

CASHLESS FARE COLLECTION IN SUB-SAHARAN AFRICAN PARATRANSIT: A REVIEW OF EXPERIENCES

AA TINKA and R BEHRENS

Centre for Transport Studies, University of Cape Town, Private Bag X3, Rondebosch 7701; Email: ARHARU001@myuct.ac.za and roger.behrens@uct.ac.za

ABSTRACT

Paratransit services in Sub-Saharan Africa have developed a reputation for poor service quality. Several reforms have been initiated to improve or formalize the sector. Notable amongst these are transitions from cash to cashless forms of fare collection, which have been largely unsuccessful to date. Drawing from academic literature and media reports, this paper reviews 24 such cashless fare collection initiatives in Sub-Saharan Africa. The scope of the initiatives identified span both public transport and for-hire paratransit services. An identification of the stakeholders in each case, and (where applicable) an assessment of the problems encountered, supported a starting proposition that the paratransit sector is a complex multi-stakeholder environment, with multiple interests that are sometimes conflicting, and that a failure to engage and address the interests of all stakeholders satisfactorily is the main cause of initiatives failing to endure. The problems encountered in minibuses paratransit cashless fare collection initiatives, however, were not observed in motorcycle paratransit initiatives. The reasons cashless fare collection has been more successful amongst for-hire motorcycle-taxi services requires further research, as does the forms of cashless fare collection that satisfy the interests of all minibuses paratransit stakeholder groups.

1. INTRODUCTION

In Sub-Saharan African cities, paratransit is the dominant mode of public transport (Behrens et al., 2016). This mode operates in a free, or partially regulated, market, and either competes with scheduled modes, or operates as the only mode of public transport. 'Paratransit' is defined in this paper as a flexible mode of public or for-hire passenger transportation that does not follow fixed schedules, manifested in Sub-Saharan Africa largely as minibuses and motorcycle-taxis. As these modes seldom, if ever, benefit from segregated lanes, they operate in mixed traffic conditions.

Cashless fare collection (CFC) has emerged as one of the most common interventions in Sub-Saharan Africa to reform paratransit services that are of poor quality. This paper reviews experiences of introducing CFC systems in Sub-Saharan African cities, in order to: (1) identify who the stakeholders were in each case; and (2) establish the reasons why many of these initiatives were short-lived. It tests a proposition that the paratransit sector is a complex multi-stakeholder environment (comprising drivers, vehicle owners, paratransit associations, regulators and passengers), with multiple interests that are sometimes conflicting, and that a failure to engage and address the interests of all stakeholders satisfactorily is the main cause of CFC initiatives failing to endure. The research forms part of a broader doctoral study into the prospects of cashless fare collection as a means of paratransit reform in Cape Town.

The paper is divided into five sections. The next section discusses the problems associated with cash-based operations in the paratransit sector. Section 3 identifies the purported benefits of cashless fare collection to the paratransit sector. Drawing from a review of academic literature and media reports, section 4 identifies and describes initiatives to introduce CFC systems in Sub-Saharan African cities. Section 5 concludes with a reflection on the starting proposition, and discusses future research needs.

2. PROBLEM FRAMING: CASH FARE COLLECTION IN PARATRANSIT

Paratransit services in Sub-Saharan Africa, and elsewhere in the Global South, have developed a reputation for poor service quality (Booyesen et al., 2013; Cervero, 2001; Cervero and Golub, 2007; Salazar Ferro and Allaire, 2015; Salazar Ferro and Behrens, 2013). Service quality problems emanate from the prevailing mode of business organization and operation (Behrens et al., 2017; Booyesen et al., 2013; Schalekamp et al., 2016). The drivers, subjected to a commission or 'target' system of remuneration, compete aggressively for passengers 'within the market'. This causes dangerous driver behaviour. On the presumption that this behaviour is, therefore, industry-imposed rather than an intrinsic characteristic of drivers, cashless fare collection has emerged over the past decade as a common intervention to improve service quality.

Labour relations in most of the paratransit sector are informal, and drivers and conductors are essentially casual workers (McCormick et al., 2016). Salazar Ferro and Allaire (2015) argue that the conventional owner-driver relationship results in high driver turnover. They report 60% of drivers operating a vehicle for less than one year in Abidjan, and average longevity of two years for a driver in one vehicle in Nairobi. They attribute this to labour relations and disputes over farebox revenues.

In the absence of a ticketing trail, cashed-based paratransit operations are characterised by a lack of information, not only for the government departments responsible for transport planning, but also for the vehicle owners and associations. There is a lack of consistent and accurate data on paratransit operations (e.g. ridership and fare box revenue) which inhibits local municipality efforts in establishing market value (Schalekamp and Behrens, 2013). Booyesen et al., (2013) and Jennings et al., (2016) report that vehicles owners have little control over their vehicles' utilisation and cash flow. The owners do not have a way of monitoring and determining daily farebox revenue. Any particular day's surplus or loss is only known to the drivers.

In Cape Town, where paratransit fares are higher than the other heavily subsidized public transport modes, the paratransit sector has agitated for operating subsidies (Salazar Ferro et al. 2013). Del Mistro and Behrens (2015) argue that subsidies should only be provided where the fare box revenue is less than the cost of operations. Prevailing cash fare collection practices do not enable fare box revenue to be measured accurately or verified. Sector subsidies could be appropriated through the establishment of franchises or concessions as a competition regulation measure, and the associated introduction of uneconomic services, but this would be difficult with the current cash-based operations (Schalekamp et al., 2016).

