

Mobile2.0@BOP Series.

The need for an efficient bus and train ticket sale-and-purchase system in Sri Lanka: Possibilities for a Mobile2.0 solution

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1.0 Introduction

1.1 Background to Mobile2.0@BOP

How will the vast majority of the population in emerging Asia, defined as the Bottom of the Pyramid (BOP)², enter the world of knowledge, convenience and entertainment that are rapidly becoming available via the Internet? Will it be through common-use access points or multi-purpose telecentres at various locations in the cities and villages they live in, or will it be through the evolution of the mobile telephone already in their pockets or bags?

The answer to this question will become clear with time; and it may well be that the two options may be unequal complements rather than pure substitutes. While the old paradigm of the PC as the central interface option will have certain infrequent interactions with the BOP, it is very likely that the new paradigm will be the mobile phone enabled interface for frequent interaction. This new paradigm we describe as Mobile2.0@BOP.

Already there are numerous Mobile2.0 services emerging in the marketplace. For instance, in Sri Lanka, a plain vanilla knowledge services offered by Dialog Telekom and Govi Gnana Seva provides regular agriculture price updates.³ Here, spot [and forward] prices of over a hundred varieties of produce from three large markets can be obtained via the mobile phone for a nominal periodic payment to the operator. A slightly more complex convenience service that has been in existence for some time now is what is referred to as 'e-channeling' where a doctor's appointment can be obtained via the

² Here BOP is defined as those belonging to Socio-Economic Classification [SEC] groups of D and E [not A, B and C]. SEC classification is generally based on the occupation and education of the chief wage-earner in a household.

³ "Dialog tradenet-GGS partnership set to Revolutionize Agri market access",
<www.dialog.lk/news/dialog-tradenet-ggs-partnership-set-to-revolutionise-agri-market-access/>

mobile phone.⁴ Here, the user makes a payment comprising the doctor's fees, hospital channeling charges and the commission of the operator via the user's mobile phone bill. In reality, due to the lack of proper framework on mobile payments, the payment does not go from the user of the service to the hospital and the doctor; but rather from the operator to the hospital and the doctor, which is then recovered by the operator from the user. Finally, a typical entertainment service that is popular is voting in reality television programmes; Sirasa Super Star, Derana Dream Star, Swarnavahini Comedy Star etc. Here every vote by SMS attracts a premium charge and the revenue is shared between the operator and the television channel.⁵

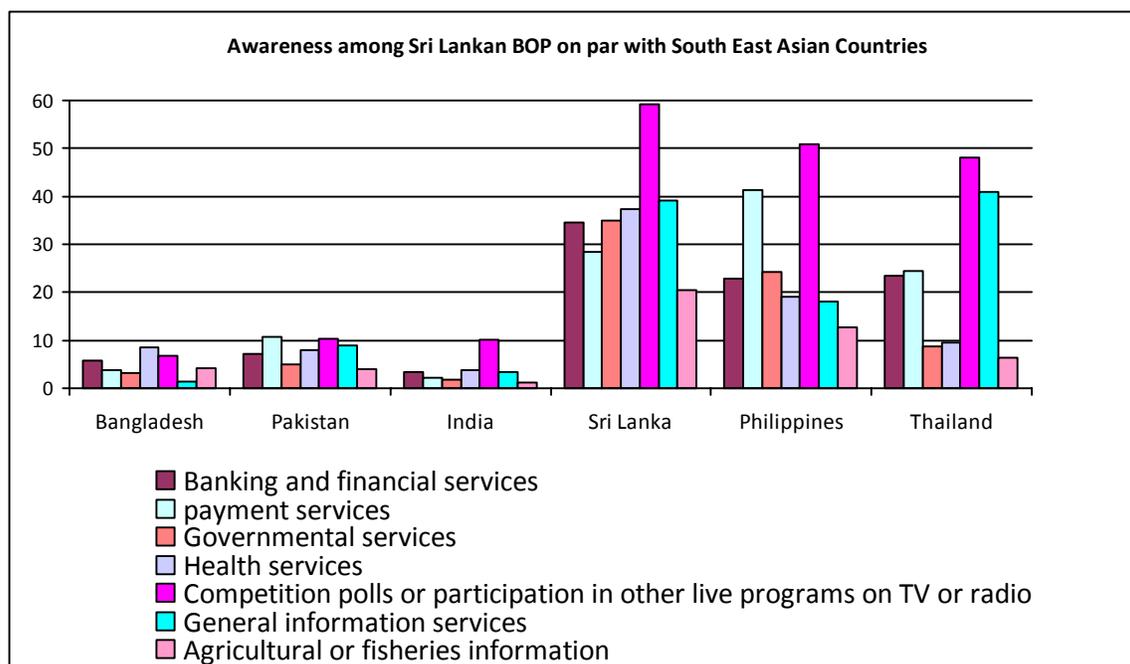
In a report on awareness and use of Mobile2.0 services, LIRNEasia (2009) provides some interesting comparisons among the BOP users of mobile phones; owners as well as non-owners, in six emerging Asian countries.⁶ As depicted in Figure 1.1, the awareness levels in India, Bangladesh and Pakistan are structurally lower than that in Sri Lanka, Philippines and Thailand across all services. The report indicates elsewhere that for Sri Lanka the difference of awareness between the owners and non-owners is insignificant indicating the ownership is not an important determinant of awareness.

