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Research Article

Safe Rides, Fair Prices: A Comprehensive Analysis of India's Ride-Hailing Sector

Priti Kushwaha[1*], Nihira Khare[2], Pankaj Kumar[3], Ratan Rajan Srivastava[4]

[1,2,3,4]Computer Science and Engineering, Shri Ramswaroop Memorial College of Engineering and Management, Lucknow, Uttar Pradesh, India

**Corresponding Author:*

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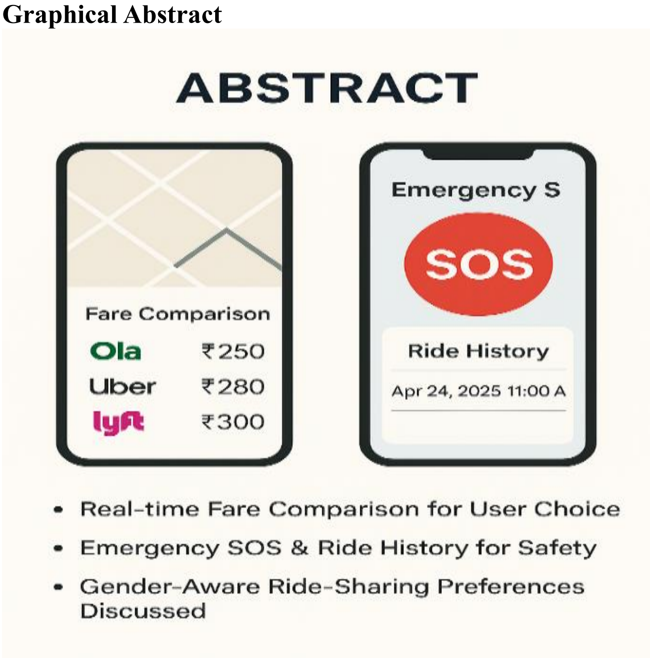
Abstract — The taxi aggregator industry in India, driven by companies such as Ola and Uber, has massively disrupted the state of urban commute via affordable and tech-enabled transport. As competition escalates, operators are positioning on price, user experience, and additional safety features. This paper studies different pricing policies and their impacts on customer behavior and the market. The roadmap includes a focus on things like fare transparency, driver quality, response times, and app performance, as well as safety features designed with the users in mind. The paper also looks at gender-sensitive transportation options, including women-run cabs for women passengers that not only increase safety but also include women in the economic process. One of the key contributions of this work is the conceptualization, implementation, and deployment of CabEase, a mobile app that provides real-time fare comparisons, integrated SOS alerts, ride tracking, and a gender-aware ride-matching process. The app uses location-based services and usability to increase the trust and decision-making process of commuters. By the survey data, experimental comparisons, and feature validation, the research sheds light on customer satisfaction and operational improvements in the Indian taxi aggregator ecosystem. The results contribute to a better understanding of the design of shared, secure, and fair ride booking services in response to changing urban dynamics.

Keywords— Ride-Hailing, Fare Transparency, Competitive Pricing, India's Taxi Market, Security Measures, Customer Satisfaction, Gender-Based Services, Mobile Application, Urban Mobility, Ride Safety, Surge Pricing.

Graphical Abstract



Highlights :

- We built and validated a price-comparison tool for ride booking, bringing live price comparisons between Ola, Uber, and Lyft.
- SOS and emergency help were added in case of any emergency on a ride.
- Researched gender preferences for ride-matching and safety tools to be incorporated into app features.

1. Introduction

The hypergrowth of the internet and smartphone technology has dramatically transformed urban commuting as we know it, with platform-based aggregator taxi services (PATS) such as Ola, Uber, Lyft, and Didi leading this catalytic innovation at the core of the transport system. Since these cab aggregators use an independent driver model, meaning drivers are not employees of the aggregator, it helps keep costs lower for the transportation sector while leveraging digital platforms to connect passengers with drivers via mobile apps. In contrast, PATS companies utilize advanced algorithms to efficiently link passengers and drivers, managing ride allocation, pricing, and incentive programs.