In addition, when fares are collected in cash, paratransit drivers are put at risk of being harmed by criminals wishing to rob them of the day's collections at the end of the service span. The burden of cash collection, and returning cash balances, is also stressful for a driver who operates a vehicle without a conductor. Although at times, passengers do

volunteer to act as conductors, collecting cash fares from fellow passengers and handing it over to the driver at the point of disembarkation (Booyesen et al., 2013).

3. BENEFITS OF CASHLESS FARE COLLECTION IN THE PARATRANSIT SECTOR

There are a number of forms of cashless fare collection, and for elaboration, see Ondrus and Pigneur (2006) and Schalekamp et al. (2017). They can be summed up as: paper-based; mobile phone-based; and card-based. Paper-based forms offer limited supplementary benefits (Jakubauskas, 2006). Card-based forms have evolved to be the most common form of cashless fare payment in public transport because of enhanced security features and ease of interoperability (Blythe, 2004; Jakubauskas, 2006; Pelletier et al., 2011). However, mobile phone-based payments have also gained recent traction.

CFC systems can reduce fraud through access to operations information in real time. Vehicle owners can be granted access to information such as the number of trips made, passengers carried and the revenue collected (Blythe, 2004; Jakubauskas, 2006). This allows them control over their vehicles and revenue inflows. As Malinga (2016) notes, this information can be used in tax payments where previously it has been based solely on the number of taxis owned.

CFC systems can provide an avenue for formalising labour engagements with contracts and salaries. This would stipulate entitlement and benefits.

Because of dependence solely on farebox revenue, the paratransit drivers must ensure that every passenger pays, and that as many passengers as possible are transported to accumulate revenues. Cashless technologies present a quick means of fare collection and validation (Pelletier et al., 2011). Blythe (2004) adds that the ease of fare collection is an important factor in determining passenger satisfaction. As driver fatigue sets in because of extended hours of operation, physical validation of payment causes tension between passengers and operators. Cashless fare collection can relieve drivers of the burden of cash handling, and improve driver-passenger relations (Byatt et al., 2007).

CFC systems can also bring about stability to fares and service availability. Masinde (2016) notes, of a mobile application enabling on-line seat pre-booking in Nairobi ('Magic bus'), that the midibuses go to where people are along the routes instead of waiting to fill at the trip origins. Relatedly, the collection of information about ridership and passenger travel patterns' (Blythe, 2004), and service departure times and routes, facilitates better network planning and route optimisation (Jakubauskas, 2006). Such planning and optimisation could be undertaken by a regulatory authority or an association, offering the potential for determining discounted fares for particular segments of the passenger market, cross-subsidising routes where shortfalls are established, and streamlining passenger transfers.

4. CASHLESS FARE COLLECTION EXPERIENCES IN SUB-SAHARAN AFRICA

This section describes attempts to introduce CFC systems in the paratransit sector in Sub-Saharan Africa cities. As noted earlier, the review spanned both public (i.e. the passenger adheres to the timing and routing of the trip determined by the driver) and for-hire (i.e. the passenger temporarily determines the timing and routing of the trip) forms of paratransit. Thus, both unscheduled bus/minibus and motorcycle-taxi services are discussed.

A search of academic literature and media reports revealed 24 CFC initiatives (20 branded systems), spanning nine countries: Benin; Cameroon; Kenya; Nigeria; Rwanda; South Africa; Tanzania; Togo; and Uganda. The 24 initiatives are summarised in Table 1 below. Selected branded initiatives (seven in number), highlighted in the table, are discussed further based on the availability of information. Each selected initiative is discussed in terms of: (1) a description of the CFC system; (2) the range and roles of the stakeholders involved; and (3) the duration of operation and the reasons for discontinuation (for those not currently in operation).

In Figure 1, the CFC initiatives are disaggregated by paratransit vehicle type, revealing that most initiatives have been introduced to mini/midibuses services (46%), followed by motorcycle-taxis (33%), buses (13%) and motor tricycle-taxis (8%).

In Figure 2, the status of each CFC initiative is presented. In this paper: ‘piloted’ means the initiative was planned and tested in a target area/route to gauge its feasibility; ‘launched’ means the initiative, after passing the pilot stage, was rolled out for operation in the target area/route; ‘operating’ means the initiative, after passing the pilot and launch stages, is still being used for fare collection; and ‘abandoned’ means that the initiative was stopped after either the pilot or a period of operation. The figure reveals that: three initiatives were planned but never piloted; seven were piloted and abandoned; two were piloted, launched and then abandoned; one is still being piloted; and 11 were piloted, launched and are still operating. Thus, of the 24 initiatives, 12 (50%) are no longer in operation, 1 (4%) is still in the pilot phase, and 11 (46%) are in operation. Of the 11 initiatives still operating, eight are motorcycle-taxi and two are motor tricycles-taxi services. It is worth noting that all the initiatives introduced into minibus service operations were abandoned at some stage.

