GPS Devices to Increase Efficiency of Indian Auto-Rickshaw Segment

Sanchay Vaidya, Sourabh Gupta, Gouresh Singhal

Abstract—There are various modes of transport in metro cities in India, auto-rickshaws being one of them. Auto-rickshaws provide connectivity to all the places in the city offering last mile connectivity. Among all the modes of transport the auto-rickshaw industry is the most unorganized and inefficient. Although unions exist in different cities they aren't good enough to cope up with the upcoming advancements in the field of technology. An introduction of simple technology in this field may do wonders and help increase the revenues. This paper aims to organize this segment under a single umbrella using GPS devices and mobile phones. The paper includes surveys of about 300 auto-rickshaw drivers and 1000 plus commuters across 6 metro cities in India. Carrying out research and analysis provides a base for the development of this model and implementation of this innovative technique, which is discussed in this paper in detail with ample emphasis given on the implementation of this model.

Keywords—Auto-rickshaws, Business Model, GPS device, Mobile application.

I. INTRODUCTION

THE current urban population (metro cities) in India is 400 million according to the 2011 census and is estimated to rise to 600 million by 2030. In such large cities people face severe problems in commuting as quite a few options of public transport are available. Auto-rickshaws are the quickest and easiest way to commute in such cities, providing the last mile connectivity.

According to the survey, about 21% commuters use auto-rickshaws as their mode of conveyance in metro cities in India.
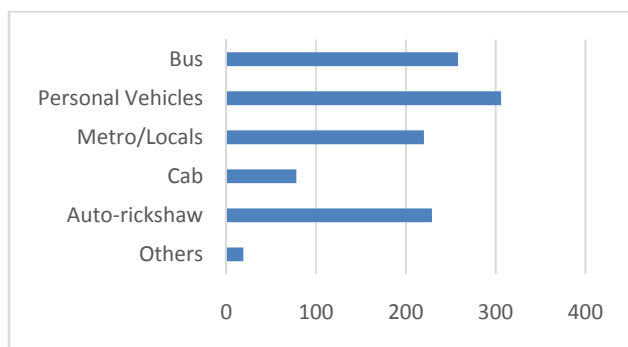

Fig. 1 Modes to commute in metro cities in India

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Although auto-rickshaws provide a convenient travelling solution to the commuters, various issues are faced, such as:

- *Passengers often have to walk long distances to get auto-rickshaws as they aren't readily available at their doorstep.*
- *Denial of auto-rickshaw drivers to ferry the passengers to a particular location.*
- *Denial for a metered ride or duped by unnecessary longer routes.*
- *Security issues arise when travelling at night or for women passengers.*

Adding to this, the auto-rickshaw drivers also face certain issues in their current way of functioning, such as:

- *Auto-rickshaw drivers travel about 40 km (about 40% of their daily running) a day looking for passengers causing severe losses in terms of fuel usage.*
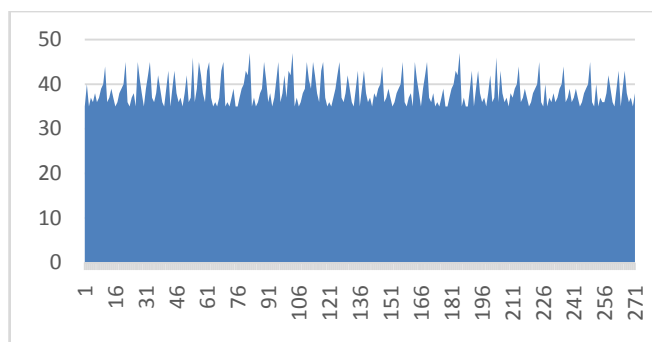