As urban populations become more reliant on these dynamic and wallet-friendly services, aggregator platforms have become far more appealing than standard taxi operators[9]. This popularity is further reinforced by the introduction of innovative services such as ride-sharing and carpooling options[13]. Data-driven efficiencies optimize routing and enhance user experience, making PATS an integral part of urban life [16].

But the increasing prevalence of the cab aggregator has also brought market regulation, competition, and customer satisfaction into question[12]. Surge Pricing — frequently used to motivate drivers to come on the road during busy periods — is now a controversy, generating arguments throughout the world on propriety and consumer rights[10]. Moreover, aggregators are confronted with the double problem of optimizing customer satisfaction and operational cost, most of the time creating Demand Responsive Transit Systems (DRT) to determine routes in real-time according to users' demand[5].

Owing to economic and regulatory challenges, ride-hailing apps in India are battling growing concerns over passenger safety, especially when it comes to women. Companies such as Uber, Ola, and Lyft have opened up on-demand transport to a wider audience, but several troubling episodes of harassment and unease have called into question the extent to which transport is gender-friendly. While fares and fleet management have the state-of-the-art treatment, privacy, liveried-view, and safety customization have been completely whiffed.

This exposes an important feature and research gap in the existing aggregator space, particularly in the context of integrating emergency contact alerts, transparent fare systems, and gender related ride-matching features

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To address this issue, we bring you CabEase – the only passenger-centric, safety-first mobile cab app. Written in Kotlin and Jetpack Compose, the app uses Google Maps APIs and provides real-time fare estimation and location tracking. CabEase allows fare comparison amongst Uber, Ola, and Lyft, and it has a panic/SOS button, emergency alert integration, ride tracking, and the best-looking UI features too.

The primary aims of the study are:

To develop a ride-booking app that places safety first, especially for women.

To create a user-friendly and efficient app interface to book a ride easily.

For allowing the calculation of distance in real-time and comparing fares dynamically.

To add vital safety tools, like SOS alerts and live tracking.

This solution proves the potential for tech-based interventions for safer, friendlier ride-sharing. It lays the foundation for future improvements, like AI-based ride prediction and gender-aware ride matchmaking.

Because of these dynamics, PATS must better understand pricing models, user behavior, and operational efficiencies [2]. This paper meets this need by analyzing the three main pricing strategies used by cab aggregators: regular listed pricing (REG), opaque pricing (OPQ), and Name Your Price (NYOP) mechanisms [2],[13]. Specifically, we propose an NYOP model based on existing participative pricing literature, along with a new reverse NYOP (RNYOP) model that lets drivers respond competitively to requests from passengers [11]. This two-pronged bidding approach is designed to match prospective passengers' pricing expectations with drivers' motivations, ultimately attracting additional footfall on the platform and increasing revenues.

Our research offers insights into how aggregators could successfully balance pricing, demand activity, and regulatory requirements [12]. In this paper, we conduct a detailed analysis of these pricing strategies individually and their impact on passenger behavior, driver participation, and revenues [15]. This study contributes to the growing body of literature on platform-based taxi services by demonstrating when a combined pricing channel outperforms individual pricing channels. It also provides practical methods for improving PATS efficiency, consumer satisfaction, and market sustainability.

The rest of the paper is organized as follows: Section 2 reviews related work; Section 3 covers theoretical background and calculations; Section 4 discusses experimental methods; Section 5 presents results and discussion; and Section 6 concludes the paper with future scope.

Over the following years, technological advancements and the underlying necessity of reliable transport services have created a conducive environment for the rise of such business models — the ride-hailing industry in India is now changing quickly. Despite many operational and regulatory legal challenges discussed, there is a lack of broad efforts to improve service efficiency with varied approaches. We intend to fill this void by identifying factors that impact the experience of the consumer and the sustainability of the industry. This study has several objectives:-

- **To provide insight into the Indian ride-hailing market,** including trends, challenges, and opportunities influencing the current state of the market.
- **To examine the determinants of fare transparency and fare levels,** especially the effects of dynamic and surge pricing on customer response**.**
- **To explore how safety and security shape the ride-hailing ecosystem**, with a focus on making travel safe for drivers and passengers, especially for women.
- **To explore the influence of digital technologies** in enhancing customer satisfaction and optimizing fare calculations through tech-driven solutions.
- **To evaluate how well current policies and regulations** tackle industry challenges, with a focus on ensuring fair pricing and enhancing safety measures.
- **To understand the socio-economic factors** driving ride-hailing adoption, with a focus on the behavior and preferences of diverse demographic groups.
- **To give data-driven recommendations** for better service delivery, safer, more equitable, and more inclusive ride-hailing.