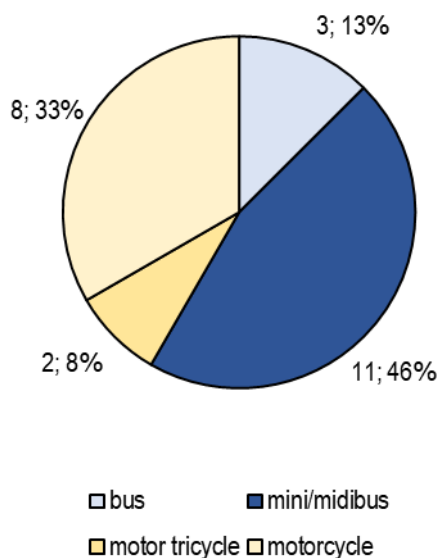
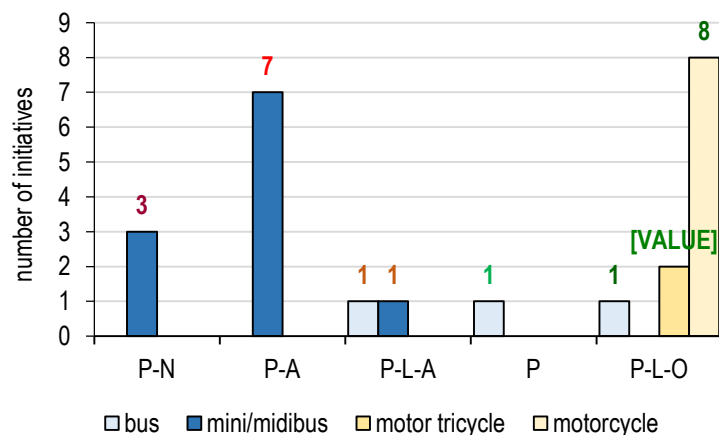


Figure 1: CFC initiatives, by vehicle type (N=24)



- Notes:
- P-N planned but never piloted
 - P-A piloted and abandoned
 - P-L-A piloted, launched and abandoned
 - P pilot still underway
 - P-L-O piloted, launched and still in operation

Figure 2: Status of CFC initiatives (as of March 2019), by vehicle type (N=24)

Table 1: Public transport and for-hire paratransit cashless fare collection initiatives in Sub-Saharan Africa

	City (Country)	CFC payment method	Paratransit vehicle type	Initiating agency	Implementing agency	Status of implementation (at March 2019)	Period of piloting/operation
FairCard	Gauteng (South Africa)	card based (EMV compliant), QR codes	minibus	SANTACO (through TaxiChoice)	FairPay	piloted & abandoned	1999, 2008, 2016
	Pietermaritzburg (South Africa)	card based (EMV compliant)	minibus	SANTACO (through TaxiChoice)	Fair Pay	piloted & abandoned	2015 – 2016
Tap-i-Fare	Cape Town (South Africa)	card based (EMV compliant)	minibus	Peninsula Taxi Association	ABSA Bank	piloted & abandoned	2012
BebaPay	Nairobi (Kenya)	card (NFC) & mobile phone	mini-(midi)-bus	Google	Equity Bank	piloted, launched & abandoned	2013 – 2015
Abiria Card	Nairobi (Kenya)	card (NFC) & mobile phone	buses	Kenya Bus Services (KBS)	KCB Bank	piloted, launched & abandoned	2013 – 2015
Pesa Mob	Nairobi (Kenya)	card (NFC) & mobile phone	mini-(midi)-bus	Family Bank	Family Bank	planned but never piloted	2014
Metro Card	Nairobi (Kenya)	card (NFC) & mobile phone	mini-(midi)-bus	unknown	PesaPrint	planned but never piloted	2014
M-Pesa	Nairobi (Kenya)	mobile phone	mini-(midi)-bus	Safaricom	Safaricom	piloted & abandoned	2014
My1963	Nairobi (Kenya)	card (NFC) & mobile phone	mini-(midi)-bus	MOA	Safaricom	piloted & abandoned	2014
Pepea	Nairobi (Kenya)	card (NFC) & mobile phone	mini-(midi)-bus	KCB Bank (in partnership with PSV operators)	KCB Bank	planned but never piloted	2014
SafeBoda	Kampala (Uganda)	mobile phone e-hailing application	motorcycles	SafeBoda (Ugandan based technology company)	SafeBoda	piloted, launched & still in operation	2014 – present
	Nairobi (Kenya)	mobile phone e-hailing application	motorcycles	SafeBoda (Ugandan based technology company)	SafeBoda	piloted, launched & still in operation	2018 – present
Tap&Go	Kigali (Rwanda)	card (NFC)	buses	AC Group (local technology company)	AC Group	piloted, launched & still in operation	2015 – present
	Yaoundé (Cameroon)	card (NFC)	buses	AC Group (Rwandan technology company)	AC Group	pilot still underway	2017
Pamoja card	Nairobi (Kenya)	card (NFC) & mobile phone	mini-(midi)-bus	Public Service Vehicle (PSV) operators	Diamond Trust Bank	piloted & abandoned	2016
Boloro	Dar es Salaam (Tanzania)	mobile phone with NFC sticker	mini-(midi)-bus	Boloro Global, JICA	Boloro Global, Telcos	piloted & abandoned	2016
ZemExpress	Cotonou (Benin)	mobile phone application	motorcycles	ZemExpress mobile lab	ZemExpress mobile lab	piloted, launched & still in operation	2016 – present
YegoMoto	Kigali (Rwanda)	card (NFC) & mobile phone	motorcycles	YegoMoto (locally based technology company)	YegoMoto	piloted, launched & still in operation	2017 – present
Max Go	Lagos (Nigeria)	mobile phone application	motorcycles	Max Go	Max Go	piloted, launched & still in operation	2017 – present
Taxify	Kampala (Uganda)	mobile phone e-hailing application	motorcycles	Taxify	Taxify	piloted, launched & still in operation	2018 – present
Uber	Kampala (Uganda)	mobile phone e-hailing application	motorcycles	Uber	Uber	piloted, launched & still in operation	2018 - present
UberPOA	Dar es Salaam (Tanzania)	mobile phone e-hailing application	motor tricycles	Uber	Uber	piloted, launched & still in operation	2018 – present
	Mombasa (Kenya)	mobile phone e-hailing application	motor tricycles	Uber	Uber	piloted, launched & still in operation	2018 – present
Gozem	Lomé (Togo)	mobile phone application	motorcycles	Gozem	Gozem	piloted, launched & still in operation	2018 – present

