RideZO: A platform designed to help NSU students share rides, reduce transportation costs and minimize campus traffic congestion

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ABSTRACT

On college campuses around the world, the increasing number of students and transport issues have become major issues. At North South University (NSU), there is a growing need for an economical, environmentally responsible, and effective way to deal with campus traffic and growing transportation expenses. These issues are addressed by RideZO, a ride-sharing app designed specifically for NSU students, which makes carpooling easier, lowers transportation costs, eases traffic, and encourages environmental sustainability. RideZO provides a seamless, secure, and sustainable alternative to traditional transportation alternatives by leveraging modern technologies such as Flutter for cross-platform development, Firebase for real-time data management, and interaction with the Uber API and Google Maps API. This study investigates the platform's technology, advantages, problems, and future potential for improving campus mobility.

CCS CONCEPTS

A platform designed to help NSU students share rides, reduce transportation costs and minimize campus traffic congestion

KEYWORDS

RideZO,Ride share,Carpooling, Environment effect, Traffic Congestion,

1 INTRODUCTION

Increased use of single-occupancy vehicles causes traffic congestion on roads. Congestion causes travel delays and increases the externalities of road transport (Sweet, 2013). Increasing supply to match travel demand does not serve society in the long run as it leads to more traffic on roads (Noland, 2001).There are more students than ever before in colleges around the world, and this is especially true in cities. However, this increase raises substantial infrastructure concerns, the most significant of which being transportation.

Universities are usually located in congested urban regions, where students' daily commutes are hampered by parking issues, inadequate public transportation, and traffic congestion. Because of the increased demand for transportation services and insufficient infrastructure, there is a need for efficient and competitively priced alternative transportation solutions.

The situation at North South University (NSU) is similar to the difficulties that universities face worldwide. The growing number of students at NSU is putting more pressure on the community's transit system. As they depend on their own cars or public transportation to get to and from school, students must contend with growing transportation expenses, severe traffic jams, and environmental issues. Private transportation, like taxis and ride-hailing services, is still too expensive for many students, and public transportation is frequently unreliable or hard to use. Additionally, the growing problem of traffic congestion surrounding the university is exacerbated by the growing use of personal vehicles, which leads to delays and environmental degradation.

The needs of students are frequently not adequately met by conventional modes of transportation, such as private automobiles and public buses. These techniques add to traffic and pollution and are costly and ineffective. They also don't give students the freedom to select their preferred modes of transportation according to their location, schedule, or financial situation. In addition to being expensive, these transportation issues restrict NSU students' access to the campus community. Students lose time that they could use for extracurricular or academic pursuits because commuting becomes an expensive and time-consuming affair. Universities need to look for creative solutions that can offer sustainable and useful transportation options as they attempt to address these issues.

RideZO wants to offer a new way to solve the problem by giving NSU students a ride-sharing platform where they can share rides. This will lower their transportation costs, ease traffic, and have less of an impact on the environment. The

platform uses cutting-edge technology to offer a user-friendly and affordable alternative to traditional transportation. RideZO's goal is to make commuting better for everyone while also helping with the bigger goal of making campuses more environmentally friendly. It does this by letting students share rides to and from campus.

2 PROBLEM STATEMENT

RideZO's main goal is to fix the poor transportation system at NSU. The increasing number of students and the lack of public transportation options make it very hard to get to school. These problems show up in a number of ways:

- **High Transportation Costs:** For a lot of students, the cost of getting to and from school is still too high. Students who use private cars or taxis are facing rising costs, especially during peak hours when prices go up. Public transportation, on the other hand, is often unreliable or hard to get to, so students don't have any cheap options. RideZO helps by letting students share rides, which lowers the cost per passenger.

- **Traffic Congestion:** Traffic congestion becomes a big problem as more cars come to campus and the areas around it. Students who drive or take a taxi to NSU often get stuck in traffic for a long time, which makes them angry, late, and wastes time. RideZO wants to cut down on the number of cars on the road by encouraging people to share rides. This will help ease traffic on campus and in the area around it.