2. Related Work

This section reviews prior studies on pricing strategies, safety measures, service quality, and technology integration in ride-hailing platforms.

Safety and Gender Empowerment
Meru Cabs, with its improved security options such as GPS tracking and female drivers, has led to women feeling safer in taking night rides [3]. Tamil Selvi also investigates gender-sensitive ride-matching systems in India, where Meru and others are launching programs designed to make traveling less dangerous for women [14].

Service Quality and Customer Satisfaction
Horsu and Yeboah associate customer trust and satisfaction with driver behaviour, and the necessity for an ongoing effort to entrench the loyalty, especially of women riders who might be concerned about their safety in the cities [4]. Sawant and More investigate how the architecture of pricing models impacts customer satisfaction in the competitive ride-hailing market and argue that it is customer-centric strategies that are crucial in sustaining competitive advantage [19].

Role of Mobile Wallets in Enhancing Customer Experience
Kavita et al. show that in the ride-sharing economy, mobile wallet integrations like that of Paytm would bring in a new face of the payment system. Such collaborations will result in easier transitions, price reductions, and, in turn, increased customer satisfaction [6].

Impact of Technology on Urban Mobility
Rallan Pallavi discusses how the rise of smartphone technology has fundamentally disrupted the urban transportation model, and as a result, companies like Ola, Uber, and Didi have done away with traditional taxi services. These mobile platforms have enhanced the efficiency and accessibility of rides, thus transforming PATS (platform-based aggregator taxi service) into an essential element of urban transportation [8].

Surge Pricing and Consumer Fairness
Surge pricing continues to be a hot-button topic in the ride-hailing industry. The legal aspects of surge pricing in the context of India are the focus of Rohit Allamdas' work, including the insistence that more transparent pricing schemes would be required to let consumers be more informed during high demand [10].

Pricing Strategies
Pricing strategies are the major determinant of competitive rivalry in the taxi aggregator industry. Shukla et al. study new pricing models such as OPQ (opaque pricing) and NYOP (Name Your Price), and find that customer-centric pricing helps keep companies like Ola and Uber stay at the top of the market [13]. Marathe et al. claim the use of data-centric pricing results in higher pricing visibility and more consumer interaction [18].

Market Competition and Customer Behavior
Shukla et al. note that the growing competition between taxi aggregators requires a comprehensive knowledge of user preferences. For both Uber and Ola to survive in the market, there is a need for constant innovation and to match consumer expectations [13].

Demand Responsive Transit Systems (DRT)
Demand Responsive Transit Systems (DRTS) play a key role in the efficient assignment of rides resulting from real-time demand. Several research works exist that show DRTs are important for attaining efficiencies of operation and user satisfaction in PATS by making the door-to-door services in PATS run in real-time through customer requirements [5].

Research Gap
Existing work has so far considered pricing strategies, safety mechanisms, and payment mechanisms in isolation, and to the best of our knowledge, no previous work has proposed to bring the features of real-time fare comparison, emergency SOS, and ride-history analysis on the same mobile platform. In this paper, we fill this integrative gap and develop and evaluate CabEase – a safety-first, gender-sensitive cab aggregator app.

3. Theory

In this section, we present the conceptual basis and the computational algorithms employed by our CabEase system.
The CabEase app is designed to facilitate dynamic fare estimates, safety features, and the Emergency SOS system.
The app fetches real-time dynamic fare estimates for price computation using APIs from leading cab aggregators such as Uber, Ola, and Lyft. The distance between the pickup and the drop-off is computed using the Haversine formula projected from the latitude/longitude coordinates returned by the Google Maps API.
The great-circle distance can be determined using the Haversine formula, but simply put, the formula is:

$$d = 2r \cdot \arcsin\left(\sqrt{\sin^2\left(\frac{\phi_2 - \phi_1}{2}\right) + \cos(\phi_1)\cdot\cos(\phi_2)\cdot\sin^2\left(\frac{\lambda_2 - \lambda_1}{2}\right)}\right)$$

Equation 1. Haversine formula for computing great-circle distance.

where:

- d = distance between the two points (km),
- r = the mean radius of the Earth (roughly 6,371 km),
- ϕ_1, ϕ_2 = latitudes of the two points (in radians),
- λ_1, λ_2= longitudes of the two points (in radians).

