

CONVENIENCE AND SIMPLICITY FOR THE COMMUTER IS AT THE HEART OF OPEN ARCHITECTURE PAYMENT TECHNOLOGIES

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ABSTRACT

This paper considers the challenges for major African cities to provide a better public transport service for the passengers that rely on multiple networks on a daily basis. It recognises that the long-term goal of many cities is to provide an integrated transport network, a goal that will be difficult to achieve any time soon, and discusses how current card-centric, closed loop systems could implement Account Based Ticketing platforms to provide a frictionless, integrated transport experience and a step towards Mobility as a Service.

1. INTRODUCTION

Rapid urbanisation of cities across the African continent and the significant forecast economic expansion in the region have led to a real need for public transport to underpin this growth by enabling people to travel from home to work and school in an efficient and cost-effective way.

While individual transport modes and networks provide an important service for passengers, the limited integration of current urban mass transport systems in modern day Africa is hindering the ability of cities to grow their economies by supporting their commuters (Phahlane, 2018).

For workers looking to use public transport services in cities across Africa and within South Africa, there is a real issue with paying a reasonable price for an end to end journey and the process of making the actual payment transaction. Research from Kerr suggests that passengers using multiple modes of transport to commute to work could see their hourly wage reduced by 40% or more because of transport costs (Kerr, 2015).

This paper considers the issues surrounding public transport in a typical South African city, the multiple service providers and the impact on the travelling public. It will look at how the movement from cash transactions towards card-based systems has improved some aspects of services but has introduced other drawbacks.

The paper looks at how open payments can deliver significant benefits to all stakeholders, developing a path to Account Based Ticketing (ABT) and ultimately a more integrated transport passenger experience providing a better customer journey. Particular emphasis will be given to the current closed loop, card-centric transport systems and the

experiences of both the passengers and the managing authorities and considers whether alternative systems could provide benefits to passengers and future transport services.

Attention will be focused on aspects of the passenger's entire journey experience and will draw on examples of systems in place that are taking steps to make public transport easy, affordable, transparent and flexible enough to support the changing needs of cities and technological developments.

Finally, the paper will consider developments beyond Account Based Ticketing and the future of integrated transport services and particularly Mobility as a Service (MaaS) and the design principles required to deliver a MaaS platform.

2. A TYPICAL CUSTOMER JOURNEY

For many commuting passengers in a modern urban city in South Africa, the journey from home to work or perhaps school is not only long and crowded but will often be expensive and may involve more than one mode of transport. Analysis of data from the 2016 General Household Survey and the 2013 National Household Travel Survey (Helen Suzman Foundation) provides an insight into travel patterns across the country, some of which are:

- Cost of transport in South Africa is very high (Simkins, 2018) (Report Table 8 - 2nd highest percentage of household expenditure compared across Global regions) - 16.0% of household expenditure in urban formal areas is spent on transport, compared with 18.7% in urban informal areas.
- Use of minibus taxis as a transport service for work is second only to private cars (Report Table 1 - Modal split and average time to work, 2016).
- Minibus taxis are used for more trips than buses and trains combined (Report Conclusions (Simkins, 2018).
- Rail services such as Metrorail suffer from fare evasion and fraud problems (Weiner, 2018).
- Bus services, including Provincial, Municipal and BRT, suffer from sporadic use and low passenger numbers especially when compared to minibus taxis (Report Table 1 - Modal split and average time to work, 2016).

Considering the findings above highlighting the costs, journey times and usage patterns of public transport, it should be no surprise to hear of general customer dissatisfaction with the services provided by the transport industry covering aspects from journey prices through to service reliability, punctuality and safety and security (Weiner, 2018; Ayanda Vilakazi, 2014). Public transport service providers are under pressure from commuters demanding a more convenient and simpler journey experience, end-to-end, across all modes of transport (Mashiri, Moeketsi, Baloyi). It is up to the Regional Transport Authorities and the formal commuter rail and bus providers to improve their service offering, drive more customers to use their services and ultimately become the go-to service provider for all modes of transport across the cities.