- **Environmental Impact:** The more people drive their own cars, the more pollution and climate change happen, since every new car on the road adds to carbon emissions. Traditional transportation has a big effect on the environment, especially in cities like Dhaka where the air is very polluted. RideZO wants to help students lower their carbon footprints by encouraging carpooling, which is a more environmentally friendly way to get around. RideZO helps lower the overall emissions from commuting by getting fewer cars on the road.

- **REDUCED GREENHOUSE GAS (GHG) EMISSIONS :** By reducing fuel consumption, several studies have demonstrated that carpooling can effectively decrease greenhouse gas (GHG) emissions. Utilising a simulation model, Herzog et al. (2006) projected that individually carpooling individuals could reduce their personal commute GHG emissions by approximately 4% to 5% after participating in an employer trip reduction program. A study conducted by Jacobson and King (2009) estimated annual savings of 7.2 million tons of GHG emissions in the United States if an additional passenger were added to every 100 vehicles. Furthermore, the same study indicated that adding a single passenger to every 10 vehicles could result in annual savings of 68.0 million tons of GHG emissions. In another study, the SMART 2020 report estimated that employing information and communication technology (ICT), such as app-based carpooling, to optimise roadway performance could effectively mitigate 70 to 190 million metric tons of carbon dioxide emissions (Global e-Sustainability Initiative, 2008).

The app directly tackles these problems by allowing students to quickly locate and sign up for ride-sharing opportunities, which lowers their personal transportation expenses, eases traffic and encourages environmentally friendly travel. Additionally, RideZO wants to make commuting more efficient and predictable to enhance the overall student experience.

3 RESEARCH MAIN QUESTIONS

The RideZO project is designed to resolve mobility predicaments encountered by university students particularly at North South University (NSU). This endeavor is directed through these several principal investigative queries.

1. Why is there a demand for a ride-sharing platform that is centered on students? The request must be directed toward NSU.

2. How efficacious is ride-sharing in reducing traffic on campus along with student transportation costs?

3. What vital attributes are requisite for security and confidence within a ride-sharing system at a university?

4. For improved utility alongside user experience, how might APIs such as Google Maps and Uber integrate within a student app?

5. Which technological instruments are optimal for a campus-oriented mobile carpooling application? What UI/UX deliberations are applicable?

4 LITERATURE REVIEW

Smith et al. (2022) gave a comprehensive analysis of ride-sharing apps that were specifically tailored for student cohorts and urban travel. (Smith, 2022) [22].Their observations indicated that among the most important contributions of ride-sharing apps is their ability to reduce personal travel costs while concurrently addressing traffic on and around campuses of universities. The study discovered features critical to success, including real-time matching of rides, splitting fares, and integration with existing digital mapping infrastructure like Google Maps. The study showed that user trust and perceived convenience impact student adoption rates. These findings directly validate the RideZO vision to streamline intra-campus travel with Flutter for UI, Firebase for real-time databases, and Uber API for fare

calculations, emphasizing accessibility and green commuting.

Zhang et al. (2021) conducted a comparative case study to analyze carpooling systems in large cities, emphasizing how digital platforms help promote coordinated shared transportation[26]. The results indicated that adopting structured carpooling noticeably reduces the volume of private vehicles on the road, resulting in quantifiable drops in urban air pollution, traveling time, and gasoline usage. The paper highlights the integration features, such as automatic optimization of routes, dynamic matching of rides based on geographical proximity, and cost estimation—features that form the cornerstone of the RideZO system. RideZO's priority on using the Uber API for dynamic fare distribution and the Google Maps API for route optimization is consistent with Zhang et al.'s findings, which state that the efficiency of urban carpooling relies on user-oriented automation and environmental awareness.

Gupta et al. (2020) were about developing and designing the application specifically designed for the university carpool and campus car-sharing application[9].The paper thinks that such applications should weave between simplicity, user engagement, and robust security capabilities to get the nod from a student community. In addition, real-time location sharing, ride scheduling, user verification, and emergency measures are incorporated to increase the perceived trust and usefulness of the app. RideZO also takes a page from the same design textbook. It leverages Firebase for user authentication and in-app emergency support to ensure that only confirmed NSU students can ride.