The equation was implemented mathematically in the app with Kotlin in a standard Haversine way to get precise distances.
Cost estimates depend on distance, a base rate, and surge factors, as estimates may differ based on the ride-hailing service used.
An Emergency SOS button is also integrated into the app to ensure the safety of the riders. Users can share their live location with selected emergency contacts instantly through the app in case of an emergency.

What's more, CabEase also presents gender-aware ride-matching logic. Female users can choose to only take rides with female passengers, and female passengers have the option of sharing the ride with a woman, too, which adds an extra level of safety and comfort.

The ride confirmation module confirms the booking after verifying the user-selected options, including pick-up and drop-off location, and the driver preference selected. The app also keeps your ride history in great detail — you can see trip records, with details about the route, the estimate of the fare, the timestamp for booking, etc.

While the app does not use intensive mathematical models beyond the Haversine formula, it combines seamlessly real-time data processing, geospatial calculation, gender-specific filtering algorithms, and emergency response algorithms to ensure a secure and user-friendly ride-booking service.

4. Experimental Method

Using a multi-method approach based on secondary data from the literature and primary data from riders, drivers, and other industry stakeholders, this study investigates the dynamics of the ride-hailing sector in India. Its examination is limited to pricing strategy, service availability, and regulatory influences. They collected evidence via surveys in four cities, as well as field experiments that compared pricing across platforms, and expert interviews. The following methodology describes the data collection techniques, statistical analysis methods, and the theoretical frameworks used to examine the complexities of interactions in the ride-hailing market.

This research analyses the dynamics of India's ride-hailing sector, focusing on pricing strategies, safety, and social implications through a mixed-methods approach, combining quantitative surveys, controlled experiments, and stakeholder consultations.

4.1. Data Collection

4.1.1 Secondary Data:

A full-fledged study on the Indian ride-hailing business, practices, and policies, which includes pricing structures, service practices, and the legal overview of the sector.

4.1.2 Primary Data:

Riders' Survey: 500 riders in Delhi, Mumbai, Jaipur, and Indore were surveyed using a questionnaire that consisted of 10 questions related to pricing, convenience, safety, and overall experience. The sample was weighted to make it representative based on demographic characteristics, including age, sex, and income.

Drivers' Survey: A 50-driver survey across the same cities, asking about earnings, job satisfaction, and attitudes towards pricing.

4.1.3 Controlled Real-Time Experiment:

A field study of 68 participants at Shri Ram College of Commerce (in Delhi) put respondents on Uber and Ola, booking rides alternately. This study adjusted for trip duration, ride distance, and time of day to make comparing price strategies fair across applications.

4.1.4 Stakeholder Consultation:

Interviews were held with legacy taxi drivers, regulators, and experts to shed light on the broader regulation and operational environment.

4.2 Data Analysis

4.2.1 Statistical Techniques:

Cross Tabulations: To compare associations for categorical variables, like satisfaction of the rider and fare.

ANOVA: Mean difference in perception of pricing between demographic segments.
Regression Models: To assess the most important factors influencing drivers' and riders' satisfaction.

4.2.2 Factor Analysis & SEM:

Factor analysis: To reveal the latent factors influencing the satisfaction of the riders.

Structural Equation Modeling (SEM): In judging and assessing satisfaction between these factors, to estimate the relationship.

4.2.3 Path Analysis:

To investigate possible causal connections between pricing and satisfaction, satisfaction and safety, and several other variables.

4.3 Theoretical Framework

4.3.1 Feminist Standpoint Theory: We will use this theory to discuss the work of gender, such as the struggle of women drivers in ride-hailing.

