

MINIBUS TAXIS AS PART OF A SUSTAINABLE PUBLIC TRANSPORT SYSTEM IN SOUTH AFRICA

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INTRODUCTION

The minibus taxi industry in South Africa is currently carrying 65% of the country's public transport passengers. It can therefore be described as the current perfect public transport solution for South African circumstances. Not taking away any positive influences that the recent initiatives like the Bus Rapid Transit, Gautrain, etc. will have on South Africa's public transport, it should be stressed that the minibus taxi industry will have a big role to play in the future of a sustainable system in South Africa. Their role will mainly be to provide feeder services to larger carriers of people. Without a sustainable public transport system it will not be possible to provide for the future transport needs of the people of the world.

The minibus taxi industry evolved out of a necessity for moving masses of people in the lower income group. The entrepreneurs who started the minibus taxi industry are all individual businessmen who made the most of the opportunity at the time. It is essential that when approaching the minibus taxi industry with new ideas it must be kept in mind that you are dealing with small business owners and not a public transport entity.

With these principles in mind the author is conducting research on the effect of the implementation of Intelligent Transport Systems (ITS) in the minibus taxi industry.

CURRENT INITIATIVES

The South African public transport scene is currently undergoing considerable changes due to a number of factors. A major catalyst for these changes is the FIFA 2010 Soccer World Cup that will be hosted in several South African cities. One factor of these changes is the integration of all public transport modes which will have the result of all modes being controlled or at least monitored by central, authority controlled public transport back offices. The minibus taxi industry forms part of the initiatives and will also need to be monitored by authorities.

The initiatives require that electronic on-board equipment must be installed on all public transport vehicles. Essentially the equipment will be used for monitoring the operations of public transport operators and the information gathered are used for controlling and planning purposes.

MINIBUS TAXI CHANGES

Currently minibus taxis are licensed to operate along specific routes. Route identification numbers are displayed on the outside of the vehicles and the drivers are allowed to carry passengers only along these routes. The route adherence by drivers is monitored by inspectors and other taxi drivers.

With the introduction of electronic on-board equipment in the industry this monitoring can be done very accurately by authorities. Other aspects of the minibus taxi operations can also be monitored accurately like for instance driver behaviour, income generated per day/month and passenger movement patterns. This monitoring by authorities is not always found as desirable by the taxi owners and/or drivers as they sometimes see this as an infringement into their private business operations. In these cases the introduction of on-board equipment has a negative connotation.

To change the aversion the taxi owners and drivers have to the introduction of on-board equipment the author fitted a minibus taxi with equipment which runs several Intelligent Transport System (ITS) applications. The taxi is allowed to operate under normal circumstances. The aim is to

illustrate the positive effects that the implementation of ITS applications can have on the private minibus taxi owner's business operations.

The on-board equipment is modular in order for the author to add and remove different applications. Applications essential for the inclusion in future initiatives planned by the transport authorities are included and demonstrated to the taxi owners. These include live GPS tracking and live data communication to a back office. Additional applications that are tested are money savings applications, money generating applications and security applications.

APPLICATIONS

Live GPS tracking

Equipment

The equipment that is installed for this application is an on-board computer, a GPS receiver unit including a GPS antenna and a GPRS modem. The GPS unit sends position and time information to the on-board computer. This is immediately sent via the GPRS modem to a server which is connected to the internet. The GPS coordinates together with a time stamp are available to be sent to the authorities and to the taxi owner. It is also displayed on a map which can be accessed over the internet.

Transport authority benefits

This application will be required by transport authorities in order to monitor taxis in contract circumstances. The main purpose will be to monitor route adherence and to gather statistical data about the movements of minibus taxis for future transport planning.

Currently there is no live back office which can receive this information although several initiatives are under way to get such back offices operational within the near future. The data was presented to the Cape Town Municipality representatives and they indicated that the data can be used for transport planning and monitoring purposes.

Taxi owner benefits

The taxi owner was given access to a website which displayed the live position of the taxi graphically on a map. This allowed the taxi owner to monitor the movements of his driver.

There were occasions when the owner could not reach the taxi driver on his cellphone and needed to know the status of the taxi's operations. The owner used the website to get the position of the taxi and determined that the driver was still operating along his route. This is an indication of the safety aspect that the live GPS tracking offers the taxi owner.

Passenger Counting

Equipment

Different methods can be used to count the passengers on a minibus taxi. Several methods were tested and it was found that different passenger counters must be used for the different types of minibus vehicles.

A low roof minibus taxi (an older model Toyota Hi-Ace) was fitted with sensors linked to each passenger seat to detect whether it is occupied. Software algorithms determine whether the occupant is a person or baggage.

A high roof minibus taxi (a newer model Toyota Quantum) was fitted with a combination of optical and infrared sensors. These sensors detect presence and movement and a software algorithm calculates the number of passengers from the data that the sensors collect.

Transport authority benefits

The future integration of minibus taxis in interoperable public transport will mean that electronic ticketing will be introduced in taxis. A passenger counter is used to monitor and verify that the electronic ticketing is used correctly and effectively.

With the current method of operation which is cash based the passenger counter supplies mainly statistical information to the authorities who can use it for Current Public Transport Record (CPTR) purposes. This is therefore a monitoring and planning tool for the transport authorities.

