mobile Ordering," *joe - mobile ordering for independent coffee shops*, Nov. 18, 2019. <https://joe.coffee/>
- [14]. "Blog – Joe Coffee Company," *Joe Coffee Company*. <https://joecoffeecompany.com/blog/>
- [15]. J. Chase and L. Roasting, "Caffè Ladro Blog Shares Coffee News, Brewing Guides & Recipes," *Caffè Ladro*, May 04, 2017. <https://www.caffeladro.com/blog/>
- [16]. ODEKO, "ODEKO," *ODEKO*, Feb. 28, 2023. <https://odeko.com/>
- [17]. "Odeko," *Odeko*. <https://order.odeko.com/>
- [18]. R. Salama and A. A. Jabbar, "Developing an Android-Based Mobile App to Solve Transportation Issues," *International Journal of Interactive Mobile Technologies (iJIM)*, vol. 16, no. 21, pp. 23–48, Nov. 2022, doi: 10.3991/ijim.v16i21.36063.
- [19]. M. Ohyver, J. V. Moniaga, I. Sungkawa, B. E. Subagyo, and I. A. Chandra, "The Comparison Firebase Realtime Database and MySQL Database Performance using Wilcoxon Signed-Rank Test," *Procedia Computer Science*, vol. 157, pp. 396–405, 2019, doi: 10.1016/j.procs.2019.08.231.
- [20]. I. Gribomont, "OCR with Google Vision API and Tesseract," *Programming Historian*, no. 12, Mar. 2023, doi: 10.46430/phen0109.
- [21]. M. Patil, "Smart Blood Donor System using Android Studio, Firebase Database and Google Maps API," *International Journal for Research in Applied Science and Engineering Technology*, vol. 9, no. 5, pp. 1593–1595, May 2021, doi: 10.22214/ijraset.2021.34540.
- [22]. C. Fernando Valarezo Loaiza and D. Triviño, "Scenarios to use React Native, native code or integrate both technologies," *ÑAWPAY Revista Técnica Tecnológica*, vol. 2, no. 1, p. 5, Sep. 2020, doi: 10.36500/nawpay.v2i1.95.
- [23]. Z. Temirgaliyev, "Features of development of geolocation applications for mobile devices with the help of framework React Native," *InterCarto. InterGIS*, vol. 25, no. 1, pp. 414–422, Jul. 2019, doi: 10.35595/2414-9179-2019-1-25-414-422.
- [24]. W. Zhang and C. Xu, "Exploring App-Based Taxi Movement Patterns from Large-Scale Geolocation Data," *ISPRS International Journal of Geo-Information*, vol. 10, no. 11, p. 751, Nov. 2021, doi: 10.3390/ijgi10110751.
- [25]. J. Zarak, C. Manav, P. Nazia, and C. Megha, "SERIGO: Development and Implementation of a Peer-to-Peer Self-Driving Car Rental App using Flutter Framework," *International Journal of Performability Engineering*, vol. 19, no. 3, p. 155, 2023, doi: 10.23940/ijpe.23.03.p1.155166.
- [26]. S. V. Kuznetsova, "Features of cross-platform mobile applications development using Xamarin," *Trudy MAI*, no. 125, 2022, doi: 10.34759/trd-2022-125-21.
- [27]. "Developing Mobile App for Identifying Indian Currency Denomination using Convolution Neural Networks for Visually Impaired People," *Journal of Xidian University*, vol. 14, no. 4, Apr. 2020, doi: 10.37896/jxu14.4/171.
- [28]. S. M. Khan, A. U. Nabi, and T. H. Bhanbhro, "Comparative Analysis between Flutter and React Native," *International Journal of Artificial Intelligence & Mathematical Sciences*, vol. 1, no. 1, pp. 15–28, Sep. 2022, doi: 10.58921/ijaims.v1i1.19.