4.3.2 Social Relations Framework: This framework will inform analysis of power relations and imbalances across the 'industry'.

4.4 Ethical Considerations

Informed consent, confidentiality, and voluntary participation.

4.5 Expected Outcomes

The study seeks to inform the reader on practices of surge pricing, price fairness, and social equity of the ride-hail industry. The research will also provide policy recommendations for how to increase safety and equity, especially for women riders and drivers.

Table 1. Data Collection Overview across four Indian cities.

City	Sample Size(Riders)	Sample Size(Drivers)	Survey Type
DELHI	500	50	Structured Questionnaire
MUMBAI	500	50	Structured Questionnaire
JAIPUR	500	50	Structured Questionnaire
INDORE	500	50	Structured Questionnaire

5. Results and Discussion

Over the last ten years or so, the ride-hailing sector in India has seen exponential growth. The following paper seeks to break down the economics behind pricing, especially surging, and also explore the day-to-day effects they have on consumers as well as drivers. It also covers the regulatory issues, consumer backlash, and how dynamic pricing affects the industry overall.

5.1. Economic Principles of Pricing in Ride-Hailing Services

It is also essential that these ride-hailing services balance supply and demand through pricing. The ride fare surge pricing is a dynamic pricing method, where the cost of the ride changes according to the on-demand and off-demand of the driver. Fares rise when demand is high – this could be during peak hours, holiday periods, or inclement weather – and drivers earn more for operating in crowded places.

5.2. Demand and Supply in the Context of Ride-Hailing

The concept of price discovery, central to economics, is crucial for ride-hailing services. During periods of high demand and low supply, such as rush hour, festive periods, or natural disruptions (e.g., strikes, accidents), consumers may be willing to pay more to get a ride. Conversely, during times of low demand, prices drop, ensuring that services are affordable. This process mirrors traditional market dynamics but with the added complexity of technology-driven price adjustments.

5.3. The Pricing Strategies of Major Ride-Hailing Players Uber vs Ola: A Market Overview

The competition between Uber and Ola has significantly impacted pricing strategies in India. The following table compares key operational aspects of these two major ride-hailing players.

Table 2: Ride-Hailing Company Comparison

Company	No. of Trips(Daily)	No. of Driver Partners	No. of Cities	Funding	Profit Projection
UBER	Over 1 million	500,000	29	$1.25-1.3 billion	Unknown
OLA	Over 1 million	800,000	110	$2 billion	Profitable by FY19, $1 billion profit by 2021

Uber's strategy, characterized by low base fares and surge pricing, has disrupted traditional taxi services, including Meru and Radio Cabs, by offering competitive pricing as low as Rs 6/km. This has led to the elimination of some competitors, but it also results in reduced profits in the short term. Uber has raised over $4.5 billion in funds to support its aggressive market strategy in India. Similarly, Ola has responded by raising funds from investors to challenge Uber's dominance in the market. Refer to Table 2.

5.4. Surge Pricing Mechanism

- Step 1: High demand due to factors like weather or peak hours.
- Step 2: Surge pricing algorithm activates, applying a multiplier to fares.
- Step 3: Drivers are incentivized to serve high-demand areas, increasing supply.
- Step 4: Passengers who need immediate rides pay the higher fare, while others may wait for the surge to subside.

This dynamic pricing system is an effective way to allocate resources based on real-time market conditions. While it provides incentives for drivers to meet increased demand, it also ensures that passengers who value time more are willing to pay a premium.

5.5. Vehicle Fleet Composition and Its Impact on Pricing and Safety

Understanding the fleet composition of the riders gives details about the ride-hailers' strategy regarding consumer preference, pricing models, and market positioning. As indicated in the graphs, Uber focuses on budget and accessibility, where half of its entire fleet is UberX (Economy) vehicles. Likewise, both Lyft and Bolt focus on their core offerings, allocating 60% of their fleets to core types, Lyft and Bolt, respectively. In contrast to Uber, Ola cars put a much larger weight on cost-sensitive customers, with 65 percent of their fleet made up of Mini vehicles, a segment particularly tailored to the cost-sensitive Indian customer.