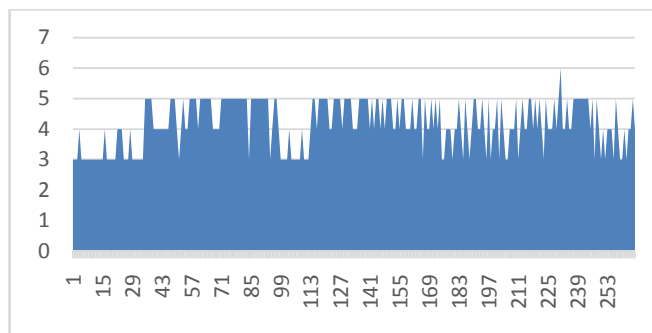Fig. 2 Wild Running Searching Passengers (in km)

Fig. 3 Time Spent Searching Passengers (in hrs)

- *Auto-rickshaw drivers waste about 4hrs (about 40% of their total working hours) a day waiting for passengers.*

In this modern age, India has seen a great increase in internet usage and smart-phone penetration. India has observed a large growth in mobile phone users with about 880

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million mobile phone connections. India ranks fifth among the countries for smartphone users with an estimated 67 million users. The growth in smart phone users in India is at the rate of 52 percent, second behind Taiwan.

Surveys conducted in the metro cities in India brought the conclusion that 79% population in such cities use smart-phones.
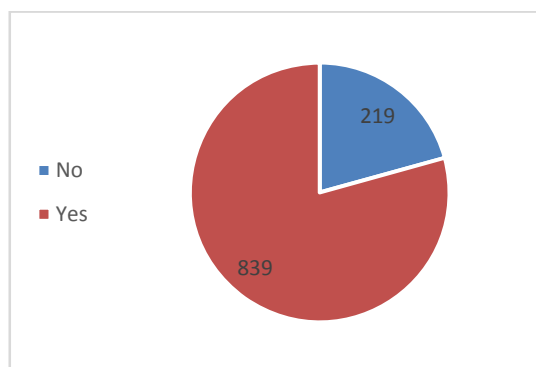

Fig. 4 Smart-phone users in metro cities

II. MODEL WORKING AND OPERATION

The operational model has been designed in such a way, so as to maximize the use of technology, reducing human interaction and thus the added risk factor

A. Basic Working

A passenger books an auto-rickshaw either by sending a SMS (Text Message) or by using the Mobile Application. The mobile application shows the nearest auto-rickshaw on Google Maps and the estimated time for pick up. The mobile application user location is tracked and the nearest auto-rickshaw within the network receives a message from the server to pick up the customer. This process took place with absolutely no call center help. The passenger is provided with the auto-rickshaw driver details booked for him and can track the auto-rickshaws location as it comes for pick-up using the mobile application. At the same time the auto-rickshaw driver is shown the shortest route for pick-up on a 3 inch LCD screen fitted in the auto-rickshaw.

The passenger pays the metered auto-rickshaw fare along with nominal convenience charges. The auto-rickshaw driver may run the GPS device in the "Live" or "Inactive" mode, depending upon his openness to new passengers. The "Live" mode enables the driver to feed his auto-rickshaw on the network and would be passed on leads generated by us, to ferry. When in the "Inactivate" mode the driver is free to travel on his own will.

B. Mobile Application Development

The mobile application prototype has been designed and is ready for launch. It has been designed with a user friendly interface for auto-rickshaw drivers as well as for commuters.

The application for auto-rickshaw drivers has been developed with a user-friendly interface taking into

consideration that they are unfamiliar with upcoming technology [3].

