

# Perceptions of using FASTag at Toll Plazas: A Case Study of Hyderabad City

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**Abstract:** FASTag is an electronic toll collection system introduced in India by the National Highways Authority of India (NHAI) to simplify and expedite toll payments on highways. The system operates using Radio Frequency Identification (RFID) technology, enabling toll charges to be deducted directly from linked bank accounts or prepaid wallets without requiring cash transactions. FASTag can be purchased, recharged, or topped up through authorized issuers or participating banks. This initiative was launched to improve efficiency at toll plazas on national highways, ensuring smoother traffic flow and reduced congestion. The FASTag, affixed to a vehicle's windscreen, allows drivers to pass through toll plazas without stopping for manual payment. It has a validity of five years, with users needing only to recharge or top it up as required. Toll plazas, typically located on highways or expressways, often face challenges related to delays and congestion. This study focuses on evaluating the level of service provided at toll plazas by examining drivers' perceptions of delays during their travel. Data was collected using an online questionnaire, with responses from 1,200 drivers, capturing their perceptions, travel behavior, and overall experience. The study provides valuable insights into driver attitudes and vehicle movement patterns, highlighting key areas for improving toll plaza efficiency and service levels.

**Index Terms:** FASTag, Electronic Toll Collection, Driver Perception and Toll Plaza Efficiency.

## I. INTRODUCTION

India boasts the second-largest road network in the world, with a vast stretch of 5.4 million kilometers of roadways, including approximately 97,991 kilometers of national highways. The National Highways Authority of India (NHAI), under the Ministry of Road Transport and Highways, is responsible for maintaining and expanding these highways. To sustain this extensive infrastructure, travelers on national and state highways—often referred to as toll roads—are required to pay a toll tax. The revenue generated is used by the government to maintain the roads, ensuring a smoother and more comfortable experience for drivers and riders.

However, conventional toll collection methods pose several challenges, including inefficiencies and negative impacts on the environment and economy. Some of these challenges include:

Limited toll booths, which create bottlenecks and slow down the toll collection process. Increased waiting times, with vehicles spending an average of 10 minutes per toll booth, leading to delays.

Fuel wastage caused by idling vehicles in long queues.

Environmental pollution, as prolonged waiting contributes to higher carbon emissions.

Conflicts and accidents, including verbal disputes and lane-switching collisions due to impatience among travelers.

Economic inefficiencies, as delays at toll plazas disrupt the transport sector and adversely impact overall productivity.

### 1.1 FASTag

To address these challenges, the National Electronic Toll Collection (NETC) program introduced FASTag, a reloadable tag designed to simplify toll collection through automated systems. FASTag employs Radio Frequency Identification (RFID) technology to enable toll payments without requiring vehicles to stop at toll plazas. This system is a significant step toward improving highway travel efficiency.

The FASTag is affixed to the windscreen of a vehicle and links directly to the user's bank account or prepaid wallet. It allows toll charges to be deducted automatically as the vehicle passes through the toll plaza. Users can procure FASTag from designated Points of Sale (POS) at toll plazas or through issuer agencies, with the account funded via online payment methods such as credit card, debit card, NEFT, RTGS, or net banking. After activation and recharge, vehicles can drive through dedicated FASTag lanes for seamless toll payment.

As of December 1, 2023, FASTag has been mandated for all vehicles by the Ministry of Road Transport and Highways, ensuring nationwide adoption. This initiative promotes faster and more efficient toll collection, reducing congestion and enabling a smoother flow of traffic at toll plazas.

FASTag is particularly beneficial on national highways, offering a hassle-free and fuel-efficient travel experience for commuters.

#### Key Advantages of FASTag

Reduced waiting time at toll booths, enabling faster vehicle clearance.

Lower fuel consumption due to minimized idling in long queues. Reduced traffic congestion, improving the overall driving experience.

Environmental benefits, as fewer emissions are generated from stationary vehicles.