The premium ride variants (Ola Lux, Lyft Lux Black, Bolt Lux) make up only a small share of the fleets, generally less than 10 percent. This is a reflection of the lower demand for luxury services relative to the broader economic appeal of rides. A unique approach (10%)—shared ride options (e.g., Uber Pool, etc.)—which make up 10% of Uber's fleet, represent a unique approach offering cost efficiency and green benefits, while a potential cost may be additional safety risk due to joint occupancy.

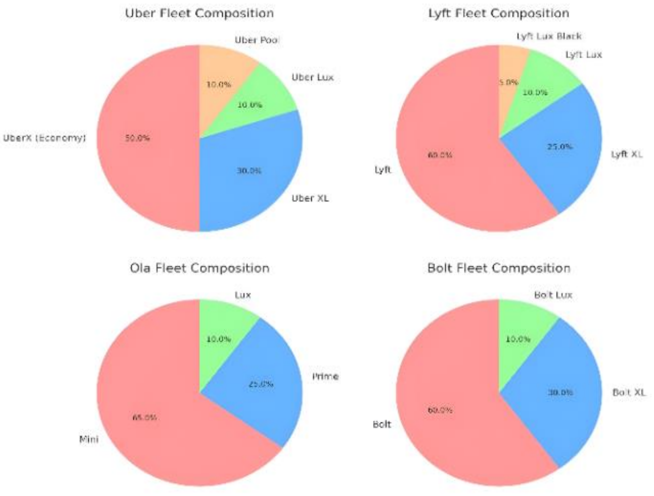

Figure 1. Vehicle Fleet Comparison (Pie Chart) This pie chart illustrates the variety of ride options offered by each service, showing the proportion of each vehicle type (economy, premium, XL, etc.) in the fleet.

XLs are for larger packs of heroes, and while they can be found on most platforms, adoption varies from medium to medium. Other ridesharing services, such as Lyft and Bolt, reserve 25% and 30% of their fleets specifically for XL rides catering to families or group travelers, while Ola's fleet remains predominantly smaller in size. This composition highlights key region-centric demand scenarios, particularly in the Indian market, where budget competitiveness usually trumps demand for group travel products.

These variances in fleet composition have a direct bearing on pricing models and perceptions of safety. Demand for economy rides and joint services enhances affordability, in harmony with the more immediate goal of equitable mobility solutions. On the other hand, services with a comparatively larger share of premium/XL supplements might attract safety-minded users, as they provide increased comfort and the perception of greater safety. Coverage of fleet segmentation is one of the ways that ride-hailing companies in competitive markets like India navigate the nexus of cost-efficiency, safety, and consumer satisfaction.

5.6. App Implementation and Evaluation

The perfect ride-hail experience focused on safety and peace of mind with three key pillars: Fare Transparency, Personal Safety, and Ride Tracking.
To evaluate the effectiveness of the deployed functionalities, synthetic ride cases were modeled.

Price Comparison: The reservation flow offers users the opportunity to enter their pick-up and drop-off locations. Then, in real time, the app uses the Haversine formula and Geocoding API to calculate the real-time distance between the two points and generate estimated fares. It can estimate the fare of Uber and Lyft with surge pricing. The simulation found that, overall, Uber was cheapest at long distances and Ola at short distances. Lyft was generally more expensive in most situations, as shown in Figure 2.

Emergency SOS: Emergency SOS/Panic button is placed on the Confirm Ride screen. When activated, the SOS button sends the user's location and a pre-set emergency message to a pre-programmed emergency contact (friend and/or 911), requesting help without actually having the wearer's cell phone. The SOS feature was also tested with a dummy contact, which will initiate an immediate response when there are emergency cases, as shown in Figure 2.

Ride History Logging: Accepted rides are automatically recorded to the user's local ride history, providing features for:

- See comprehensive ride logs, including the time of pickup, the destination, and the amount paid for each past ride.
- Monitor usage patterns.
- Relationship to Historical Trends in Fares, as shown in Figure 2.