Notes: JICA=Japan International Cooperation Agency; MOA=Matatu Owners Association; NTSA=National Transport and Safety Authority; SANTACO=South Africa National Taxi Council. 2. Initiatives highlighted in yellow cells are those discussed in greater detail later in this section.

4.1 FairCard

4.1.1 System description

In October 2016, the FairCard pilot phase began in the Gauteng city region, with FairPay as the implementing partner. The system was based on card interface technology, and compliant with the Europay, MasterCard and Visa (EMV) South African national transport standard (Koigi, 2016; Malinga, 2016; Shezi, 2016). Passengers pay fares by tapping on a scanner fixed inside the vehicle. The scanner deducts the fare amount and shows the balance on the card. The system also provided for an alternative payment mode using Quick Response (QR) code paper-based tickets that are scanned at the point of vehicle entry. The cards were loaded at kiosks setup within the taxi ranks. The system further

provided for onboard Wi-Fi, and was GPS enabled to allow for monitoring of vehicle operations (Shezi, 2016).

FairCard was also trialled in Pietermaritzburg, and by all accounts the CFC system was similar to the one in the Gauteng city region. The system was initiated as a pilot project with 115 minibus-taxis, from the Grand Westgate Taxi Association, operating on one route. Free cards were given out to passengers, and kiosks to top up cards were set up in the taxi ranks (Moore, 2016).

4.1.2 Range and roles of stakeholders

In the Gauteng city region, the system was trialled on routes connecting Johannesburg, Pretoria and Mabopane (Koigi, 2016; Malinga, 2016). The system was endorsed by the Gauteng Department of Transport, the regulatory body coordinating the industry with other regulatory bodies, such as the Independent Communications Authority of South Africa (ICASA) which approved the planned electronic advertising (Shezi, 2016). The South African National Taxi Council (SANTACO), through its business arm, Taxi Choice, was the sole shareholder and Curve Group Holdings was the technology partner. SANTACO first initiated the CFC system in 1999 but was stopped by the government because of taxi association rivalry (Moore, 2016). In 2008, trials supported by SurePaw Technologies were run with 180 selected minibus taxis along the Johannesburg-Tshwane route (Venter, 2008). It is not clear for how long the system ran, but it was restarted in 2016. The system promised passengers benefits such as onboard Wi-Fi; card usage in selected retail shops; discounted fare structures; accidental death and permanent disability cover; and emergency assistance (Koigi, 2016; Malinga, 2016; Shezi, 2016). The CFC system also promised drivers formal employment relations with vehicle owners. This elevated status, and subsequent electronic routing of financial remunerations through banks, would render them creditworthy (Malinga, 2016; Shezi, 2016), qualifying them for loans, medical aid and insurance (Moore, 2016). The transparency created by the system in farebox revenues was to provide a basis for the South African Revenue Services (SARS) to levy taxes, other than the number of taxis owned (Malinga, 2016).

4.1.3 Duration of operation and reasons for closure

No information was found on the actual operationalization of the system in the Gauteng city region. However, Shezi, (2016) indicates that the system was to be piloted up to February 2017 and then rolled out nationally over the following five years. No further information was found on the system running thereafter, and on its discontinuation.

In Pietermaritzburg, the CFC system was started as a pilot in October 2015. In November 2015, a group of residents and taxi drivers protested against the system, burning down kiosks and blocking roads (Moore, 2016). Moore quotes one of the TaxiChoice officials attributing the violence to industry disorganization, local politics, and drivers believing that they would lose their jobs. In March 2016, the system was restarted, but the uptake of the cards was low, with passengers fearing they would be attacked by taxi drivers, and thereafter the system returned to full cash operations (Moore, 2016).

4.2 BebaPay

4.2.1 System description

BebaPay was a Near Field Communication (NFC) technology with prepaid cards tapped on handheld mobile card readers to pay the travel fare. The system automatically generated a Short Message Service (SMS) to a passenger to confirm payment as well as a notification of the card balances (Odero, 2016; Kimani, 2018). The cards were distributed free and passengers were required to register on the Google–BebaPay website. The cards

were reloaded without extra charge at Equity Bank branches and agents, and through its mobile banking system. Vehicle owners were linked to a system interface from where they received real-time information on their vehicles' operations (Mwaniki, 2013).