⁴ What the press says about us. <<http://www.echannelling.com/EChannel/Press.htm>>

⁵ The revenue share details are not publicly known.

⁶ T@BOP3 is the third in a series of T@BOP studies of ICT [mainly mobile telephone] use at the 'bottom of the pyramid' in six emerging Asian countries conducted by LIRNEasia. The study has been conducted three times since 2005, the last of which [T@BOP3] was conducted in late 2008 and early 2009 among those who had used a telephone [not necessarily owned] in the three months prior to the research. The most recent study was conducted in Bangladesh, India, Pakistan, the Philippines, Sri Lanka and Thailand. For the purpose of the study, BOP was defined as the two lowest socioeconomic groups (SEC), D and E, with the exception of the Philippines, where only SEC group E was considered. Telecom users between the ages of 15 and 60, in rural and urban locations were studied. Quantitative as well as qualitative methods were used.

Figure 1.1: Awareness of Mobile2.0@BOP services



Source: http://lirneasia.net/wp-content/uploads/2008/04/TaBOP3-LK-JAIC-4Mar09_FINAL.pdf

The LIRNEasia (2009) report provides further information on the use of such services for the Sri Lanka BOP. As depicted in Figure 1.2, it was found that regular use of Mobile2.0 services at the BOP is very low.

Figure 1.2: Use of Mobile2.0 services at the BOP

	Use regularly	Use, but not regularly
Banking and financial services		2%
Payment services		3%
Government Services		2%
Health Services		8%
Voting, competitions, reality shows, etc	1%	5%
General information services		3%
Agricultural or fisheries information		1%

Source: http://lirneasia.net/wp-content/uploads/2008/04/TaBOP3-LK-JAIC-4Mar09_FINAL.pdf

The above findings indicate that adoption of Mobile2.0 services at the BOP is still very low. Is it because the users are satisfied with their current services and do not need Mobile2.0 services? Is it because they are not willing to try out innovations? Is it a social, demographic or cultural phenomenon? The questions are many but the answers are few. De Silva (2009), considering adoption of mobile telephones by the BOP in the six Asian countries aforementioned has found in that social influence; both social pressure and social benefits play a significant role in mobile phone adoption. An interesting finding therein is that besides the education level and some other demographics, the odds of adoption increases significantly with each member of the close network of one's contacts becoming an adopter. Will the adoption pattern of Mobile2.0 also be similar? Will it be the case that there will be 'group adoption' of such services? Once again, these are questions still without answers.

In this background of only some-awareness but very-low-adoption of Mobile2.0 services at the BOP, the Private Bus Operators Association of Sri Lanka has come forward with an initial proposal to introduce a possible a service for sale and purchase of bus tickets via mobile phones and/or customized electronic cards. Given that public transport is a several-times-a- day need for the majority of the BOP in Sri Lanka and elsewhere in the region, this study was undertaken to bring to the discussion table the multi-faceted issues that need to be considered prior to implementing the proposed service. It is expected that such a discussion among the stakeholders would lead towards considered decisions that would help avoid the pitfalls and facilitate the success of the proposed Mobile2.0@BOP service.