Many areas of improvement need to be addressed to improve the entire journey experience but there are a few key elements around fares and ticketing that can be improved upon to provide a better service:

1. Fare management
2. Ticket purchase and payment
3. Integrated journeys

2.1 Fare management

Customers expectations are driving transparency (World Bank) and clarity of fare prices on the services they use no matter what type of fare policy is in place, including; - pay-as-you-go (PAYG) single ticket pricing, point to point fare pricing, distance-based pricing, peak and off-peak pricing. Communicating these pricing policies is challenging but actually managing and changing these policies in the field can be very difficult.

Transport authorities should consider whether their Back-Office systems are capable of managing the current fare policies and, more importantly, capable of managing future fare policies. Back-Office system flexibility allows fare policies to be easily changed and updated to reflect ticket price changes and new pricing models which might involve increased complexity. A common example is where a city needs to change its fare model from a complicated point-to-point environment to a zonal based model that provides a simplified passenger experience but handles the system complexity through the Back Office. The city of Manchester in the UK recently made this change across their tram network (Transport for Greater Manchester).

2.2 Ticket purchase and payment

The types of transport tickets and tokens available to passengers has stayed static for many years and has only recently moved beyond the cash model to more updated systems. These newer tickets and tokens such as smart cards and open payment platforms provide passengers with less friction in ticket purchase and far more convenience.

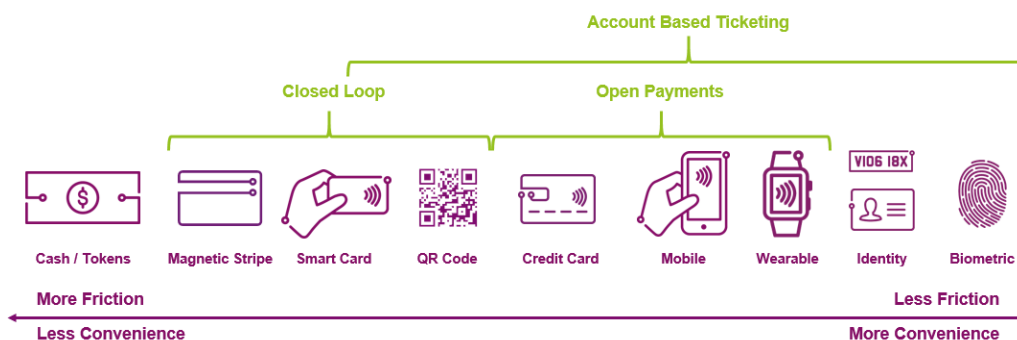


Figure 1: Transport ticketing evolution

Transport authorities recognise their fundamental business drivers are strongly influenced by the ticketing systems employed (First Bus). By moving away from cash to closed loop and ultimately open loop payments, passenger ridership numbers can be increased by improving the customer experience while at the same time operational costs can be reduced.

Many cities and authorities around the Globe have successfully deployed closed loop models using a smart card or a QR Code to establish the right to travel for the passenger. For many transport companies the smart card was seen as revolutionary to the industry with many advantages such as removing cash from the system, driving usage loyalty among passengers and speeding up the boarding time for passengers who just need to present their card to the validating machine either at a gate or on a platform or bus.

While there are benefits to these Stored Value Card (SVC) schemes, that effectively store an amount of digital money within the card that is reduced by the fare value every time it is

used, there are also some drawbacks for the passengers especially the need to load funds and monitor the amount of spending on the card.

Benefits

- Removes cash from the transport system
- Passengers simply use their card to travel
- Funds can be added to any card such as a gift or for a family member
- Card networks can be expanded to other 3rd party retail purchases
- Operators can gain important operational insights through the data generated and collected within the card system.
- Operators benefit from the cashflow generated from the value of the pre-paid funds “sitting” on the cards prior to being used on the network and the potential for earning interest on any positive balance.