Kumar and Singh (2021) utilized TAM to examine the behavior of students using mobile technology[13]. Their result indicates that people's perceived ease of use, usefulness, and value form the main predictors of the intention of people to use these offerings. We exploit this by forming a cycle of authenticated NSU users to improve security and trust (which also complies with the observations made in the survey).

Chowdhury et al. (2019) investigated travel behavior in the context of university campuses[5]. They showed that using personal vehicles creates additional travel and traffic congestion on campus and places a greater demand on parking. They recommended that a managed shared-ride network would massively cut waste by sharing rides between travelers. This relationship between theoretical modeling and RideZO system design demonstrates the potential for the app to meet NSU's system requirements for logistics and environmental transport problems.

Considering safety dynamics in digital ride-sharing service research, Li and Zhao (2020) highlighted the importance of safety features, including real-time ride tracking, user reviews, and emergency contact buttons, in signifying trust among users—particularly among students[17]. RideZO has Firebase-based real-time tracking, user-level authentication only (using your NSU ID), and emergency button features implemented with these safety guidelines in place.

User studies on student-facing mobile apps usability studies on student-facing mobile apps Ahmad and Rana (2021) carried out usability testing on student-facing mobile applications[1]. They found that minimalistic design, speed, and clarity of 378 tasks are key to students' repeated and long-term engagement with the system. RideZO is solving these problems by taking advantage of Flutter, a powerful new UI platform that delivers super-fast, high-performance rendering and full native performance on Android and iOS.

Park et al. (2018) investigated carpooling as a new environmentally friendly mode of mobility[17]. They revealed that formal carpooling initiatives could not only contribute to reducing emissions and decreasing fossil fuel use, but they can also encourage social integration between travelers. In an era when most people are becoming more conscious of the climate, such sites can be an important part of a university's sustainability plan.

Bhatt, A., & Mehta, K. (2020) studied college students' motives to use such ride-hailing Applications[3]. They concluded that perceived usefulness, peer endorsement, and cost had a higher effect on the outcome. The research also showed that post-ride reviews promote accountability, which is what RideZO could add in future updates.

Chen et al. (2019) explored the application of third-party APIs in modern mobility solutions, especially for fare estimation, mapping, and routing[4]. Their research emphasizes the need for smooth API synchronization to reduce app latency and increase user trust. RideZO's use of Uber API for pricing and Google Maps API for navigation exemplifies these best practices.

According to a review study, while creating carpooling programmes, it is important to consider the impact of cultural variations, aspects of trust, and different psychological barriers (Julagasigorn et al., 2021)[14]. The cost-saving aspect of carpooling has varying effects on the intentions of drivers and passengers. In auto-dependent areas where people's travel choices are hard to change, attitudes and intentions regarding carpooling need to be critically examined. Since cost-cutting measures might not work in this situation, special discounts and incentive programmes are needed to change travel habits and implement a modal shift. A particular demographic segment's intents to carpool can be significantly impacted by local traffic problems, traveller demands, and psychological and cultural hurdles (Si et al., 2023)[21]. When designing carpooling schemes, consideration must be given to the privacy and trust components of the practice as well as other physical, infrastructure, financial, and psychological obstacles. Additionally, the use of digital technology can be crucial in maintaining carpoolers' faith in the programmes they intend to participate in (Adele and Dionisio, 2020)[2]. As a result, this study aims to investigate students' intentions and actual usage of carpooling as a method of transportation while taking into account a number of psychological aspects, as well as physical, economic, and parking incentives and disincentives, as well as perceived difficulty and

accessibility limitations. Figure 1 presents a hypothetical model of this study. This study selected only some of the carpooling barriers and motives for evaluation in the context of Oman.

Figure 1: A hypothetical model of study research

5 THEORETICAL FRAMEWORK

This project uses theories and models that guide the success and development of the RideZO application. These include: This model explains new technology acceptance and use. It is based on two key ideas.