The rest of the paper is structured as follows. Section 2 provides a background to public transport in Sri Lanka which explains the current situation in bus and train travel in Sri Lanka. Then, an introduction is given to the ticket sales and purchase systems currently used. It is then discussed how Mobile2.0 services can be used to improve these ticketing systems. Also, it provides information on available electronic transport ticketing systems

and the possibility of using such a system in Sri Lanka. Section 3 discusses the results of a survey of bus and train commuters. The need for a more efficient ticket sale purchase mechanism, mobile phone usage and commuter preference are highlighted in this section as revealed by the survey. Section 4 contains a discussion on electronic ticketing systems focusing on contactless cards and mobile phones. This Section provides an overview of how Mobile2.0 can be used to improve the bus ticketing system in Sri Lanka and, finally, section 6 explains the challenges and policy issues along with a short section on concluding comments on the possibilities of a Mobile2.0 as a solution to improve the sale and purchase of bus and train tickets in Sri Lanka.

2.0 Public transport and ticketing systems

According to the Draft National Transport Policy [Draft Policy] document prepared by The Ministry of Transport in 2008⁷, public transport accounts for some three-fourths of the total motorized passenger transport in Sri Lanka. Such public transport is also the only means of transport for the majority of the population in the country. Out of this share of public transport, bus transport accounts for 93 percent, while just 7 percent is served by rail.⁸

2.1 Bus Transport

Bus transport is shared between the state owned bus services and private operators where the former accounts for one-third share and the latter two-thirds. The state owned service is offered by the Sri Lanka transport board [SLTB; better-known as Ceylon Transport board or CTB]. According to the Draft Policy (2008), the primary objective of the SLTB is to provide stability in the bus transport market and prevent any monopolistic behaviour on the part of private operators. It is to ensure such stability that the SLTB is always offered the first-refusal for 25 percent of the scheduled capacity on any route. The entity is expected to competitively increase its share in each route to around 40 percent over time. The data obtained from the SLTB indicate that some 2 million commuters travel daily in the country on approximately 5,500 CTB buses, each of which on average, operates 200km a day⁹. About 2,500 buses operate in cities as town services, while the rest are normal buses which stop at each halt between selected cities.

The private bus transport sector on the other hand is scattered with some 15,000 individual operators. It is noteworthy that even after almost thirty years in operation,

⁷ Ministry of Transport, Draft National Policy on Transport in Sri Lanka
<<http://www.ntc.gov.lk/pdf/Draft%20National%20Transport%20Policy.pdf>>

⁸ Ibid

⁹ SLTB Monthly report, September 2009

no large-scale private bus companies have emerged. In this background, it is estimated by the Lanka Private Bus Owners Association [LPBOA] that 10 million commuters travel daily on approximately 18,000 private buses currently in use in the country.

Given the reliance of bus transport for the majority of commuters in Sri Lanka, it is logical to assume that the BOP by and large dependent on busses for their regular transport.

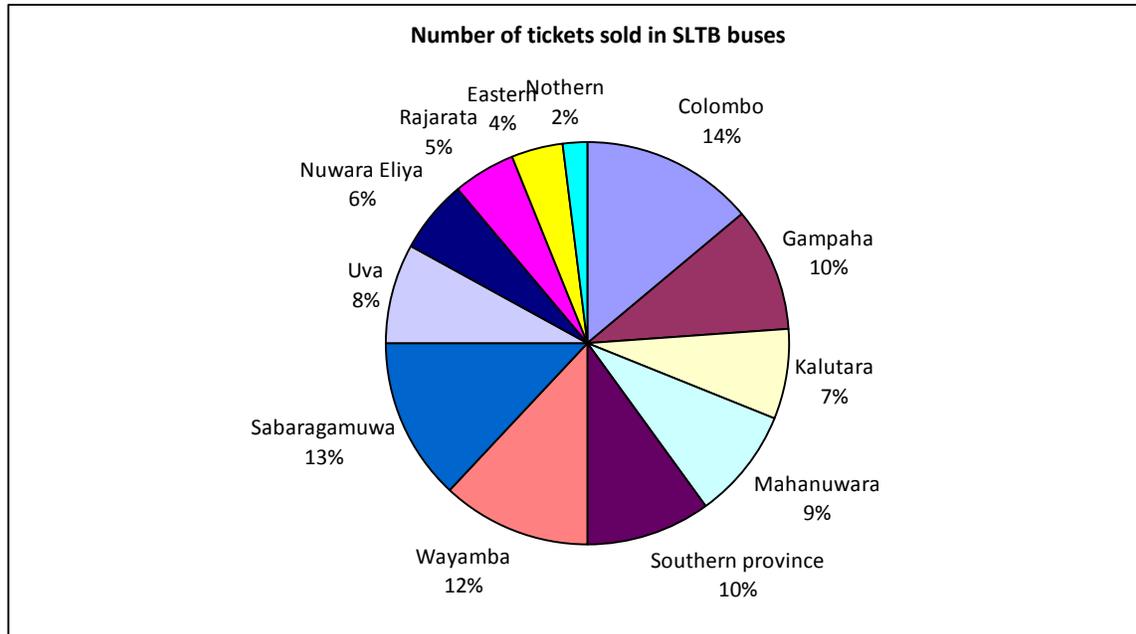
The bus that starts in the morning and the last bus at night are very important. A country needs to ensure that there is reliability in terms of these. The case in Sri Lanka is that there are so many buses running in the middle (day time) unnecessarily but not in the night.