Drawbacks

- Expensive to manage and administer
- Difficult for passengers to monitor their card credit levels
- Hassle for passengers to add funds to cards
- Cards are usually tied to a single operator or in some cases a single mode of transport such as rail.

Transport authorities are starting to move along the path of further enhancing customer convenience and reducing friction by introducing Open Payment services (Rail Professional). Across the globe, many cities (First Data) are starting to deploy contactless payments within the transport environment, supported by the card schemes, from Mastercard, Visa and others, and typically linked to a passenger’s bank account for the settlement of fare payments. The card schemes have developed contactless payment service rules specifically for the transport industries which allow flexibility and innovation around how fares are charged. These card schemes are typically linked to a bank account and operate as a debit or credit card from the users’ bank account.

While there are some innovative bank services opening up in South Africa (Just Money), there are still many South African passengers that rely on transport services to get to and from work that may not have access to a bank account. The 2017 World Bank Global Findex database estimates that 30% of adults do not have an account (The World Bank Global Findex Database, 2017). Several transport and BRT companies have recently launched services that could be seen as a hybrid solution - a card centric closed loop system using an EMV Low Value “Open” Payment card.

These are still stored value cards (where funds are added and stored on the card rather than a bank account) but are supported by the card schemes like Mastercard in providing an open payment or digital travel right as part of the National Department of Transport (NDOT) regulations for the transport industry. Just two examples of these services are the Cape Town myConnect (MyCITI) card and the Tshwane Bus Service Connector card (Tshwane Bus Service Connector Card).



Figure 2: Examples of the open payment contactless transport cards

These “open” payment card centric systems are effectively pre-paid debit cards that have been driven by the big national banks and supported by the card schemes. They allow passengers to add funds in a similar way to the more traditional closed loop systems but can provide wider flexibility to spend the funds on the card in other retail channels that accept EMV payments. This step towards open payments is an important base that will allow for future ticketing innovation to be developed.

Cards for these schemes can be purchased for a fee and registered against the user’s details. Although there is no passenger facing Back-Office account for managing the funds on the cards or tracking payments, there is still a Back-Office that manages the card top-up and fare payments. Funds can be added by several means, either via cashier kiosks located at stations or via cash-accepting ATMs. Future possibilities of being able to add funds to the card by other means are very interesting such as gifting funds from another person or even an employer and perhaps the use of mobile money services to add funds to cards as easily as paying for airtime.

Moving from a card centric to Account Based Ticketing platform is not necessarily a new phenomenon and can certainly be deployed within a closed loop card service but ABT, where passenger funds are managed within the Back-Office account and the payment is applied after travel is completed, starts to become increasingly important as cities strive to provide passengers with a more integrated transport experience by building on additional services through the same account.

3. INTEGRATED TRANSPORT EXPERIENCE vs INTEGRATED NETWORK

As cities become busier and the road networks become congested due to the high number of private vehicles trying to use them, the cities themselves are working to encourage a greater adoption of public transport services (The World Bank). As we have seen already through the dissatisfaction levels with public transport (Weiner, 2018; Ayanda Vilakazi; Mashiri, Moeketsi, Baloyi) there is a long way to go.

Passengers want to use public transport to take them from their current location to their destination (Forbes Survey), safely, efficiently and at reasonable cost and while there are transport services that might satisfy one of these criteria there are unfortunately very few that will satisfy all these requirements due to the lack of integration between multi-mode transport services.

Multi-modal journeys are no different in other cities around the world that rely on combined local and regional transport services and services that address the first and last mile of a journey. However, discovering, paying and purchasing a ticket to travel can be a real bottleneck for cities that want to provide a wider transport service for the future.

Recent reports have highlighted the need for city wide Integrated Transport Network Plans rather than focusing on specific transport services for example:

“South Africa should be putting more energy into integrating BRTs better with other public transport systems, including municipal buses, minibus-taxis and e-hail services like Uber. It should be working towards common cashless fare systems and easy transfers.” (The Conversation).