### 1.2 Working of FASTag

The FASTag system functions through the following steps:  
Tag Scanning:

As a vehicle enters the Electronic Toll Collection (ETC) lane at a toll plaza, the system reads the FASTag details, including the Tag ID, Vehicle Class, and TID, and forwards this information to the acquiring bank for processing. The FASTag lane for different categories of vehicles is given in Figure1.



Figure 1. FASTag Lane for vehicles

**Tag Validation**

The acquiring bank requests validation of the tag details from the National Electronic Toll Collection (NETC) Mapper, which verifies the tag's authenticity and status.

**Verification Response**

If the tag is valid, the NETC Mapper provides details such as the Tag Status, Vehicle Class, and Vehicle Registration Number (VRN). If the tag is invalid or unregistered, the mapper sends a rejection response.

**Toll Fare Deduction**

Upon successful validation, the acquiring system calculates the applicable toll fee and debits the amount from the user's FASTag account. This process is seamless, ensuring the vehicle can pass through without stopping.

The comparison of various systems with FASTag are given in Table I

**1.3. Mechanism of Fastag**

Step 1: Whenever a vehicle will pass through the Electronic Toll Collection (ETC) lane of the Toll Plaza, the Toll Plaza system will capture the FASTag details like (Tag ID Vehicle class, TID, etc.) and send it for processing to the acquiring bank.

Step 2: The acquiring bank will send a request to the National Electronic Toll Collection (NETC) Mapper to validate the tag details.

Step 3: Once the Tag ID will get validated, NETC Mapper will respond with details like Tag Status, Vehicle class, VRN etc. If the Tag ID is not present in NETC Mapper, it will respond as the Tag ID is not registered.

Step 4: The acquirer host will calculate the appropriate toll fare and initiate a debit request to the NETC system after successful validation of Tag ID from NETC Mapper.

**II. LITERATURE REVIEW**

S. Amrin (2019) [2] studied FASTag perceptions in India, highlighting the challenges associated with conventional toll collection systems. The study emphasizes the need for an automated toll collection system like FASTag, a program launched by the National Highways Authority of India (NHAI) for electronic toll collection on national highways.

Pontarelli et al. (2014) [7] studied numerous socio-economic and environmental benefits of FASTag to both users and toll operators. Despite its advantages, the study underscores the importance of addressing the challenges faced by FASTag to enhance its technological capabilities. With appropriate solutions, FASTag can become a superior toll collection system and a game-changer in the years to come.

M. Likhitha et al. (2017) [3] focused on the role of FASTag in reducing manual workloads through RFID technology. This electronic toll collection system not only decreases waiting times at toll plazas but also minimizes environmental pollution caused by fuel combustion.

Suvarna et al. (2015) [8] studied that users can perform toll transactions online, eliminating the need to carry cash, thereby reducing human errors at toll booths. The cashless transaction system also increases transparency. The inclusion of an IoT module enables sending confirmation messages to vehicle owners regarding toll deductions.

Joshi,B (2017) [9] studied image processing technology, wherein the vehicle's number plate is scanned and processed for toll collection. However, the study notes that currently, only one FASTag-enabled lane is operational at most toll plazas, while the others still rely on traditional methods.

Dr. S. Sukumar (2020) [1] examined FASTag as an electronic toll collection system operated by NHAI. Using Radio Frequency Identification (RFID) technology, toll payments are directly deducted from linked bank accounts. The tag can be purchased, recharged, or topped up through official issuers or participating banks, with a validity of five years.

TABLE-I.  
COMPARISON OF VARIOUS SYTEMS

Parameter	AVI	RFID	Fastag	Book my toll
Time Consumption	Average	Average	Average	Average
Fuel wastage	High	Low	Low	Low
Traffic Congestion	High	Average	Average	Average
Processing Speed	High	Average	Average	Average

Singh (2020) [10] studied the expanded usage of FASTag, including payments at fuel stations after agreements with Indian Oil Corporation (IOC), Bharat Petroleum (BPCL), and Hindustan Petroleum (HPCL) in January 2019. By September 2019, FASTag lanes were available on over 500 highways, with more than 54.6 lakh vehicles enabled with FASTag.