As is the case with many a sector in Sri Lanka, the policy and the regulation of public transport fall across a number of ministries and agencies, usually with overlapping responsibilities leading to fragmented and uncoordinated action by the various parties. However, a redeeming feature is that the bus fares [tariffs] are regulated by the National Transport Commission [NTC] based on a pre-defined cost plus formula conforming to industry standards for minimum levels of quality. While the fairness of the formula has come under heavy criticism by private operators besides the way in which data are gathered to calculate the fare, the NTC has succeeded in effectively maintaining a stable fare regime for the most part. Current [January 2010] bus fares are based on the last revision on 22 September 2009; where the fare for the shortest distance, which is about 2km, is Rs.6.00 and the fare for the longest distance of about 260km is Rs.655.00 [Colombo to Akkareipattu].¹⁰

¹⁰ Annual Bus Fare Revision By the National Transport Commission, September 2009, <http://www.ntc.gov.lk/pdf/Bus_fare.pdf>

As depicted in Figure 2.1, most bus tickets are sold in the Western Province which includes the populous districts of Colombo, Kalutara and Gampaha.¹¹

Figure 2.1: Number of tickets sold in SLTB Buses



There were no data available on the tickets sold provincially by private buses. However, the private bus owners believe that about 5million commuters travel on private buses daily in the Western Province alone.¹²

2.2 The current bus ticketing system

SLTB buses use both ticket books and manual ticket machines to issue tickets to commuters. Private buses also did use book tickets and manual ticket machines until recently, but now are primarily on digital ticketing machines that print out tickets which are mainly used in the Western Province and on a few inter provincial buses. These new

¹¹ Discussions with Lanka Private Bus Owners Association

¹² Discussions with Lanka Private Bus Owners Association

digital machines have the capability to store and process data and thus provide the conductor with a number of important statistics at the end of the day. For instance, the number of tickets issued and the amount of money collected for each journey, the load factor and journey durations are some of the basic information generated. During the journey, these machines indicate to the conductor the number of passengers that ought to be getting off at each stop. Immaterial of the technique of issuing tickets to commuters, the transaction is done purely in cash [except monthly paid season tickets that are issued to school children, university students and government workers on a targeted subsidy].

Figure 2.2: Digital ticketing machine



Source: "Computerizing Bus transport in Sri Lanka", Undergraduate research, APIIT, 2009

Figure 2.3 Digital bus tickets



Figure 2.4 Book tickets



As commonly experienced in cash transactions that involve principals and agents, discrepancies on accounts between the SLTB or the private bus owners and the conductors [and sometimes also drivers] are said to be frequent.¹³ SLTB claims that 15 percent of bus fare collection is 'lost in transit'; while private bus operators claim their leakage is 25 percent of ticket revenue. This massive leakage, the private operators suggest, has kept them from actually making any worthwhile profits from the services

¹³ Discussions with President of LPBOA

they provide. In monetary terms, the daily revenue leakage from the SLTB and the private operators could be more than Rs.10 million.¹⁴

Upon inquiry, it was found out that this leakage, immaterial of SLTB or private, happens due to two reasons. One, the conductor just 'takes' a certain amount of money from the daily ticket revenue. This is estimated to be the primary cause for the leakage. Two, some commuters travel without purchasing tickets or travel for distances longer than entitled for the purchased ticket.