4.2.2 Range and roles of stakeholders

After a year of piloting, the BebaPay fare collection system was launched in Nairobi in April 2013, by Google and Equity Bank (Masinde, 2016). The system was supported by a government legal notice: 'Operation of Public Service Vehicles'. The notice was published by the National Transport and Safety Authority (NTSA) in September 2013 (Kimani, 2018). The government banned the use of cash in public transport, setting a phase-out deadline of July 2015, which was later shifted to December 2015 (Odero, 2016). The main objectives of the ban were to improve service efficiency, limit corruption by traffic police (who extorted money from matatu drivers), and formalise the sector (Kimani, 2018; Odero, 2016; Masinde, 2016). It was anticipated that electronic ticketing systems that track all transactions would help the Kenya Revenue Authority (KRA) tax the industry (Odero, 2016).

4.2.3 Duration of operation and reasons for closure

The initiative, that reportedly had about 700,000 registered users, was closure in March 2015 (Okoth, 2015). Okoth cites intense competition from new market entrants, and lack of interoperability amongst the competing actors, as reasons for the abandonment of the initiative. The complex matatu operating environment in Kenya includes Savings and Credit Organisations (SACCOs), Matatu owners associations, drivers, and conductors. Insufficient engagement with all stakeholders in this environment, particularly the drivers and conductors, in the design of the initiative also contributed to the failure of the system (Odero, 2016; Kimani, 2018).

4.3 Abiria Card

4.3.1 System description

Abiria Card is a MasterCard enabled NFC technology. It allows tapping to pay for travel fares, and can also be used for other banking purposes across Kenya Commercial Bank (KCB) and any other MasterCard accepting facilities. Cards are loaded at any KCB branch or outlet. The card details are accessible on passengers' smartphones, to which electronic receipts are also sent after any transaction (Hapa Kenya, 2014).

4.3.2 Range and roles of stakeholders

The Abiria Card initiative was a partnership between Kenya Bus Service (KBS) and KCB. It started with the installation of card readers in 260 KBS buses, purposely to solve revenue under-declaration by the bus drivers and conductors. The initiative was in line with the NTSA's directive regarding to adoption of electronic fare collection in public transport services (Hapa Kenya, 2014).

4.3.3 Duration of operation and reasons for closure

Like BebaPay, the Abiria Card ceased operating in March 2015 (Dika, 2016). Dika (2016) identifies the following reasons for the abandonment of the Abiria Card initiative: high transaction fees (at 3%) charged by the implementing bank; fragmented and uncoordinated electronic payment platforms following the government CFC directive; and low public awareness.

4.4 SafeBoda

4.4.1 System description

SafeBoda launched its cashless fare collection system in Kampala in 2014, with the aim of improving road safety (Douglas, 2015), and reducing cash-related quality-of-service problems such as haggling for fare and lack of change for large denomination banknotes (Olupot, 2017). Its e-hailing platform is a phone-based application that enables passengers to request the nearest available motorcycle-taxi, by entering a point of origin and destination. The application displays the nearest driver and the trip fare, and requests confirmation of the trip in order to activate the driver (Douglas, 2015). Trip fares can be paid electronically (via mobile money) or by cash (East African, 2018). The application allows passengers to top-up their credit using mobile money (through MTN and Airtel telecom platforms), rate riders' performance, and report any issues of concern (Olupot, 2017).

4.4.2 Range and roles of stakeholders

SafeBoda recruits motorcycle-taxi drivers from the general motorcycle (or 'boda boda') industry, and signs contract agreements only with the motorcycle drivers. SafeBoda, in partnership with Red Cross, then undertakes training for the recruited drivers on road safety, customer care, first aid and motorcycle maintenance (Douglas, 2015). SafeBoda maintains a code of conduct for the drivers, including observance of traffic rules, the use of safety gear, punctuality, and regular motorcycle maintenance (Olupot, 2017). The e-hailing initiative also enables operations monitoring by owners through GPS tracking systems for the registered motorcycles. There is limited regulation of the motorcycle-taxi industry by the Ugandan government. The system is still operating.

Prompted by SafeBoda success, the Uber and Taxify ride-hailing initiatives entered the Ugandan motorcycle-taxi market. Taxify joined the market in February 2018, and Uber in March 2018 (Grilhot, 2018). These initiatives have adopted the same operating model as SafeBoda, and Grilhot notes that the only difference in operations is the level of commissions charged.

SafeBoda extended its services into Nairobi, in 2018, with similar operating procedures to those in Kampala. The Kenyan initiative has registered more than 5,000 riders and serves more than 100,000 passengers weekly (East African, 2018).

4.5 Tap&Go card

4.5.1 System description

The Tap&Go card initiative in Kigali is a NFC card-based technology, operating with the Kigali Bus Service (KBS) company. The system has onboard fare validators, GPS and speed monitoring equipment. Passengers pay the travel fare by tapping on the card readers, and can top-up the cards at mobile units set up along the service route and through mobile money platforms (Bhan, 2015; East African Business Week, 2015).

4.5.2 Range and roles of stakeholders

The Tap&Go initiative was launched in Kigali in 2015 by the AC Group, a locally based technology solutions company, in partnership with the government (through the Rwanda Utilities Regulatory Authority, RURA) and the KBS bus company (Bhan, 2015; East African Business Week, 2015). The system was piloted with KBS buses for eight months before the system launch (Bhan, 2015). KBS services operate largely without a schedule, but on five fixed routes, enjoying a public transport passenger market share of 18%. The dominant mode of public transport in the city is the minibus with a market share of 25%

(Van Zyl et al., 2014). The initiative grew in patronage from 300,000 in 2016 to 1.2 million subscribers in December 2017 (The New Times, 2018). The system is still operating.

