

Digitalizing the Student Concession Card

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Abstract

This aims to develop a student concession card that helps students who are taking public transport daily. This device includes a student card that is the same as an ATM card which allows the user to tap on the scanner provided by the officials on each bus and pay their bus fare according to the concession provided to them. This device also reduces the time taken to renew the cards, they can renew them online. The design involves a card that can be tapped on the scanner which is much more efficient than an actual card which is in the form of paper cards. The student concession card presents a viable business opportunity that can benefit both students and public transportation providers. By leveraging technology, convenience, and cost savings, the card has the potential to streamline the daily commute experience for students while promoting the use of public transportation.

Keywords: Student Concession Card, Tap-and-Pay System, Easy Transportation, Online Renewal, Contactless Payment.

1. Introduction

The use of public transport for daily commuting is essential for students, especially in urban areas where educational institutions are spread across vast distances. Many students rely on government or private buses to travel, with most benefiting from discounted fares through concession cards. Traditionally, these concession cards have been paper-based, which are prone to damage, misplacement, and require regular renewal at administrative offices. Furthermore, handling physical cards during each transaction can lead to delays and inefficiencies. In our state Kerala it's impossible to carry a paper card around so easily as our climate conditions are mostly unpredictable and there is a high risk of the card being torn due to getting wet from the rain or get lost due to many other reasons. The renewal of cards is also not so easy for the students. The quality of the card will be improved as a result of digitalizing the paper cards. Since there are no digital concession methods for students, the system need to be build students friendly and efficiently overcome all the current problems facing regarding this. As for the bus fare, they are mostly fixed concessions for the students but sometimes they are not able to get their deserved concessions. The

concession amount is mostly half the price and private transport is mostly between two to twenty rupees considering the distance from starting bus stop to studying institution for a student. But if the bus fee is rupees two and they pay five, they would be automatically charged five instead of the actual amount they should pay. So, we digitalize the student concession card in the form of an electronic card which is the same as an ATM card that is provided by the banks. This is much more advanced than normal paper cards which are now available. Many countries like Singapore, the United Kingdom, and others have successfully implemented digital and contactless payment systems for public transport. However, such systems are not yet widespread in all regions, particularly for students. The need for a modern solution to enhance convenience, reduce our current issues for student relay on public transport to schools, and improve transportation management [1].

2. Literature Review

Near Field Communication (NFC) technology is common and used in various sectors, particularly in payment systems, access control, and public transport. Many cities globally have adopted NFC for fare collection on public transport. NFC is

particularly appealing because of its simplicity and security. It allows users to make quick, contactless payments with a simple tap of a card or mobile phone, which reduces transaction times and enhances user experience. NFC-based digital systems can address the issues of Student concession cards effectively by offering a more durable, efficient, and user-friendly solution [2].

2.1. Limitations of Paper-based Concession Cards

Paper-based concession cards have several inherent limitations:

- **Physical Damage:** Paper cards are easily damaged, especially in regions with high humidity or during rainfall. When exposed to water, these cards may become illegible, making them unusable.
- **Limited Lifespan:** Paper cards get damaged overtime, requiring frequent replacement. This can result in significant administrative costs and time delays in issuing new cards.
- **Inconvenient Renewal Process:** Traditional paper-based cards require students to visit offices for renewal, which is not only time-consuming but also inconvenient, especially during peak times.
- **Fraud and Misuse:** Paper cards can be easily forged, misused, or tampered with, making them less secure compared to digital solutions that offer encryption and authentication.

2.2. Advantages of NFC for Public Transport

NFC technology provides several advantages for public transport fare collection systems:

- **Speed:** Transactions with NFC cards are instantaneous, reducing waiting times at ticket barriers and bus boarding points.
- **Security:** NFC transactions are encrypted, ensuring that sensitive information is protected. Unlike magnetic stripe cards, NFC technology is harder to clone.
- **Cost-effectiveness:** NFC cards reduce the need for paper-based tickets, lowering operational costs for transportation providers.
- **Environmental Impact:** By reducing the reliance on paper, NFC systems contribute to sustainability efforts.

3. Methodology

This system provides the students with a more advanced way of using, upgrading, and renewing the cards much more easily. They can also apply for their concession cards online using the applications. This system provides an NFC card which acts as a student card, a scanner whose purpose is to scan the student card and provides the student with the receipt. It provides an application so that students can renew and upgrade their card where ever they want. NFC cards are mostly contactless cards we can just scan the cards just by bringing them to the scanner. It generates an electromagnetic field which the NFC chip can use for wireless communication. NFC cards use near-field communication technology to allow contactless communication between two devices over a short distance. The communication distance is only about 4cm or less. There are no manual pairing or device discovery steps or passwords to deal with. It allows users to seamlessly share content between digital devices, shown in figure 1.

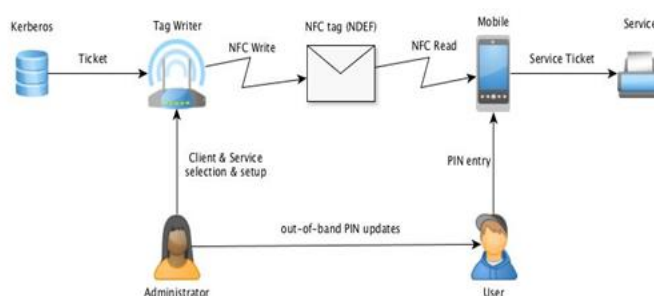


Figure 1 Representation of Basic Working of NFC Based Concession Card System.