Hinge (2021) [11] employed tools such as percentage analysis, ranking, descriptive statistics, Likert scaling, and factor analysis to analyze user satisfaction. Results show the potential of FASTag to streamline toll collection and reduce inefficiencies.

N. Akshaya (2021) [6] explored FASTag role as a technological advancement in toll collection systems. Using RFID technology, the system detects tags affixed to vehicle windshields and deducts toll charges from linked accounts. Users receive SMS notifications for transactions or insufficient balance.

Abhishek Sontakke et al. (2019) [5] examined the implementation of FASTag as a step toward cashless toll transactions. Developed by the Indian government and NHAI, FASTag eliminates the need for vehicles to stop at toll plazas for cash payments.

B. Gayathri (2020) [4] researched the impact of digitization on toll collection in Tamil Nadu, particularly focusing on the transition from manual to electronic toll collection. While FASTag has been widely accepted in urban areas, the study notes its limited awareness and usage in rural regions.

Dalip Kaur (2022) explored the broader context of digitalization in India and its impact on the economy. The government's push for a cashless economy has introduced technologies like RFID-based FASTag, which allows toll payments without cash transactions.

Mehul B (2024) explored FASTag as a (the) new technological solution for the great contribution of Indian toll tax collection. It is user friendly and economically viable for every user of motor vehicles in the Indian part. Fastag (It) is a() simple to use, reloadable tag in which is automatic deduction of toll charges and passes through the toll plaza without stopping for the cash transaction.

The study highlights benefits such as reduced fuel consumption, minimized traffic congestion, lower paperwork, and decreased air pollution. Focused on Coimbatore city, the research investigates user satisfaction, identifying benefits and challenges faced by FASTag users, and offers suggestions for improvement. By installing FASTag on vehicle windshields, toll charges are automatically deducted from linked accounts, making toll collection seamless. This technology can also be applied for generating challans and automating penalty deductions. The study emphasizes FASTag ability to reduce delays caused by traffic congestion and highlights its convenience for users.

The research stresses the importance of educating people about FASTag benefits and suggests that distributors should

actively promote its merits and address user concerns. The study concludes that increased awareness and adoption of FASTag will lead to more frequent usage and a better understanding of toll taxation. FASTag simplifies toll collection by using radio frequency waves to automatically deduct toll charges from linked accounts. The study gathers public feedback on the convenience and usability of these RFID tags, finding that most users appreciate the system's ease of use and transparency.

### III. METHODOLOGY

The present study has been basically designed as a 'Descriptive Study' with 'survey' as the Technique of research. A questionnaire was constructed and validated by the researcher. Data collected through online and offline

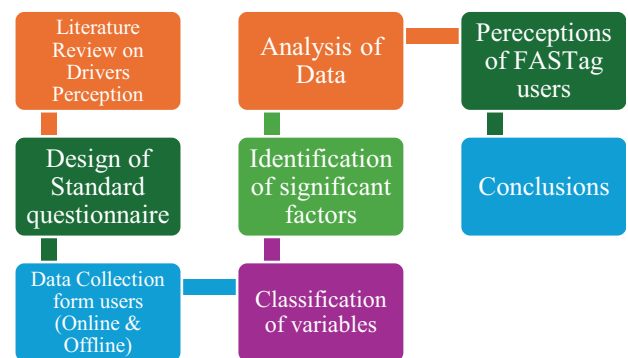


Figure 2. Flow Chart of the Methodology adopted

questionnaires. The flow chart of methodology is given in figure 2.

#### 3.1. Data Collection:

The data required for this study were collected from toll users using a structured questionnaire. The questionnaire was meticulously designed by referencing various academic literature and case studies to ensure its relevance and validity. This study primarily focuses on toll users, aiming to understand their demographic profile, travel behavior, and perception of FASTag technology.

The researcher adopted the convenience sampling method to select the sample respondents, considering factors such as accessibility and willingness of participants to provide information. A total of 114 respondents were chosen as the sample size for the study.