This needs to be addressed if the true benefits of a growing economy are to be realised but moving to a fully integrated transport network is a huge undertaking that very few cities have managed to address (Deloitte Review Issue, 2017).

When considering the goal of improving the customer journey there are several elements of a service that can be considered as part of an integrated experience:

1. Integrated journey discovery and planning
2. Integrated fare
3. Integrated purchase
4. Integrated single token
5. Integrated information

3.1 Integrated journey discovery and planning

Passengers need to be able to plan an entire journey from start to finish and understand the interchanges between modes of transport. How do the timetables align? What is the wait time? Is there a need to walk between stations? etc.

3.2 Integrated fare

Passengers want to know what they have to pay for their entire journey and that they are paying the best fare for that journey no matter how many different modes of transport they need to take to complete the journey.

3.3 Integrated purchase

Passengers would like to pay once for their journey at the start of the journey from a single source of funds.

3.4 Integrated single token

Passengers would like to use a single ticket or token for the entire journey rather than having to use multiple tickets and tokens each for the mode of transport used. An interim step may be to use different tokens but all linked to the same account and source of funds.

3.5 Integrated information

Is there a single point of reference for all transport information for the city? How do I know if my bus is going to be late? What is the next bus I can take if I'm running late? How is this information distributed to me - on signage at the stations? Through mobile updates?

This integration of services is a great vision for a city to have but it is difficult to achieve in practice, but there are several examples around the world including London, UK that under the management of Transport for London (TfL) has integrated several modes of transport including underground metro, buses, some of the rail lines, river boats and even a cable car across the river. Passengers can choose to pay by a number of methods but the most common being a contactless EMV bank card or mobile payment service linked to an Account Based Ticketing back office. Passengers can access and pay any of the supported modes of transport using the same contactless EMV card and no matter how many journeys and modes of transport the passengers make in a day, their fare for the day will be capped above a predetermined level.

For most cities this is a difficult task as integration across a city wide infrastructure means gaining agreement between all the transport providers to work together for the combined benefit of the city, to support a common open payment standard and use an Account Based Ticketing platform that is able to understand a passengers journey in order to calculate the total fare. Once a fare has been settled with the source of funding, it needs to be apportioned, or cleared, across the various transport modes that provided the service to the passenger so that everyone gets paid for their service.

Ultimately, this level of service offering is going a long way to a providing a Mobility as a Service (MaaS) platform to a city that could then extend to even wider private operator services such as mini-bus taxis, ride hailing and vehicle rental services (figure 3).

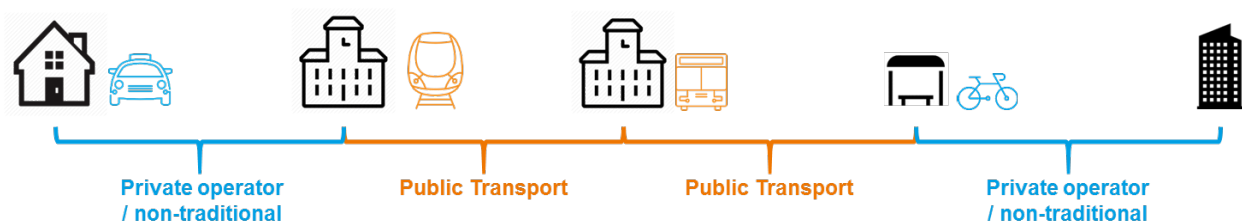


Figure 3: The entire customer journey

4. THE PATH TO MOBILITY AS A SERVICE

There are many service elements that make up a MaaS platform but it all starts with an open architected ABT system that allows a single token (either closed loop card centric or more likely, an open payment) to be associated with a passenger and can be used to access and pay for multiple transport services. A passenger may need to pay a separate fare for each mode of transport but they can do so with a single token linked to a single account. This integration of the ticketing experience through a single token can be seen as the start of a longer-term goal of an integrated transport network.