Taxi owner benefits

The general agreement between the taxi driver and taxi owner is that the driver pays the owner a fixed amount per day for the use of the taxi. The surplus income that the driver receives from the passengers is used for petrol and what is left over is the driver's income.

During exceptional cases when the passenger volume is low the owner might accept a lower amount per day to ensure the taxi driver can still have an income. A passenger counter gives the taxi owner confirmation that the passenger volume is low for these exceptional cases.

Security via on-board monitoring

Equipment

The taxi is fitted with three video cameras, two directed towards the inside of the vehicle and one directed towards the oncoming traffic. The images are recorded on the on-board computer. The images are kept for three days after which it is overwritten.

Still images of a specific time can be requested via the website and will be retrieved from the on-board computer via the GPRS modem.

Taxi owner benefit

This is an obvious security application. It was found that the passengers behave better when they are aware that they are being monitored. The driver reported that passengers used to damage the interior of the taxi and since the cameras were installed he did not have any cases of destruction.

The driver also reports that since the cameras were installed his taxi is preferred by older people because they feel safer due to the fact that they are being watched. The security monitoring had a positive effect on the turnover of the minibus taxi service and the taxi driver is the direct beneficiary of this application.

Advertising and information display

Equipment

A LCD display is fitted behind the driver. The information on it is controlled from the on-board computer. Different information types can be displayed on the screen, namely short movie clips, still images and variable messages. The on-board equipment can receive live information via GPRS communication and display this on the LCD screen.

Transport authority benefits

As part of the future plans for interoperable public transport it is envisaged that public transport vehicles should have an Automatic Public Transport Message System (APTMS) which will inform passengers when the vehicle will arrive at the next stop, what connections are available at the next stop and also about other public transport related information.

Taxi owner benefit

The LCD screen is used to display adverts in the form of movie clips and still images. The adverts are interchanged every 30 seconds. The extra revenue generated from this is between R250 to

R600 per month. This method of advertising was used during the recent election campaign on other minibus taxis and proved to be very effective.

Research into the advertising requirements of large organisations showed that for them to find this method of advertising desirable, they will need to be visible on at least 1000 minibus taxis distributed proportionally across the country. A better and more practical method for testing the advertising potential within the scope of this pilot demonstration is to get small businesses to target advertisements on taxis that deliver passengers to their vicinity. The investigation into this revealed that businesses are interested and are eager to sign up with taxi owners for advertising possibilities.

The benefit for the taxi owner of owning- and having control over the on-board equipment is that he does not have to rely on third parties to obtain clients to advertise on his taxi. The taxi owner can directly sell advertising space on his equipment which means he can get a bigger portion of the generated income.

Apart from the advertising application, the LCD screen is also used to display short videos for the entertainment of the passengers. This is an attraction to draw more passengers and make the specific taxi a more desirable option.

Airtime

Equipment

A user interface in the form of a 7 inch LCD touch screen is fitted close to the driver. If a passenger wants to buy airtime the driver uses the interface to select the relevant amount of airtime from a list shown on the touch screen. He then types in the passenger's cellphone number on the touch screen and the request is sent to the control server via GPRS communication. The passenger receives a SMS with the relevant code to recharge his/her airtime with the requested amount. The passenger pays the driver for the airtime bought. The profit for the seller (taxi owner or driver) is a certain percentage of the sold airtime.

Taxi owner benefits

This is a purely money generating application. The amount of profit generated depends on the amount of airtime sold by the driver. In the pilot situation it was agreed between the taxi owner and driver that the owner will take a small percentage of the profit and give the rest to the driver.

Because of the importance of the driver's involvement in this application it is envisaged that the driver will receive most, if not all of the profit from selling airtime. This is also an incentive for the driver to take care of the on-board equipment and not let it fall into disrepair.

CONCLUSION

An on-board computer with several ITS applications was installed on a normal operating minibus taxi. The applications do not interfere with normal operations. The installation of technology on the taxi was welcomed by both the taxi owner and driver.

The most visible application is the LCD screen and this attracts passengers to this specific taxi. The security application also has a positive effect on operations and the behaviour of both the driver and passengers.

The GPS tracking application is positively received by the taxi owner and he does not mind that the transport authorities have access to the movement data of his vehicle. The fact that his taxi is not deviating from his route and the owner being able to proof this make this application a strong requirement from the taxi owner's side.

The passenger counter gives the transport authorities insight in the number of passengers carried by the taxi and also an idea of the income generated by the taxi. The taxi owner reported that this is not a concern for him because it also gives him an insight into the daily operations of the driver.

He felt that the knowledge and control he gained over the taxi's operations outweigh the fact that the transport authorities has insight into his operations.

The taxi driver reported that the fact that he can generate an extra income negates the fact that he is monitored. He does not mind following the rules and laws of operation because he does not have to break them in order to generate a decent salary.

It was found that the applications necessary in the current public transport situation regarding minibus taxis should add value to the operations in terms of security and additional income generation. If this can be achieved then the taxi owner and driver is more than willing to cooperate with the transport authorities.

This research is the beginning in the development of a full business model for taxi owners which will influence them into working more openly and willingly with transport authorities to create a better and more sustainable public transport solution for South Africa.