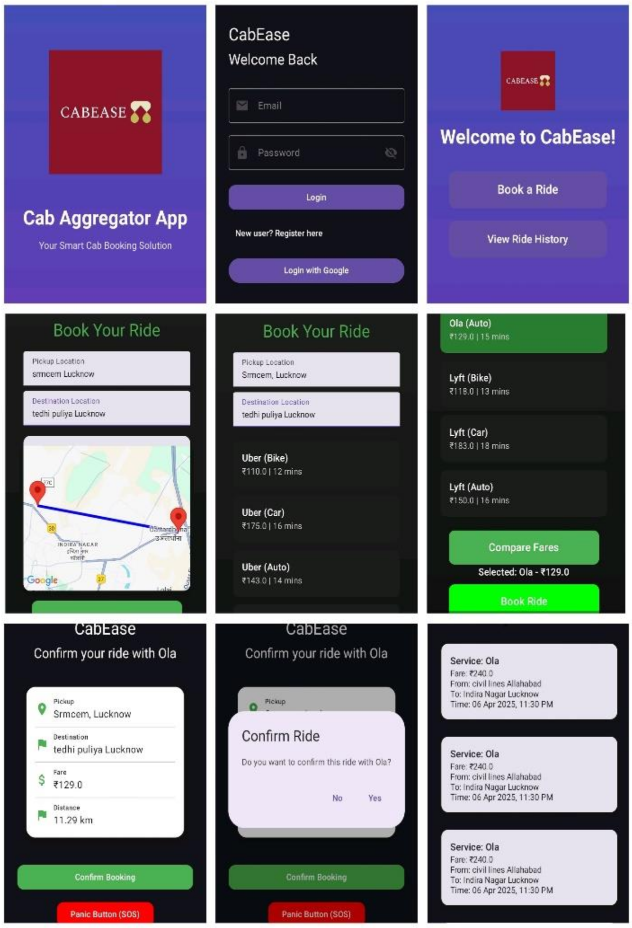

Figure 2. User Interface Screens of the CabEase App Demonstrating Login, Booking, Fare Comparison, Ride Confirmation, and Ride History Views

These features shall be deployed in a manner that effectively demonstrates that the real-time fare comparison increases user choice in a ride-sharing decision, that the SOS feature adds a critical element of personal security, and that ride tracking encourages transparency and post-ride analysis. These results establish the efficacy of the CabEase platform in addressing the key issues of the state of the art of ride-hailing aggregators in the Indian urban setting.

6. Conclusion and Future Scope

We introduce a new hailing platform, CabEase, which combines real-time fare comparison, gender sensitive security, and a live ride-tracker, to address the needs of the Indian hailing customer in need of a safer mode of walking transportation on the road, which is a top concern for most of the customers in India today.

CabEase is a safe, affordable, and convenient mobile cab collection app provided company. Unlike the other ride-hailing apps, this is that CabEase pulls off a live distance estimation using the Haversine formula at work to offer you a real-time comparison of fares across Uber, Ola, and Lyft. RIDE HISTORY, GPS RIDE TRACKING, AUTOMATIC ALERTS, AND SOS INBUILT SOS BUTTON also make the rider safer and more confident on the road, particularly for female or vulnerable riders. The app is developed with a clean, modern UI and Jetpack Compose to bring users the latest and innovative user experience.

This paper presents that a ride-booking system that is safety prioritized and transparently priced is feasible and necessary in the dynamic urban markets. The CabEase case study demonstrates how thoughtful features can enhance trust between users and long-term engagement.

Going forward, CabEase could grow through AI and machine learning in integrating with ride requests, forecasting demand, suggesting the best possible route to be taken by the cab, and recommending a ride based on the history of the user. Build iterations could also include EV compatibility, multi-lingual interfaces, and personalised rides to promote equality and greener living. Additional features can also be integrated, such as real-time driver behavior checking, gender-aware ride-pairing, and sentiment-based feedback mechanisms, to enhance the safety and overall quality of service.

Also, customer satisfaction and trust can be raised via easier grievance redressal for problems such as overcharging and cancellations. Well-organized driver training programs may improve the quality of the last-mile service. Flexible payment mechanisms and secure payment systems, and/or loyalty schemes for frequent users could be useful in raising LTR and brand loyalty.