User Interface of the mobile application for auto-rickshaw drivers is as shown below, wherein, there exists the freedom to select the ferry of own choice depending on proximity and fares that would be earned. Once the ferry to be taken is selected a Google Map would help the auto-rickshaw driver to reach the pick-up location as depicted in the below screenshot.
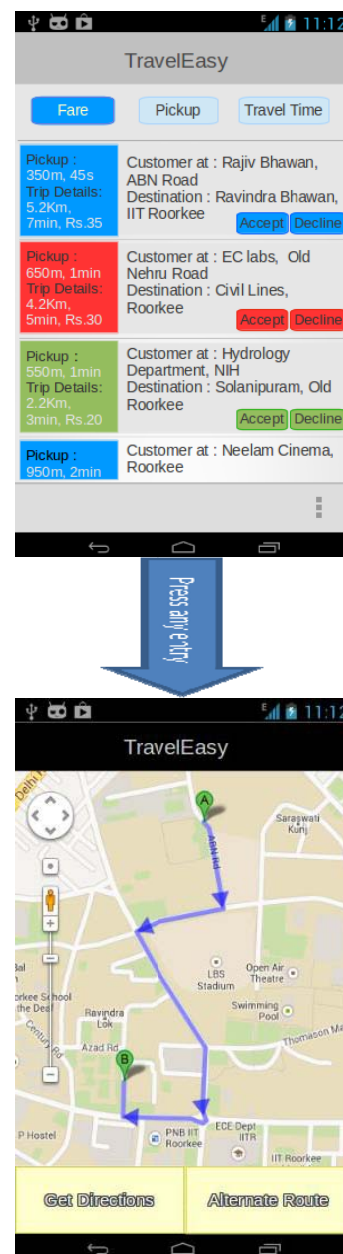

Fig. 5 Screenshot auto-rickshaw interface

User interface of the mobile application for commuters is as shown below, wherein, details are provided about the nearest auto-rickshaw, approximate time required for pick up and the upper limit i.e. the maximum time until the start of travel. The nearest ride map-view shows the location of the nearest located auto-rickshaws on a Google map. Once the commuter

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accepts the deal, details between both the parties are exchanged and the commuter can track the auto-rickshaw on its way to the pick-up location.
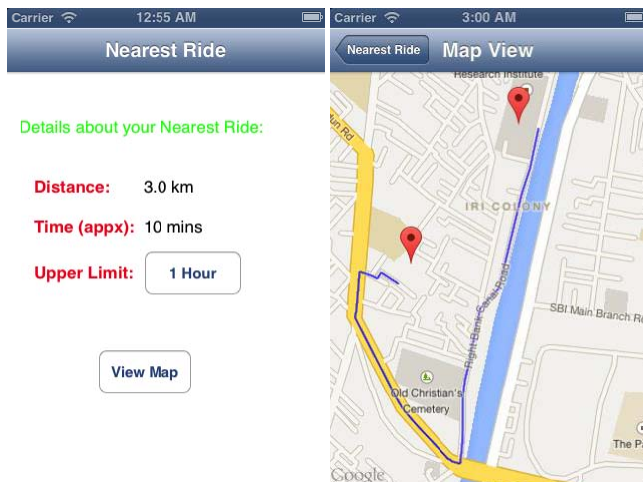

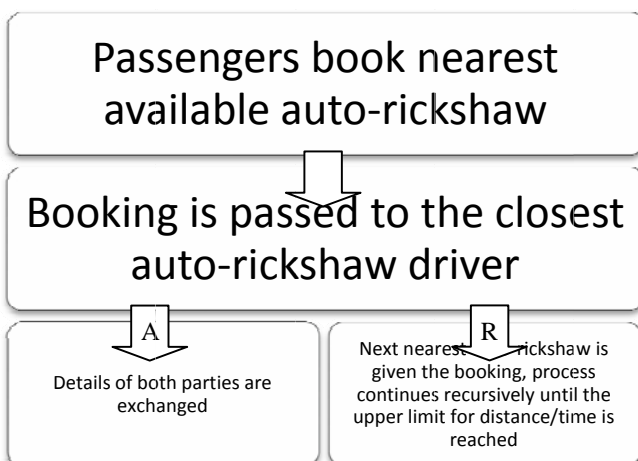Fig. 6 Screenshot commuter interface

C. Booking Procedure

Fig. 7 Booking procedure: A=Accepted by commuter; R=Rejected by commuter *Bookings are passed to only those auto-drivers who are working in the active mode by turning on the GPS tracker