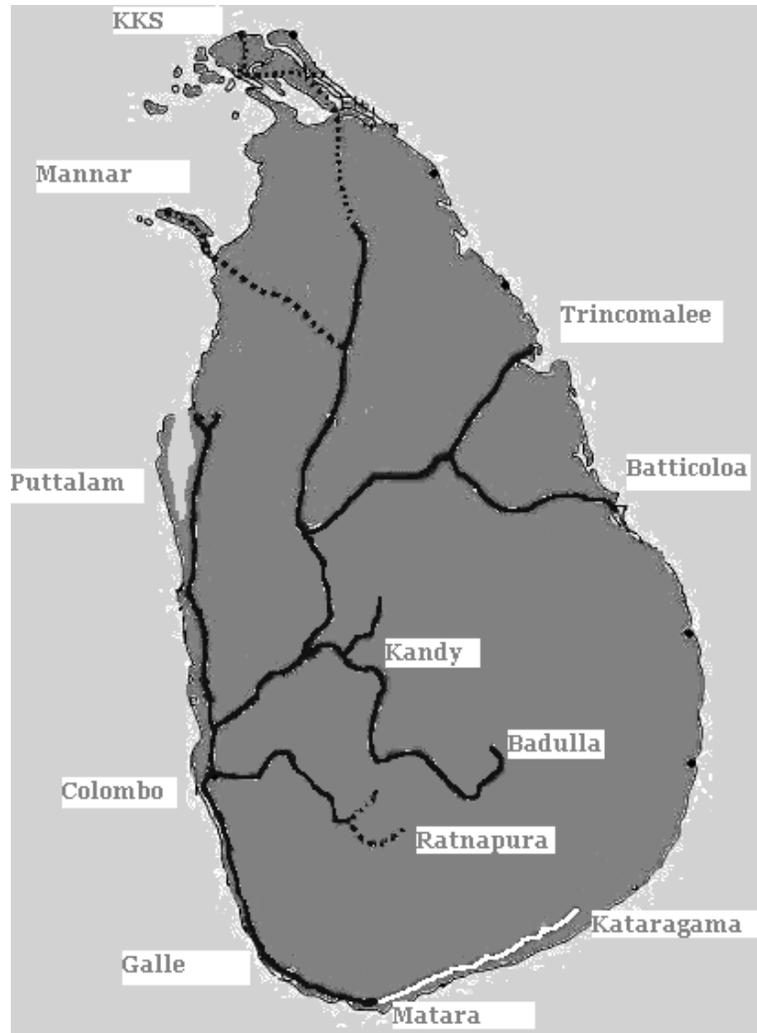
The other key ticket issue is that the book ticket issuing process is time consuming. This results in some passengers getting down from the bus even before purchasing a ticket. It was found that this happens especially when a large number of passengers get on to a bus at once. *"There is a train station at Dematagoda. When buses stop at the Dematagoda bus stop, a lot of train commuters get on to buses if a train has just passed by. Since about 30-40 people get on to the bus at once, the conductor is unable to issue tickets to all commuters resulting in commuters who travel short distance getting down without paying for the ticket"* claimed one of the operators with whom we discussed this issue. Petrol seems to be another leakage where the bus drivers and conductors in collusion siphon off diesel [or money for diesel]. Beyond the leakage in the ticketing process and fuel, it was found that government appointed agents who are placed at bus stands to keep to the time-tables [known as Time OICs] demand for bribes just to execute their task of scheduling orderly departures. Another I

¹⁴ Ibid

2.3 Railway

Sri Lanka's state owned railway began operations in the 1850s primarily to transport tea and coffee from the hill country to Colombo, but today, the railway is more of a passenger service reaching most of the island [except the southeast] from Colombo.

Figure 2.5: Railway network in Sri Lanka¹⁵



Source: <http://www.srilankanlocos.com/slmap.bmp>

However, the railway in Sri Lanka as a public enterprise is not a success. In fact, Sri Lanka Railway [SLR] has failed in its objective of becoming a passenger transport service with

¹⁵ Dotted line routes are currently not operational

just 7 percent of commuters using rail, and it has also failed in becoming a goods transport service with just 1 percent of freight being transported via rail.