4.6 YegoMoto

4.6.1 System description

YegoMoto is a NFC and mobile network-based cashless fare payment technology used by motorcycle-taxis in Kigali. Drivers are provided with smartphones that act as Points of Sale (PoS). The passengers can request a ride by entering their origin and destination into the YegoMoto application. Fare payments are automatically calculated according to the distance travelled. Payment can be made by NFC tags, or mobile money supported by MTN and Airtel telecom companies. Riders receive their revenues through transfers into their mobile money accounts (Balancing Act, 2018).

4.6.2 Range and roles of stakeholders

YegoMoto was launched in Kigali in January 2018 by a local technology company, and supported by the government through the Rwanda Utilities Regulatory Authority (RURA). The CFC system was launched after piloting in 2017 with 600 motorcycles. YegoMoto was licensed by the government. Heavy fines are instituted against any motorcycle-taxi driver found not using the YegoMoto fare payment system (Balancing Act, 2018).

4.7 UberPOA

4.7.1 System description

UberPOA is an e-hailing option introduced in Dar es Salaam among motor tricycle taxis, commonly referred to as 'tuk tuk' or 'bajaj'. The option was introduced alongside normal Uber applications in sedan taxis, in an effort to improve safety and reliability (Techmoran, 2018; Makero, 2018). The motor tricycle taxi services, recognised for their comparative fuel cost effectiveness, are steadily expanding across the city (Makero, 2018). Passengers can access the uberPOA service by logging onto the Uber Application (selecting uberPOA among other Uber options), enter their origin and destination, and may choose to pay either through electronic funds authorisation or by cash. The passenger then confirms the trip and the displayed travel fare, before the UberPOA driver arrives. The UberPOA platform also displays the name and photograph of the driver, the registration number of the vehicle, and a driver rating (Techmoran, 2018).

4.7.2 Range and roles of stakeholders.

Uber partners with drivers as independent contractors, who provide their vehicles for use on set terms. For registration, Uber requires a national identification card, a police clearance certificate, a vehicle inspection report and Public Service Vehicle (PSV) insurance. These are relied upon, together with pre-contract screening, to ensure the safety of riders. The motor tricycle drivers' location and speed behaviour is also monitored using Uber telematic technology, ensuring compliance with Uber standards (Techmoran, 2018).

UberPOA was launched in Dar es Salaam in March 2018, and is still operating. Following the successful launch in Dar es Salaam, UberPOA was extended to Mombasa in September 2018 using similar operating procedures (Mbogoh, 2018; Techmoran, 2018).

5. CONCLUSION

The past five years have seen considerable interest in, and a rapid diffusion of, cashless fare collection systems in Sub-Saharan African cities. This paper set out to review these

initiatives, with particular attention given to establishing the range of stakeholders involved, and the reasons for the short-lived nature of many of the initiatives.

Notwithstanding the limited availability of detailed information in the accessed literature and media reports, with regard to the stakeholders, it was found that there are numerous stakeholders with differing interests. The common stakeholders that emerged in the initiatives discussed in the paper, include: vehicle crews (drivers and conductors); vehicle owners; paratransit associations (at varying scales of aggregation); regulators; passengers; financial institutions; and technology companies.

With regard to the reasons for CFC initiative abandonment, it was found that many of the failed initiatives were in minibus services, and key amongst the reasons for failure are: a failure to adequately consider the interests of vehicle drivers and conductors (who were to be relied upon to operationalise the system on the ground) in scheme planning; rivalry amongst some stakeholders as a result of protection of interests, subtle in Nairobi but pronounced in South African cities; and the absence of any coordinating or interoperable mechanism introduced either by the regulatory authority or by the paratransit associations.

The findings of the review thus support the starting proposition that the paratransit sector is a complex multi-stakeholder environment, and that a failure to engage and address the interests of all stakeholders is the main cause of failure.

It is interesting to note that the CFC initiatives that continue to operate successfully were found in the motorcycle-taxi sector. This can perhaps, in part, be attributed to the larger and more complex nature of the minibus industry compared to motorcycle-taxis. However, this needs further empirical research. Other questions that need further investigation include: how the interests of all stakeholders, and particularly those of paratransit drivers, can be met in the design of CFC systems; and what level of co-ordination is required, and by whom, to enable CFC systems to be interoperable.

6. ACKNOWLEDGEMENTS

The authors gratefully acknowledge the doctoral research funding for the lead author provided by the Volvo Research and Educational Foundations. The assistance of Lourdes Diaz Olvera, Mirko Goletz and Pascal Pochet in identifying past and current CFC initiatives is also acknowledged.

7. REFERENCES

Academic References:

Behrens, R, McCormick, D and Mfinanga, D, 2016. An introduction to paratransit in Sub-Saharan African cities, in Behrens R, McCormick D and Mfinanga D (eds), *Paratransit in African cities: Operations, regulation and reform*. Routledge, London.

Behrens, R, McCormick, D, Orero, R and Ommeh, M, 2017. Improving paratransit service: Lessons from inter-city matatu cooperatives in Kenya, *Transport Policy*, Vol 53, pp70-88.