D. Revenue Collection

It was also observed that revenue collection in such kind of a model would be a tedious job and has to be devised in such a way that it requires minimum man-to-man handling. Most of the Indians don't have credit cards and the booking through SMS option cannot have credit cards being used. Also, majority of the Indians aren't comfortable paying through a mobile application and don't have their credit card synced with their mobile phones. Thus the revenue has to be collected by the auto-rickshaw drivers which can be credited by 3 simple revenue collection models:

- *Prepaid: Like prepaid mobile recharge the auto-driver buys credit at the start of the period which are deducted by the bookings taken by him from our end, most suitable due to low realization costs.*
- *Post-Paid Model: The driver pays the monthly accumulated commission in the regional office. However, this method involves recovery issues and manpower gets involved.*
- *Subscription Model: The driver pays fixed fee every month for the service, ensuring a constant free-flow of revenue.*

E. Other Revenue Sources

The model aims to gain revenue through various sources such as:

- *Auto-rickshaw advertisement and In-house branding*
- *Peripheral add-on services such as Wi-Fi, magazines and snacks.*

III. PROBLEMS SOLVED

An analysis considering the difficulties faced by the commuters and auto-rickshaw drivers, the current solution and the simple solution on using GPS devices in auto-rickshaws.

TABLE I
PROBLEMS SOLVED

Problems Faced	Solution NOW	Solution THEN
Passengers have to walk long distances to get auto-rickshaws	Save phone numbers of drivers for consistent route travel	This platform provides booking from smart-phone or SMS(for non-smart-phone user) from their home
Denial of auto-rickshaw drivers to ferry the passengers to a particular location.	Pay unreasonable fares or use personal vehicles for their rescue.	A mobile application and SMS to book a GPS tracked auto-rickshaw whose location can be traced on centrally monitored servers.
Denial for a metered ride or duped by unnecessary longer routes.	Pay unreasonable rates or wait for a metered ride.	The rides would be metered from pick-up to the destination and the GPS navigator uses Google maps to show the shortest route to avoid dubious fares.
Auto-rickshaw drivers waste 40% of their time and resources finding the commuters.	Travel here and there or wait at a trite place in lean period.	With this platform drivers will know where to go to pick the passengers which will reduce unproductive time and wild passenger-less running.

IV. CONCLUSION FROM SURVEYS

After a market survey, which included 1000 daily auto-rickshaw commuters and 300 odd auto-rickshaw drivers we finally came to quite a few reasonable conclusions.

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A. Organizing the Highly Unorganized Sector

Organizing this highly unorganized but huge sector in the Indian economy would yield revenues of up to 0.5 million INR a day. The revenue analysis goes, as such:

- Indian metro cities have about 0.5 million auto-rickshaws plying across the streets.
- Assuming 10% market share in the auto-rickshaw segment would make it 0.05 million auto-rickshaws under our belt.
- 0.05 Million autos in major Indian cities, each travelling 50 Km (5 hour idle time) looking for passenger. If each km can fetch them INR 10 and we charge a 10% commission for revenues generated (10% conversion rate), it would translate into 50,000 *50*10*0.1*0.1= 0.5 million revenues daily.
- The number of trips generated can be estimated to be 50 thousand (10 per auto per day, 10% conversion). For each trip, passenger pays us INR 5 as convenience charge, translating into 0.25 million.

Revenue of 0.5 million/day from core business + unidentified revenue generated from advertisement.