Notwithstanding the commercial un-sustainability of the service, SLR operates two types of passenger trains to meet its 'social' obligations. One is the Inter-city train service that offers express service between main cities such as Colombo, Kandy and Vavuniya. The other, the normal Colombo commuter trains are not express trains. These trains stop at each train station till they reach the destination. Yet, there are some Colombo commuter trains which operate as semi-express trains. They stop only at a few selected stations. This service makes travelling easier for commuters regularly moving to and from Colombo.

2.3.1 Train ticket system

The SLR ticketing system is fraught with inefficiencies. For the most part each railway station has only a few ticket counters and purchasing a ticket is a time consuming exercise. Complaints abound that commuters miss their trains because they are not able to purchase tickets on time due to long queues especially during office hours. As in the case of State bus operators the ticket issuing system of SLR is primitive. The thick pre printed ticket issued after being validated by a manual machine by date stamping is an inconvenience to both the issuer and the user. At the same time, it is common knowledge that many commuters get on to the train without ever purchasing a ticket.¹⁶

The losses at SLR are primarily due to its structural inability to operate as a profitable or in the least a cost-recovery service provider due to a multitude of political reasons and interference that prevents it, inter alia, from pricing its tickets above cost. However, discussions with the senior management of SLR revealed that the management is indeed interested in at least reducing the losses even marginally if the ticketing system was made more efficient and ticket-less travel eliminated.

¹⁶ Discussions with train commuters at the Fort Railway Station

Figure 2.5 Railway season ticket



2.4 Need for a Mobile 2.0 service for ticketing services in busses and trains

It is clear from the foregoing discussion that the need for a more efficient ticketing system to reduce revenue losses is a priority for the supply side of the public transport sector; particularly busses, both SLTB and the 15,000 private operators. Given that the main reason for the revenue leakage is misappropriation of cash by the conductors in the process of issuing tickets to commuters and also the case of passengers riding without purchasing proper tickets, operators are looking for solutions that would help reduce this revenue loss.

It is in this context that the service providers; initially the private bus operators, are considering an 'e-bus ticketing system'. The initial plan is to consider either a contactless smart card and/or a mobile phone based solution.¹⁷ The logic is that by using cash-less ticketing systems the ability to siphon off cash does not exist. While such a fool-proof scenario may never become reality the implementation of a smart card and/or mobile phone solution would certainly reduce the leakage; thus the demand for a solution from the supply side party to the transaction. Given that bus transport accounts for 93 percent of public transport in Sri Lanka, the value of such a

¹⁷ Discussions with LPBOA

system would be significant not only to the operators but by extension to the commuters and the entire nation. The rationale being the producer [operator] and consumer [commuter] surplus generated by lowering transaction cost of the ticketing process by reducing the leakage would get redistributed between the participants of that transaction.

While the same rationale would apply to the rail transport in general the specific case of conductor cheating is not a factor in its leakage. The important reason is ticket-less travel and the hassle to purchase a ticket. Thus, the exact need for a system such as the one envisaged by the bus sector may or may not be relevant in the rail sector. Furthermore, it is noteworthy that SLR caters to only 7 percent of the public transport commuter population.

Besides the transaction cost argument, the e-bus or train ticket systems can have numerous other benefits to all stakeholders. For instance, it would actually cost less for commuters to purchase a ticket of a given amount due to the fact that currently balance amounts are sometimes not returned by the conductors. They could also plan their travel and purchase tickets in advance and better manage their transport expenditure among others. Bus or train operators could offer discounts for bulk purchases or they could enroll commuters to loyalty schemes. Bus and rail operators could combine tickets so that commuters could seamlessly switch between bus rides and train journeys. The State could also benefit, for instance, by using such a system to target subsidies; say to senior citizens or to school students etc. A fool-proof mechanism that allows for the subsidy to be provided to the user directly would create a significant opportunity for the State to reconsider the current inefficient subsidy structure that has become a heavy burden. However bus conductors and drivers could stifle the introduction of such a system as the incentives to participate is not in their favour; given the status quo. Thus the system must be well planned in that the additional revenue is shared with the bus two employees in an equitable manner.