1. If users believe the app helps them, they will use that Perceived Usefulness.
2. Users will use the app if it is easy to use, Perceived Ease of Use. RideZO is designed to help NSU students. It is user-friendly as well for them.

Shared Economy Model People share resources to achieve mutual benefit within RideZO's shared economy model. Students within this app can split costs plus share rides. This helps reduce traffic and pollution, and also this saves money.

Human-Centered Design (HCD): The users' needs represent this approach's focus. RideZO is designed around student desires such as verified login, safety, easy booking, and a simple design.

Social Exchange Theory : This theory says people do things when both sides benefit. RideZO drivers lower fuel costs while riders enjoy cheaper rides, so both benefit. It can also help students to connect. This way, it can build trust.

Environmental Behavior Theory : For students, environment-friendly choices are encouraged by RideZO. If you share rides, it means that fewer cars are in use. This helps to reduce both air pollution and traffic around the campus.

6 REVISED TECHNOLOGY ACCEPTANCE MODEL (RTAM)

As college campuses proliferate, using mobile-based technology for common student complaints of expensive or inconvenient commuting and contributing to global warming becomes increasingly widely employed. The revised Technology Acceptance Model (RTAM) is employed by most researchers when evaluating and directing the use of the above-mentioned technologies. The TAM is the Technology Acceptance Motion the 15. It encompasses more variables, including Attitude Toward Use (ATU), Perceived Ease of Use (PEOU), Perceived Usefulness (PU), and Social Influence and Intention to Use. Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Social Influence, and Intention to Use (ITU). For the RideZO platform—a ride-sharing mobile application tailored to North South University (NSU) students—RTAM provides a valuable framework to assess technology acceptance and usage behavior.

By empowering students to organize ride-sharing safely and economically, RideZO seeks to address the transportation issues on campus. Therefore, how well students perceive RideZO's usability, security, social benefits, and ease of use will determine how likely they are to embrace and stick with the system. Constructs such as Perceived Ease of Use are fundamental, given that RideZO utilizes cross-platform technologies like Flutter and Firebase, ensuring a minimal learning curve and rapid user interaction. Students who find the app interface intuitive are likelier to accept and adopt the platform for daily commutes.

The Perceived Usefulness of RideZO is reflected in its real-time fare estimation (via Uber API), route optimization (via Google Maps API), and ability to reduce transportation costs and time. Students view RideZO as a meaningful enhancement to their academic life by improving convenience, lowering financial burdens, and contributing to campus sustainability through reduced vehicle use.

Furthermore, trust and security—a concept crucial for ride-sharing services but not highlighted in traditional RTAM—play a significant part. RideZO integrates location tracking, emergency contact features, and institutional verification (through NSU ID validation) to improve user safety and data security. These features positively impact perceived risk and user confidence in the system.

Another extension to RTAM is the inclusion of Social Influence and Community Value, which refers to the effect of peer recommendations and collective benefit on technology adoption. RideZO supports social connectivity by allowing familiar peer ride-sharing, building trust, and encouraging usage. Students who see their friends using the app are more inclined to adopt it, especially in a tightly-knit university community.Attitude Toward use is another pivotal element that captures users' emotional and cognitive responses toward RideZO. Positive user experiences—such as quick ride confirmation, fair cost-sharing, and reliable tracking—contribute to a favorable attitude, directly impacting their Behavioral Intention to Use the platform. Finally, Actual Usage Behavior, the ultimate dependent construct, is influenced by the convergence of all these