Blythe, PT, 2004. Improving public transport ticketing through smart cards. *Proc. Inst. Civ. Eng. - Munic. Eng.* 157, 47-54. doi:10.1680/muen.2004.157.1.47

Booyesen, MJ, Andersen, SJ and Zeeman, AS, 2013. Informal public transport in Sub-Saharan Africa as a vessel for novel Intelligent Transport Systems, in: IEEE Conference on Intelligent Transportation Systems, Proceedings, ITSC. IEEE, The Hague, Netherlands, pp. 767-772. doi:10.1109/ITSC.2013.6728324

Byatt, M, Oscuro, G and Rookes, M, 2007. Improving efficiency: An evaluation of Sydney buses "Bondi Bendy" prepay service, in International Conference Series on Competition and Ownership in Land Passenger Transport. University of Sydney, Hamilton Island, Queensland, pp. 231-251.

Cervero, R, 2001. Informal transport in the developing world. UN-Habitat 1-186. doi:10.2981/0909-6396(2007)13[172:hatlci]2.0.co;2.

Cervero, R and Golub, A, 2007. Informal public transport: A global perspective. *Transp. Policy* 14, 445-457. doi:10.1016/j.tranpol.2007.04.011.

Del Mistro, R, Behrens, R, 2015. Integrating the informal with the formal: An estimation of the impacts of a shift from paratransit line-haul to feeder service provision in Cape Town. *Case Stud. Transp. Policy* 3, 271-277. doi:10.1016/j.cstp.2014.10.001.

Dika, A, 2016. Cashless payment system: Why the field day on cashlite fare system? *Abiria Mag. KENYA BUS Serv. Manag. Ltd.* 28.

Jakubauskas, G, 2006. Improvement of urban passenger transport ticketing systems by deploying intelligent transport systems. *Transport* 21, 252-259. doi:10.1080/16484142.2006.9638075.

Jennings, G, Bruun, E, Orero, R, McCormick, D and Browning, P, 2016. Strategy options for paratransit business development and service improvement, in Behrens, R, McCormick, D, Mfinanga, D (Eds.), *Paratransit in African cities: Operations, regulation and reform*. Routledge, London and New York.

McCormick, D, Schalekamp, H and Mfinanga, D, 2016. The nature of paratransit operations, in Behrens, R, McCormick, D, Mfinanga, D (eds.), *Paratransit in African cities: Operations, regulation and reform*. Routledge, London.

Ondrus, J and Pigneur, Y, 2006. Towards a holistic analysis of mobile payments: A multiple perspectives approach. *Electron. Commer. Res. Appl.* 5, 246-257. doi:10.1016/j.elerap.2005.09.003.

Pelletier, MP, Trépanier, M and Morency, C, 2011. Smart card data use in public transit: A literature review. *Transp. Res. Part C Emerg. Technol.* 19, 557-568. doi:10.1016/j.trc.2010.12.003.

Salazar Ferro, P and Allaire, J, 2015. Paratransit: A key element in a dual system. CODATU, Accessed at: http://www.codatu.org/wp-content/uploads/transports_collec_artisanal_V03ecran_EN.pdf.

Salazar Ferro, P and Behrens, R, 2013. Paratransit and formal public transport operational complementarity: Imperatives, alternatives and dilemmas, in 13th World Conference on Transport Research, Rio de Janeiro.

Salazar Ferro, P, Behrens, R and Wilkinson, P, 2013. Hybrid urban transport systems in developing countries: Portents and prospects. *Res. Transp. Econ.* 39, 121-132. doi:10.1016/j.retrec.2012.06.004.

Schalekamp, H and Behrens, R, 2013. Engaging the paratransit sector in Cape Town on public transport reform: Progress, process and risks. *Res. Transp. Econ.* 39, 185-190. doi:10.1016/j.retrec.2012.06.012.

Schalekamp, H, Golub, A and Behrens, R, 2016. Approaches to paratransit reform, in Behrens, R, McCormick, D, Mfinanga, D (Eds.), *Paratransit in African cities: Operations, regulation and reform*. Routledge, London.

Schalekamp, H, McLaren, M and Behrens, R, 2017. Exploring cashless fare collection in the context of urban public transport reform in South Africa, in 36th Southern African Transport Conference. Pretoria.

Van Zyl, N, Swanepoel, L, Bari, M, Haskoning DHV, R, 2014. Planning of a public transport system for the city of Kigali, Rwanda, in 33rd Southern African Transport Conference. Pretoria.

Media Reports:

Balancing Act, 2018. Rwanda: going digital to tackle accidents and crime - Senegal and Rwanda adopt two very different approaches. Accessed on 21st Jan. 2019, at: <https://allafrica.com/stories/201808160370.html>.

Bhan, N, 2015. Rwanda launches cashless public transport payments - will they succeed where Google failed in Kenya? Accessed on 21st Jan. 2019, at: <http://nitibhan.com/2015/12/21/rwanda-launches-cashless-public-transport-payments-will-they-succeed-where-google-failed-in-kenya/>.

Boko, H, 2017. In Benin, Zemidjans in Uber mode. Accessed on 22/04/2019 at: https://www.lemonde.fr/afrique/article/2017/09//15/au-benin-les-zemidjans-en-mode-uber_5186459_3212.html.

Douglas, K, 2015. A new business model for Uganda's motorbike taxi industry. Accessed on 21st Jan. 2019 at: <https://www.howwemadeitinafrica.com/a-new-business-model-for-ugandas-motorbike-taxi-industry/49829/>.