The questionnaire was designed to capture three main categories of information:

1. Personal and Socio-Economic Information: This section included questions about respondents' age, gender, income level, education, and other demographic details.
2. Trip-Related Information: This part gathered data about the respondents' travel frequency, purpose of travel, route preferences, and mode of payment at toll plazas.
3. Perception of FASTag: This section assessed respondents' awareness, adoption, and satisfaction with FASTag, along with their views on its efficiency, convenience, and potential challenges.



To ensure data accuracy and reliability, the researcher personally administered the questionnaire to each respondent, enabling clarification of any queries and improving response quality. The information collected through this process served as the foundation for analyzing user behavior and preferences

**IV. PERCEPTIONS OF FASTAG USERS**

**4.1 Analysis of FASTag Users in Hyderabad City**

A questionnaire survey was conducted online to gather data from FASTag users in Hyderabad city. The responses to the survey have been summarized and presented below using pictorial representations to provide a clear and concise visualization of the findings. These visuals help to analyze the trends, preferences, and experiences of FASTag users in the region effectively.

**Driver’s personal information and socio economic information:**

Socio Economic factors are deciding the services utilized by the customers in the market. The factors chosen for this study such as age, gender, occupation and income. NHAI is offering FASTag facility to Cross the toll plaza in a quick manner and easy payment. But it depends on the lifestyle of the People, the needs of the services, availability, utility and vehicle which are used.

**4.1.1. Analysis of age :**

It is observed that the age group between 18-30 (77.19%) which is majorly responded among other 3 age groups.

**4.1.2. Analysis of Gender :**

The gender in the sample results indicate that male participants are more than female participants.

**4.1.3. Analysis of study status:** Most of the responses were collected from the UG students (79%) and responses from the Ph.D. students are just 3%.The education level of FASTag users who participated in the survey given in figure 3.

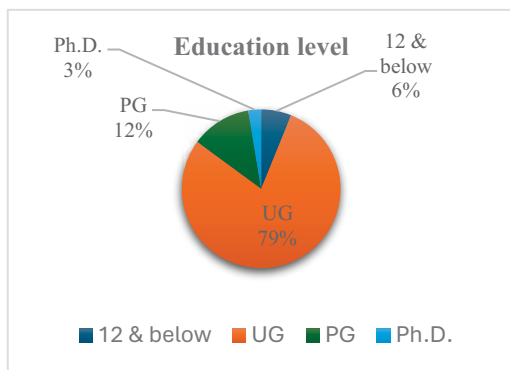


Figure 3. Education level of FASTag Users in survey

**4.1.4 Analysis of vehicle type :**

Approximately 46% of respondents are having 2 wheeler and 4 wheeler type vehicles. Heavy commercial vehicles & 4 wheeler vehicles have 0% .

**4.1.5. Analysis of driving experience (in years) :**

The respondents who are having greater than 3 years of experience in driving are 40.35% and who are between 2-3 years of experience in driving is less (14.04%) as given in figure 4.

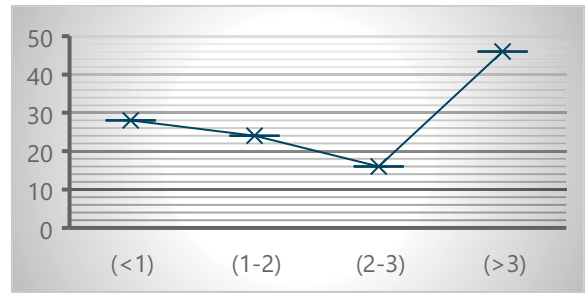


Figure 4. Analysis of Driving experience of users in years

**4.1.6. Analysis of employment status :**

It is observed that students are responded more than the employees with 72.81% and 17.54%

**4.1.7. Analysis of reasons for not using FASTag**

It is observed that the reason for not using FASTag — most of the people don’t like to pay the FASTag in advance (25%) and the service centers are not near (23%) to recharge the FASTag which is given in figure 5.