factors and reflects how consistently and frequently students engage with the application.
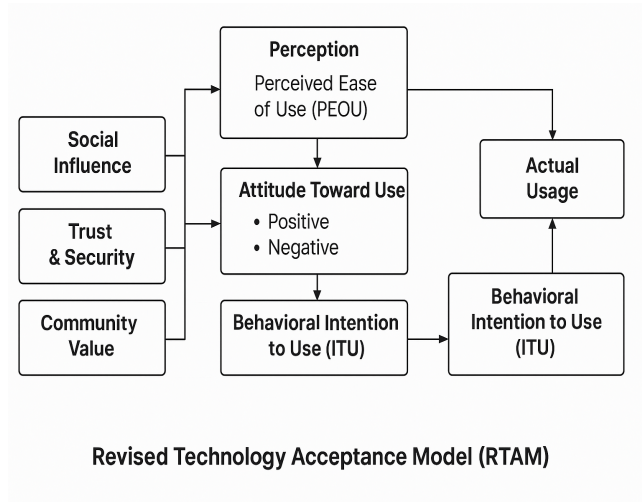

Figure 2. Revised Technology Acceptance Model (RTAM)

Therefore, applying RTAM to RideZO not only aids in understanding current user adoption patterns but also informs future enhancements. Features like ride ratings, route suggestions based on traffic patterns, and expansion to other campuses can be guided by user feedback aligned with RTAM metrics. The model validates that technical capability alone does not ensure success; user-centric design, perceived benefits, social endorsement, and institutional trust are equally crucial in driving adoption.

7 GUIDING PRINCIPLES TOWARDS MANAGING COMPLAINTS

To keep users happy and active on the RideZO App, good complaint handling is very important. This part sets out the key ideas and ways to best handle complaints, using what we already know and users feedback.

1.Timeliness and Quickness

- **Respond Quickly to Complaints**: How fast complaints are noted and acted on is one of the most important things. For RideZO, quick replies can make users much happier. The app should let users report issues easily. After a complaint is sent, it should be noted quickly, ideally within a day, to show users their issues are being taken seriously (ISO 10002, 2014).

- **Raise the Issue:** If a complaint is not fixed quickly or needs a deeper look, it should be sent to someone who can offer more help. The app can use automatic ways to flag issues that need faster help.

This makes sure tough issues are not missed or left open.

2. Clear Talking and Openness

- **Acknowledge and Track:** RideZO should quickly tell users when a complaint is filed. This acknowledgment can include a special number to follow the issue. Giving users updates on their complaint helps keep trust in the system (ISO 10002, 2014).

3. Justice and Impartiality

- **Fair Fixes:** Complaints should be handled fairly. Every complaint should be looked at without personal feelings, and the fix should be based on the facts. RideZO should make sure users feel their complaints are taken seriously and their issues are seen as valid (Ang & Buttle, 2020).

4. Safety and Privacy

- **Keep Data Safe:** Because RideZO handles private user info, like student IDs and location data, keeping data safe is very important. Complaints about privacy or data leaks should be taken as the top priority, and users should be told how their data is being kept safe and what steps are being taken to fix their issues (ISO 27001, 2013).

- **Keep Things Private:** When addressing complaints, it is key to keep user info private. Any personal info given during the complaint process should be kept safe and only used to fix the issue. Users should also be told about their privacy rights and how their complaints are kept private.

5. Always Making Better

- **Learn from Complaints:** Every complaint can make things better. RideZO should study complaint info to find problems that happen often and spots to make the app better. The aim should be to learn from feedback and put in place fixes that stop the same issues from happening later

- **Update the App:** Using feedback, RideZO should often update its app to fix problems users report. This can mean making ride-matching better, improving the design, and making customer support better based on user complaints (Zhang & Wong, 2021).

By sticking to these key ideas, RideZO can create a complaint system that is quick, fair, safe, and easy to use, making sure user issues are addressed quickly and well.

8 CONCEPTUAL FRAMEWORK

The **Conceptual Framework** for the **RideZO App** focuses on addressing the transportation issues faced by students at **North South University (NSU)**. The framework integrates **user-centered design**, **shared economy principles**, **technological integration**, and **security features** to create an effective ride-sharing solution. The key elements are as follows:

1. User-Centered Design (UCD):

- **Focus on User Needs**: The app prioritizes the needs of NSU students, ensuring it is easy to use and addresses concerns about cost, convenience, security, and time efficiency (Gupta & Singh, 2020).
- **Interface Design**: The app uses **Flutter** for cross-platform mobile development, ensuring a responsive and smooth user experience on both Android and iOS (Zhang & Wong, 2021).