2.5 The other side to the transaction

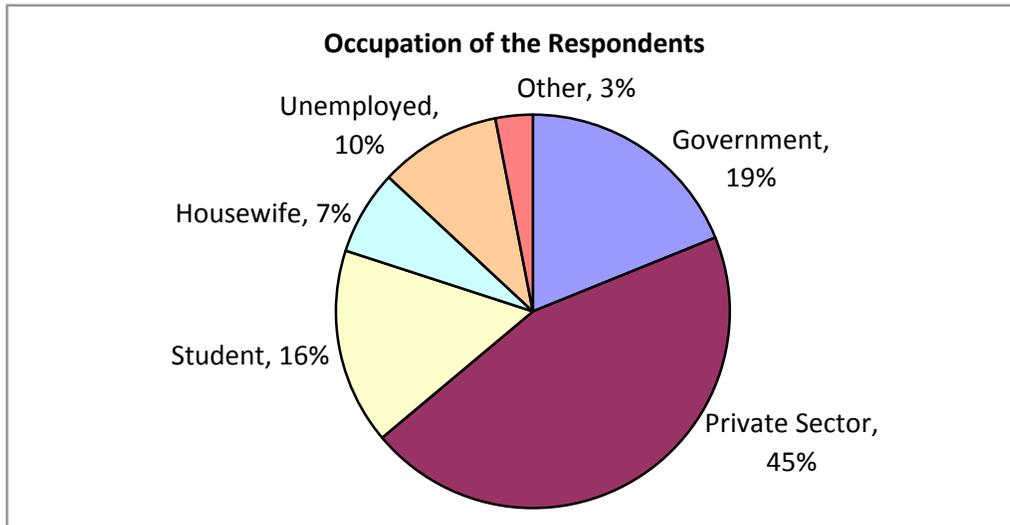
Given the clear financial benefits to the supply side to the ticket transaction, it is necessary to determine if similar benefits or perhaps other non-financial benefits exist in the demand side of the transaction too. The logic being an e-bus ticket system would only materialize and be sustained if both sides to the transaction would gain from the same. Therefore, in order to understand the demand side of the equation, a limited study among bus and rail commuters was undertaken. The results of this study are discussed hereunder.

3.0 Survey results

A simple quantitative survey was conducted among a purposive sample of 100 regular bus and train commuters in the morning hours of late December, 2009. The location for the survey, the central public transport hub in Sri Lanka; the Fort Railway Station, was selected to ensure a high number of regular bus and rail commuters from varied geographical locations. Once at the location, respondents were selected randomly with no formal selection criteria. The results, therefore, are not meant to be projected to the bus and rail commuter population in anyway but rather be used to get a sense of the perceptions of these commuters towards a possible Mobile2.0 service for bus tickets.

The respondents were made up of 63 males to 37 females. This is a reflection of the gender break down of the working population for the most part as the location served mostly for those employed and not students which would have been a different break. In terms of age, 32 percent were in the 21-25 group; 29 percent in the 26-40 group; 20 percent in the 41-55 group and a smaller 10 percent in the 15-20 age group.

Figure 3.1: Occupational distribution



The majority of commuters were found to work in the private sector with the rest in the public sector; again reflecting the distribution between formal/semi-formal private sector and the public sector. Apart from the employed persons the other large group of commuters was students. The reasons for travel in general corresponded to the patterns of employment of life status of the respondents.

In terms of travel modes, it was found that, of the commuters surveyed, 71 percent traveled by bus as well as train and 29 percent traveled only by bus. There were no commuters who traveled only by train which is not surprising.