Separating the right to travel token from the source of payment means that when different payment tokens appear on the market such as contactless enabled mobile phones and wearables (using Apple Pay or Google Pay), these can also be enabled within the ecosystem and utilise the same source of funds linked to an account. In the future this could be as far ranging as personal identification technology such as facial recognition or fingerprint readers. Recently we've seen the First National Bank trialing ATMs with fingerprint recognition (Find Biometrics) so why not transport?

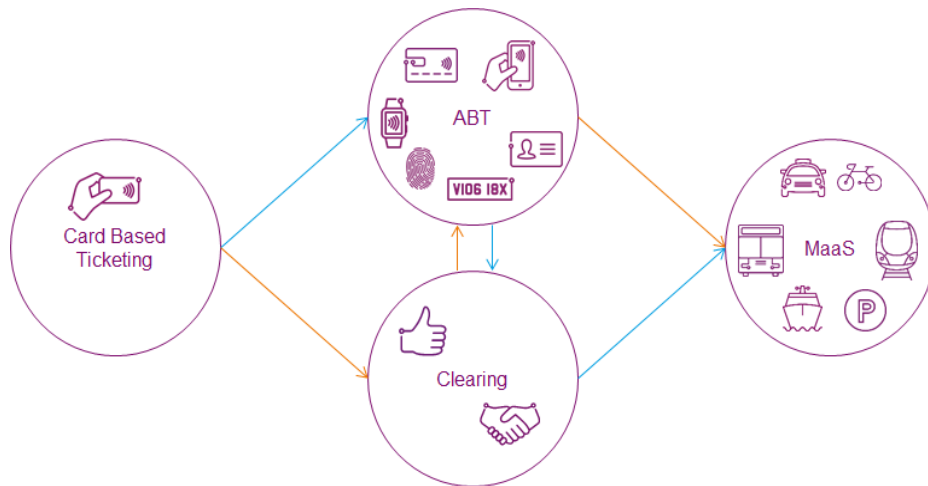


Figure 4: Account Based Ticketing path to Mobility as a Service

4.1 Design Principles for MaaS

When developing a MaaS platform it is important to consider the design principles employed.

- **Open API**

All products and systems should be able to integrate and interface through open APIs, providing flexibility and ability for expansion.

- **Data management**

Data is the lifeblood of the platform and should be tightly managed and controlled in order to maintain consistency, integrity and stability of the platform. Access to the data should be provided through the Open APIs for both internal and external services.

- **Cloud based**

Cloud services provide the flexibility, scalability and resilience to support the needs of a MaaS platform at an economical level for all customers.

- **Security**

Platforms that combine customer sensitive data, financial transactions and multi-party fare apportionment must have secure and compliant processes throughout each service element.

- **Modularity**

Ability to add and remove services as required.

4.2 Delivering MaaS

Ultimately the responsibility for delivering a MaaS platform should sit with the regional or national transport agencies. These agencies need to provide the vision for the future service of the cities and provide the encouragement for the multiple transport operators to be part of an integrated transport network.

5. CONCLUSIONS

Commuters are looking for improved services from their transport providers across many different aspects of service. Key to this improvement is a focus on the customer

experience from the initial service discovery, through the process of paying for a ticket to travel, in completing the end to end journey and, of course, the experience of the journey(s) itself.

Many passengers will need to take multiple modes of transport for a single journey, often provided by different transport operators that are run by the city or private services. The journey complexity delivered through these disparate services presents significant financial and emotional barriers to the growth of public transport services.

An integrated transport network is a noble goal for any city to aspire to but this vision is not an easy one to deliver. However, there are steps that cities can take to provide an integrated passenger experience through Account Based Ticketing in order to remove some of the barriers to public transport growth.

Putting the passenger at its very heart can deliver a better customer journey experience while allowing service competition to thrive and therefore keeping transport prices under control. Account Based Ticketing is the first step on the ladder of integration that can ultimately lead to the goals of network integration and Mobility as a Service.

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