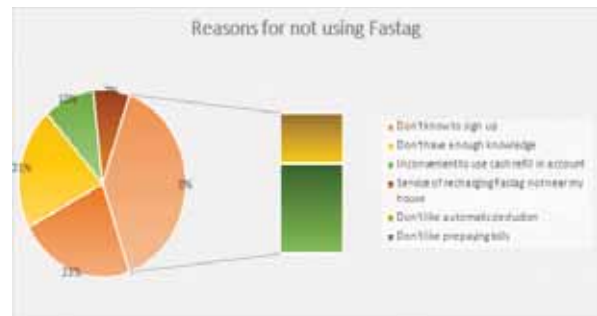


Figure 5. Reasons for not using FASTag of Users

**4.1.8 Analysis of Travel purposes**

It is observed that the purpose of travelling through toll roads are work (29%) and education (23%) and commercial purpose was less (8.78%) which is given in figure 6.

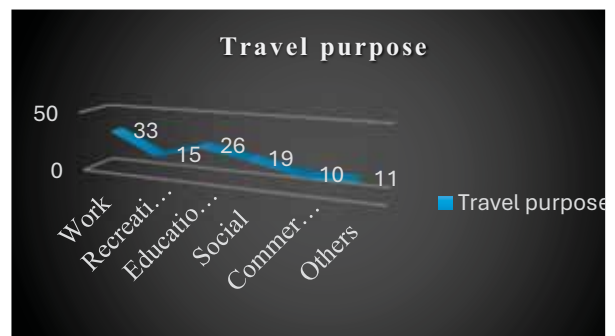


Figure 6. Analysis of Travel purpose in percentage

**4.1.9 Analysis of FASTag period usage:**

It is observed from figure 10, 32.46% of people started using Fastag and 17.54% of people not using Fastag given in figure 7.

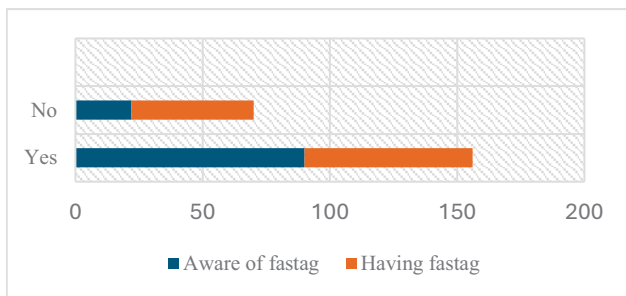


Figure 7. Analysis of FASTag Period usage in percentage

#### 4.1.10 Analysis of toll roads :

In the below graph, Blue colour indicates the awareness of toll roads and 83.33% of the people are aware of toll roads. Orange colour indicates the usage other roads to reach their destination. (revise the sentence put in yellow) Most of the people use toll roads to reach their destinations which is 58.77% . Grey colour indicates the statement 'toll roads help to reach faster and only 29% of people agreed with that statement.

### V. CONCLUSIONS

- This study deals with the application of the latest technology of the FASTag which is beneficial in avoiding the traffic hassle at the National toll plazas.
- With the use of FASTag installed on the front windshield of vehicles, Toll generation is made a fun job. Automatically, the Toll charges are deducted from the FASTag account. This technology can also be used for the generation of challan and automatic deduction through the FASTag linked to the vehicle.
- This can be the solution for many people who are suffering from being late by 1–2 min due to the long queue at the toll plaza and paying the toll again.
- RFID based FASTag is seen as an advantageous mode of toll collection system in India offering numerous. Socio-economic and environmental benefits to both – the user and the collector.
- The present study has brought out the satisfaction level of passengers and the benefits they enjoy using FASTag and the problems faced by them and suggestions to be improved in FASTag for its betterment.
- It is observed that 78.95% of respondents are aware of FASTag. In that only 57.89% are using/having FASTag.
- Awareness of FASTag was spreading by the internet and friends (39.47% and 31.58% respectively) majorly and From last one year, 32.46% of people started using FASTag.
- From the collected samples, the reason for not using FASTag — most of the people don't like to pay the FASTag in advance (25%) and the service centers are not near (23%) to recharge the FASTag.

- The payment through paytm/Google pay/Amazon pay/phone pay (43% ) is more than the offline payment (6.14%) for the recharge of FASTag.
- Most of the respondents are interested in the decreasing waiting time at toll plazas (51%) than the rewards (23.68%).

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