East African, 2018. Uganda motorbike hailing App SafeBoda launches in Nairobi. Accessed on 21st Jan. 2019 at: <https://www.theeastafrican.co.ke/business/uganda-motorbike-hailing-app-SafeBoda-launches-in-Nairobi/2560-4730426-wggsI5z/index.html>.

East African Business Week, 2015. Rwanda: Electronic payment for Rwanda public buses. Accessed on 21st Jan. 2019 at: <https://allafrica.com/stories/201512070379.html>.

Grilhot, G, 2018. Uber and Taxify launch into the motorcycle taxi market in Uganda. Accessed on 17/02/2019 at: https://www.lemonde.fr/afrique/article/2018/04/06/uber-et-taxify-se-lancent-sur-le-marche-des-motos-taxis-en-ouganda_5281715_3212.html.

Hapa Kenya, 2014. KCB and KBS partner to launch bus fare debit card. Accessed on 13/02/2019 at: <https://hapakenya.com/2014/06/09/kcb-kbs-partner-launch-bus-fare-payment-debit-card/>.

Jackson, T, 2018. Ride-hailing startup Gozem launches in Togo with grand plans. Accessed on 18/02/2019 at: <http://disrupt-africa.com/2018/12/ride-hailing-startup-gozem-launches-in-togo-with-grand-plans/>.

Kimani, M, 2018. How Nairobi's matatus defied the will of Kenya's cashless policy makers. Accessed on 23rd Oct. 2018 at: <https://kioneki.com/2018/08/01/how-nairobis-matatus-defied-the-will-of-kenyas-cashless-policy-makers/>.

Koigi, B, 2016. South African taxi association to launch electronic fare collection system. Africa Bus. Communities. Accessed on 30th Dec. 2018 at: <https://africabusinesscommunities.com/news/South-africa-taxi-association-to-launch-electronic-fare-collection-system.html>.

Mbogoh, J, 2018. Uber launches tuk tuk service in Mombasa. Accessed on 22/04/2019 at: <https://kenyanwallstreet.com/uber-launches-tuk-tuk-service-in-Mombasa/>.

Makeru, H, 2018. Uber launches uberPOA in Dar es Salaam. Accessed on 22/04/2019 at: <https://mgongopr.blogspot.com/2018/03/uber-launches-uberpoa-dar-es-salaam.html>.

Malinga, S, 2016. Gauteng intros cashless payment for taxis. ITWeb. Accessed on 30th Dec. 2018 at: <https://www.itweb.co.za/content/nLPp6VMrBpeMDKQz>.

Masinde, J, 2016. Nairobi's colorful but chaotic local bus system is resisting being digitized. Quartz Africa. Accessed on 4th Oct. 2018 at: <https://www.thelocalafricanews.com/nairobis-colorful-chaotic-local-bus-system-resisting-digitized/>.

Max, 2018. Beat traffic with safe and affordable transport and delivery service. Accessed on 22/04/2019 at: <https://max.ng>.

Moore, N, 2016. Taxi industry tries to usher in smart card system. Mail Guard. Accessed on 30th Dec. 2018 at: <https://mg.co.za/article/2016-03-31-taxi-industry-to-usher-in-smart-card-system>

Mwaniki, C, 2013. Equity, Google launch prepaid commuter cards. Accessed on the 13/02/2019 at: <https://www.businessdailyafrica.com/markets/Equity-and-Google-launch-prepaid-commuter-cards/539552-1762746-hfof6h/index.html>.

Odero, K, 2016. Kenya's cashless payment system for public transport was doomed by a series of experience design failures. Accessed on 23rd Oct. 2018 at: <https://www.iafrikan.com/2016/09/21/kenyas-cashless-payment-system-was-doomed-by-a-series-of-experience-design-failures/>.

Okoth, E, 2015. Recall of BebaPay card leaves 700,000 commuters stranded. Accessed on 13/02/2019 at: <https://www.nation.co.ke/business/Recall-of-BebaPay-card-leaves-700000-commuters-stranded/996-2625900-8ufrfdz/index.html>.

Olupot, NE, 2017. Have change or not: SafeBoda Uganda now allows its passengers to ride cashless. Accessed on 21st Jan. 2019 at: <https://pctechmag.com/2017/08/have-change-or-not-safeboda-uganda-now-allows-its-passengers-to-ride-cashless/>.

Shezi, L, 2016. No more cash in taxis: Gauteng launches first-in-SA payment system. Hypertex. Accessed on 30th Dec. 2018 at: <https://www.htxt.co.za/2016/10/17/gauteng-cashless-taxi-payment>.

Techmoran, 2018. Uber tuk tuks launch in Dar es Salaam, Mombasa as uberPOA. Accessed on 22/04/2019 at: <https://techmoran.com/2018/09/20/uber-tuk-tuk-launch-in-dar-es-salaam-mombasa-as-uberpoa/>.

The New Times, 2018. How cashless bus fare payment system has helped public transport companies cut costs. Accessed on 18/02/2019 at: <https://www.newtimes.co.rw/section/read/227185>.

Venter, I, 2008. South Africa's taxi industry gets set for electronic fare revolution. Eng. News. Accessed on 30th Dec. 2018 at: www.engineeringnews.co.za/print-version/south-africasquos-taxi-industry-gets-set-for-electronic-fare-revolution-2008-03-28.