When the card comes in contact with the scanner the scanner device immediately reads the data stored. NFC scanners read data from NFC cards using radio waves. When an NFC scanner is brought close to an NFC card, the scanner generates a magnetic field that induces a current in the card's antenna. The card then sends data back to the scanner using the same magnetic field. The scanner also contains an electronic sim which provides the Wi-Fi required for data scanning and reading processes [3].

3.1. Core Features of concession App

- **Student Registration and Login:** Students log in with their school ID, email, or phone

number. The app checks who they are through OTP or email.

- **Apply for NFC Card:** Students upload a picture of their school ID card. They fill in their school, year, and course info. The app lets them send their application right away and keep an eye on it.
- **Card Renewal:** Students can get a new card or update existing cards using the app.
- **Recharge Wallet:** Students can put money into app using various payment systems or bank cards.
- **Concession Details:** The app shows rules about who gets discounts and how much. It figures out the right fares and discounts as things change [4].

3.2. Value-Added Features

- **Transaction History:** Each Students can see how much they've spent and what's left in their account. The app gives them a rundown of their costs each month.
- **Real-Time Notifications:** The app tells students about their card application, low balance, or when their card will run out.
- **Integration with Public Transport:** NFC cards track buses and routes in real-time. Each trip shows expected costs and discount info.
- **Support and FAQs:** A helpdesk or chatbot helps solve problems. Quick answers about how to apply, renew, or fix issues.
- **Multiple Payment Options:** Add money to wallet using UPI, cards, or online banking, shown in figure 2.



Figure 2 Card Emulation Mode

4. Results

It makes paying bus fares a completely new ball game with unparalleled ease and convenience. It eliminates the need for cash or correct fare during a trip for students; hence, this feature saves the hassle of handling change, and boarding time will be much faster as well as less stressful both for the students and bus operators. One of the significant advantages that this card has is fare concessions on private and government buses. This gives the students a huge amount of saving as far as fares are concerned. This makes public transport even more attractive to students who are able to use them daily to school, colleges, and universities. The integration of an app-based recharge feature further enhances the convenience of the system, as students can top up their cards anytime, anywhere, based on their needs and budget. Apart from making the fare payment easier, the card simplifies the entire management process. The mobile application makes renewal and configuration of the card a trouble-free process and saves students from visiting the physical location or going through the tedious paper work. This digital approach decreases the administrative burden on transportation authorities while allowing students to manage their cards directly from their smartphones. The abolition of physical cards brings further benefits. By going digital, students will no longer have to fear losing or damaging their cards, which makes daily commutes easier and less stressful. The streamlined scanning process, which can be done using mobile devices or wearable technology, makes the user experience more efficient and smoother. But scanning the card also gives direct access to student information, so it allows transport providers to verify eligibility for concessions without delaying unnecessary. This system has the potential to expand beyond its initial implementation. Expansion into areas with a high student population will make it reach more students who need an affordable and efficient means of commuting. Partnering with educational institutions and transportation service providers will amplify its reach and credibility, making the system a trusted choice for students and their families. The mobile application can further develop into a multi-functional platform with

additional features and services. Some of the features that can be added include real-time tracking of buses, route planning, and even card balance or renewal reminders. The application can also include loyalty rewards, such as discounts for frequent usage or incentives for eco-friendly travel habits, to encourage greater engagement and retention. The tap-and-pay mechanism combined with an all-encompassing mobile app is very convenient and saves costs for students to commute while providing an immense advantage of convenience and efficiency. Promoting public transport, thus reducing dependence on physical cards, will help it meet modern digital trends and sustainability goals. The solution can scale and accommodate further upgrades, making it a revolutionary innovation for the transportation service of students [5].

Conclusion

One of the greatest benefits a digital student concession card offers is With a few clicks on a smartphone, transportation passes can be accessed, inconvenience of carrying physical cards is reduced, which is always damaged by some sources. Moreover, digitalizing it will ensure balance checks, validity reminders, and quick recharges. Digital student concession card integrated into a handy mobile application could have excellent potential to redefine the form of access offered to student transport services from public companies. This cutting-edge, tech-based solution ensures that student and transport-related benefits occur directly with the improvement of some very important issues such as bottlenecks which have been usually associated with traditional physical concession cards, while the increased convenience of system use, speed, as well as user convenience, easily simplifies travel in schools as well as at colleges. The success of this idea depends on switching to digital services. The actual challenge is Keeping personal data and payment details safe is important since this sensitive information will be stored and shared. Another important challenge is that with many transportation options and apps already available, the digital student concession card needs to stand out for its unique features, affordable pricing, and excellent service. Joining hands with schools, colleges, and public

transport authorities this help to build a trust among users. The implementation process needs to be well-planned and needs testing the system carefully to ensure a smooth launch. To make the launch successful we can approach schools and colleges which will be a great contribution that encourages people to use it more.

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