B. Response of Auto-Rickshaw Drivers

- Majority of the auto-rickshaw drivers seemed to have faith in the idea and their responses were very encouraging. They could be working at a very high efficiency rate once the model is implemented, leading to progress in this sector with about 88% being confident that they would adhere to these services, if implemented.
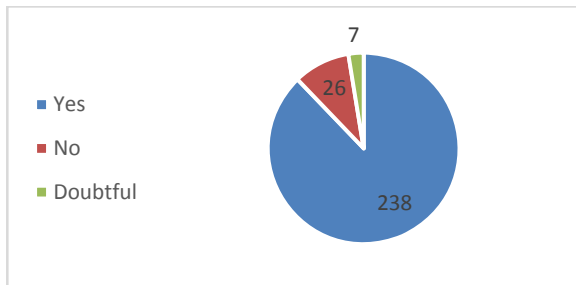

Fig. 8 Auto-rickshaw drivers response to adhere to GPS services

C. Net Income of Auto-Rickshaw Drivers

- The daily net income (excluding fuel costs) of auto-rickshaw drivers can be estimated to be about 500 INR and the model aims at raising the income to twice of what they earn today. This ensures auto-rickshaw drivers being easily ready to volunteer into the GPS model.
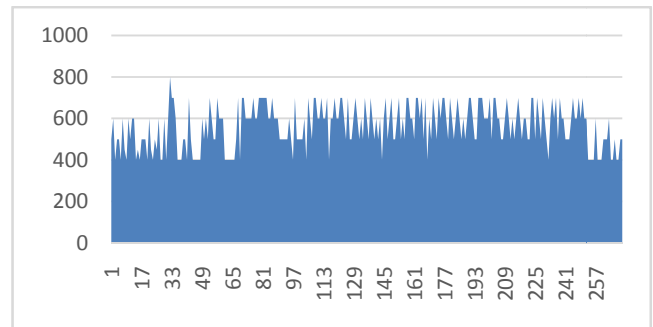

Fig. 9 Daily revenues of auto-rickshaw drivers

D. Demographics of Users

- The age demographics of auto-rickshaw user's shows majority of them lying in the age group between 20-50 years of age, which is that part of the population ready to adapt to upcoming technology and are mobile phone users [1].
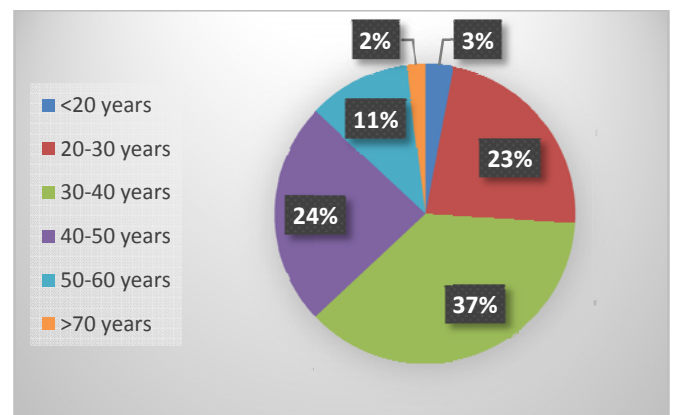

Fig.10 Demographics of autorickshaw users

E. Use of Mobile Application

- Majority of the commuters, about 67 percent, are willing to switch over to the use of mobile phone application to book an auto-rickshaw and feel that it would considerably reduce the effort put into the cause.
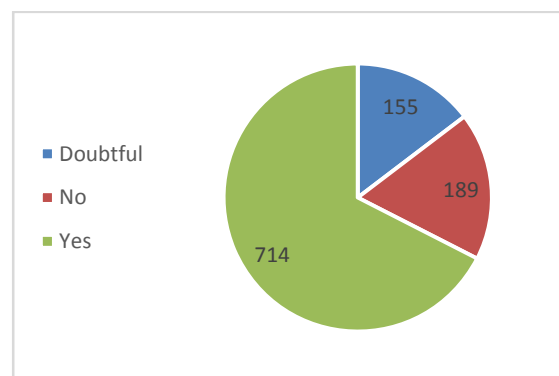

Fig. 11 Commuters willingness to switch to mobile application for auto rickshaw booking