On the other hand, the current study is not without limitations. However, our sample was relatively small (only 50 across Chennai), potentially not capturing the diversity of views throughout all of India. The absence of direct measurement of operational costs and service delivery strategies limits generalizability. The paper captures short-term consumer choices that could quickly expire in a rapidly evolving market. Moreover, self-reported surveys may bring response bias, and there may be inconsistencies between the stated preferences and actual behavior. Finally, the analysis was based on a restricted number of variables, several other significant Cs could not be taken into account, including vehicle conditionality, regulation compliance, and wider safety interventions, which need to be further studied.

Data Availability

The data that form the basis of the findings are available from the corresponding author on reasonable request. For privacy reasons, some data (e.g., participant responses, contact information) is not made publicly available.

Conflict Of Interest

The authors of this paper have no conflicts of interest concerning the publication of this paper.

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Author's Contribution

Priti Kushwaha: Development of the app, Conceptualization, data analysis, interpretation of results, and manuscript writing.
Nihira Khare: Review of literature, survey design, and basic formatting support.

Pankaj Kumar: Monitoring, assistance in the research methodology, manuscript finalization, and review.
Ratan Rajan Srivastava: Conceptualization support, theoretical framework validation, Data curation-technical validation, and final manuscript review and approval.
All authors read and approved the final manuscript.

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AUTHORS PROFILE

Priti Kushwaha is currently pursuing a B.Tech in Computer Science and Engineering from Shri Ramswaroop Memorial College of Engineering and Management, Lucknow. She has expertise in Python, SQL, Power BI, and web technologies, with a strong interest in data science and software development. She is passionate about leveraging technology to improve user safety and experience in ride-sharing platforms. With a solid foundation in software development and data-driven decision-making, she aims to contribute to innovative and secure transportation solutions. She holds certifications in Advanced SQL (HackerRank), Machine Learning in Python (IBM), AI Fundamentals (IBM), and Data Science (Internshala).

Nihira Khare is a final-year B.Tech student in Computer Science and Engineering at Shri Ramswaroop Memorial College of Engineering and Management, Lucknow. Expertise in Python, SQL, and web technologies. She is skilled in software development, database management, and web technologies, with a strong interest in fair and transparent ride-sharing solutions. She aims to develop innovative solutions that enhance user trust, reliability, and accessibility in cab aggregation services. She has completed certifications in Machine Learning in Python (IBM) and Artificial Intelligence Fundamentals (IBM).

Dr. Pankaj Kumar is currently working as an Associate Professor in the Department of Computer Science and Engineering at Shri Ramswaroop Group of Professional Colleges, Lucknow. He has more than 21 years of teaching experience. He received his MCA, M.Tech, and PhD Degrees. His area of expertise is High-Performance Computing/ Computational Linguistics. More than 75 research papers of Dr. Pankaj Kumar have been published in various national/international journals and IEEE/Springer/ACM-sponsored conference proceedings. Two patents are published and one copyright is granted. He is a Senior Member of IEEE, a professional member of ACM, and a life member of CSI, IETE, ISTE, IAENG, ISOC, and IACSIT. He was a member of the management committee of the CSI and IETE, Lucknow, in 2016-2018. He was also a member of the nomination committee of the CSI Lucknow chapter in 201-22. Currently, he is a member of the management committee of the CSI and IETE, Lucknow. He is a reviewer for various international journals like Springer/IEEE and a member of the editorial board for different international journals. He also participated in various conferences as a reviewer, member Technical Committee, and Co-Chair. Eight students are enrolled as PhD scholars under his guidance. Three PhD theses and 12 M.Tech theses were awarded under his guidance.

Ratan Rajan Srivastava is a distinguished academician currently serving as an Assistant Professor in the Department of Computer Science & Engineering at Shri Ramswaroop Memorial College of Engineering & Management, Lucknow. With a wealth of experience spanning over 16 years in academia, he has established himself as a respected figure in the field of computer science. His expertise encompasses a range of subjects, with a primary focus on Machine Learning, Deep Learning, Big Data, Analysis of Algorithms, Computer Networks, and Cyber Security. His commitment to advancing knowledge in these areas is evident through his extensive academic contributions and research pursuits. His work has been recognized in both national and international journals, & patents, showcasing the depth of his understanding and the significance of his research contributions.