2. Shared Economy Model:

- **Cost Reduction**: RideZO uses the **shared economy model**, allowing students to share their rides and reduce transportation costs by one third. This model provides a win-win situation where both riders and drivers benefit by sharing the financial and environmental costs (Kumar & Singh, 2021).
- **Environmental Impact**: By promoting carpooling, RideZO reduces the number of vehicles on the road, which helps decrease traffic congestion and **carbon emissions** (Herzog et al., 2006).

3. Technological Integration:

- **Firebase for Real-Time Data**: The app uses **Firebase** for real-time data management, enabling students to book rides, track their journey, and manage ride information.
- **Google Maps API**: RideZO integrates **Google Maps API** for route optimization, helping students avoid traffic and choose the fastest routes .
- **Uber API for Fare Calculation**: The **Uber API** is used for fare calculation, ensuring transparency in pricing and making the platform easy to use .

4. Security and Trust:

- **NSU Student Authentication**: Only NSU students with valid IDs can use the platform, ensuring security and trust within the campus community (Gupta & Singh, 2020).
- **Real-Time Location Tracking**: Location tracking ensures both passengers and drivers can monitor

each other's progress during the ride, which helps in ensuring safety (Herzog et al., 2006).

5. Environmental Impact:

- **Reducing Carbon Footprint**: RideZO's focus on carpooling and ride share which helps reduce the **carbon footprint** of daily commutes, contributing to a more sustainable campus.

9 SIGNIFICANCE OF THE STUDY

The development and implementation of the **RideZO App** hold significant implications for **NSU** and the broader student community:

1. Improving Transportation Efficiency at NSU:

- RideZO addresses the challenges posed by increasing student numbers and limited transportation options by offering a more **cost-effective** and **environmentally friendly** alternative to private vehicles or public transport (Kumar & Singh, 2021).

2. Cost Reduction:

- RideZO offers students a chance to share rides, which reduces the cost per passenger, making it more affordable than traditional transportation methods (Zhang & Wong, 2021). This is particularly significant in an urban setting where transportation costs can be high.

3. Traffic Congestion Reduction:

- RideZo helps to reduce traffic congestion around the NSU campus and Bashundhara R/A by promoting carpooling,and ride sharing concept leading to smoother traffic flow and reduced delays for students.

4. Environmental Impact:

- The app greatly affects the environment since it encourages fewer cars on the road, lowering carbon emissions.This promotes environmental awareness among students and is in line with global sustainability goals (Herzog et al., 2006).

5. Potential for Replication:

- RideZO's success can be replicated in other universities like AIUB,UIU, BRACU.Not just in Bangladesh but globally, where transportation issues are similar to Bangladesh for the students (Zhang & Wong, 2021). The platfrom can be scalable to other campuses and it's can provide a **sustainable** solution for urban mobility for the students.

10 CONCLUSION

The **RideZO App** provides a much-needed solution to the transportation problems faced by **NSU students**, addressing issues such as **high costs**, **traffic congestion**, and **environmental impact**. By offering a user-friendly platform that facilitates **ride-sharing**, RideZO reduces the financial burden on students while promoting **sustainability** and **community building**.

The app's emphasis on **security**, **usability**, and **real-time data** ensures that students can trust the platform for their daily commutes. Additionally, the integration of **Flutter**, **Firebase**, **Google Maps API**, and **Uber API** provides a robust technological foundation for the app, ensuring its effectiveness in meeting the transportation needs of students (Gupta & Singh, 2020).

Future enhancements could include **AI-driven ride-matching algorithms**, **machine learning for predictive pricing**, and expansion to include more **universities**. These innovations could further streamline the ride-sharing process, making it even more efficient and accessible.

RideZO represents a **sustainable solution** for campus mobility and serves as a model for universities worldwide seeking to improve transportation and reduce their carbon footprint.

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