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F. Use of Add-on Services

Quite a few commuters, approximately 37 percent are also ready to shell out an extra few bucks to avail add-on peripheral services such as Wi-Fi, newspapers, food and beverages which would help generate additional revenue.
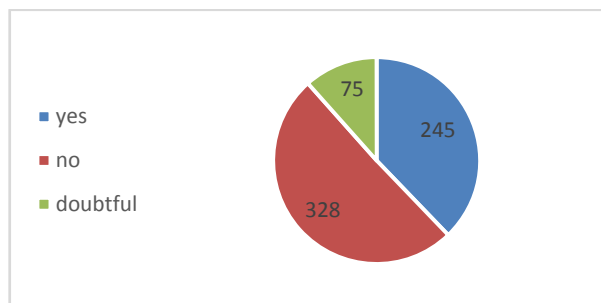

Fig. 12 Commuters ready to pay for add-on services

V. MARKET APPROACH

The way of launching in the market would play a very crucial role, aptly balancing the way of approaching the auto-rickshaw drivers and the commuters:

TABLE II
MARKET APPROACH STRATEGY

| Service Providers (Auto-rickshaw drivers)	Service Users (Commuters)
• Use a two-way channel to approach auto-rickshaw drivers i.e. Directly or through aggregators (those who own a fleet of auto-rickshaws)	• Launch mobile application firstly among university students as they are generally early adopters of new technology and use auto-rickshaws.
• Value proposition to auto-rickshaw drivers is extra-income generation and providing customer satisfaction to the passengers.	• Distribute flyers outside office complexes to make target audience of working professionals aware.
• Organize informational session for auto-rickshaw drivers to get more buy in.	• Make the presence felt outside metro stations where auto-rickshaw requirement is maximum.
• Providing financing options in the form of installments or trial version. (According to market surveys 76% auto-rickshaw drivers don't mind purchasing the GPS device in installments which may be worth about INR 3000 as the pay-back is assured within 15 days of purchase)	• Advertisement on auto-rickshaws registered on the network to generate more market awareness.
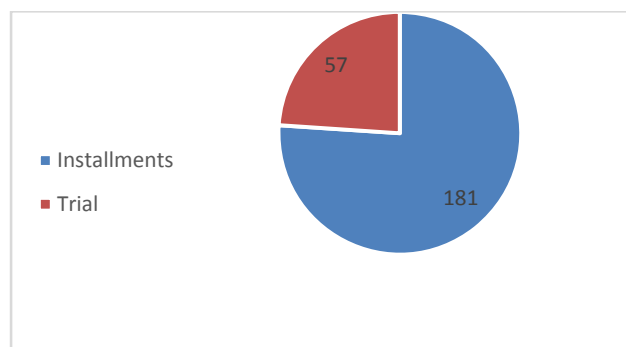
Fig. 13 Financing options to But GPS device

VI. SWOT ANALYSIS

Taking into consideration our strengths, weakness, opportunities and threats:

Strengths:
- *Increases passenger convenience in booking, travel and safety.*
- *Presence of 2 million autos with 0.3 million sales of 3 wheelers in 2012[2].*
- *Increase in income – 400 million people in 0.1-0.5 million annual income bracket by 2015.*
- *Our model works on minimal human interaction & makes use of technology to achieve scalability.*
- *GPS tracking of Auto-rickshaw.*
- *Low operational costs of auto-rickshaw.*

Weakness:
- *Dealing with individual drivers - Absenteeism of auto rickshaw drivers.*
- *Fulfilling customer satisfaction - On time pick up of passenger.*
- *Uneducated auto rickshaw drivers. (60% of auto-rickshaw drivers are illiterate) [5].*

Opportunities:
- *Advertisement on auto-rickshaws*
- *Brand promotion services & goods inside auto-rickshaws.*
- *Utility services like Wi-Fi, magazine, packaged food etc.*
- *Auto-pooling – use technology for optimum implementation.*
- *Early mover advantage.*

Threats:
- *Auto-rickshaws face competition from small vehicles like Tata ace for commercial usage and Radio cabs for local travel [4].*
- *High Marketing expenses to reach out to passengers, especially in metro cities.*

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