Figure 3.2: Distances traveled by commuters

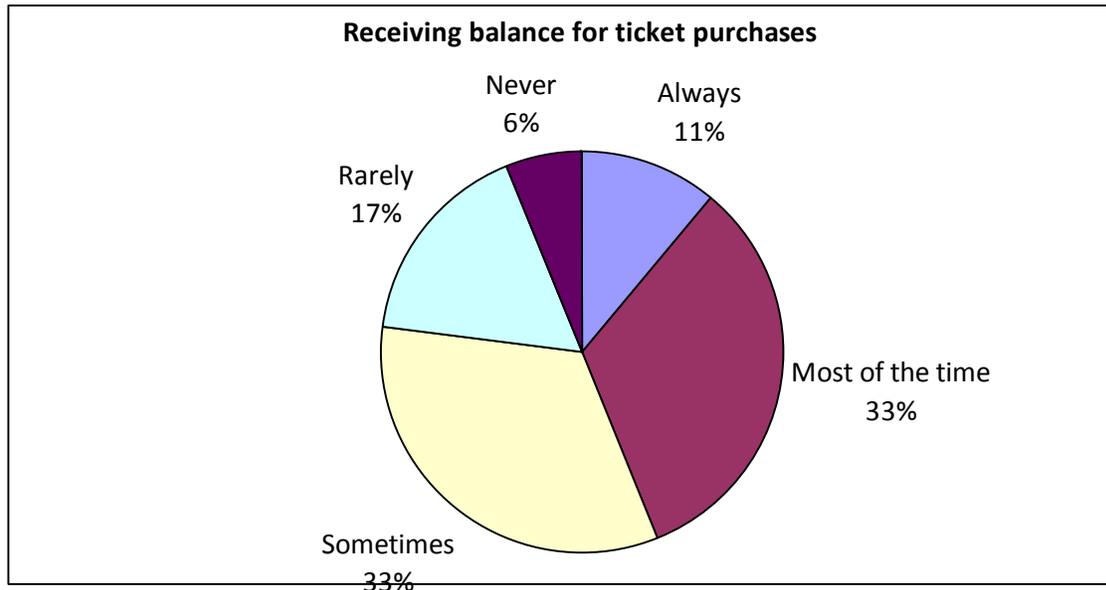


Of those commuters who traveled by bus, it was found that 42 percent traveled more than 10kms a day, while 40 percent travelled between 2kms and 10kms and only 8 percent traveled short distances of less than 2kms a day. Perhaps, given the location bias, the sample could have had a larger share of longer-distance travelers than it would have been a purely random sample.

3.1 The ticketing system

A problem which is often spoken about bus travel is that of commuters not receiving their balance money after paying for a ticket. The survey confirmed the existence of this problem. Only a small share, of just over one tenth of the commuters surveyed, stated that they receive the balance for ticket purchases as a general experience.

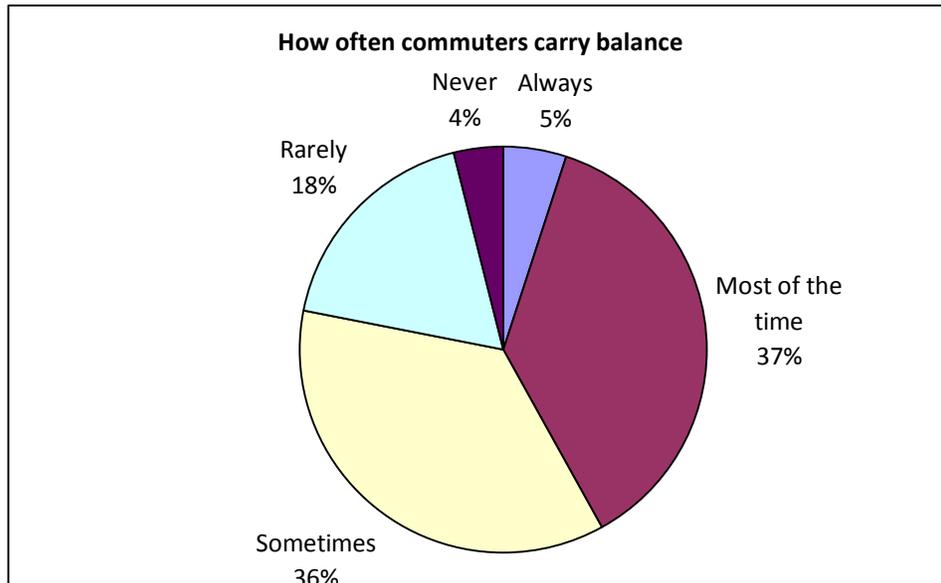
Figure 3.3: Receiving balance for ticket purchases



Is it that the conductors are 'playing out' the commuters or is it that they are genuinely unable to give balance due to an adequate supply of change coins. Perhaps it could be due to both, since there have been many complaints about shortages of coins in the market. The survey found that most of the commuters find it difficult to carry exact change with them on every ride and pay for the ticket with notes. But, when conductors are unable to give the balance to commuters and it keeps happening everyday, commuters become frustrated.

On the other hand, do passengers always carry low valued coins with them? Not surprisingly we found that for the most part they do not as depicted in Figure 3.4.

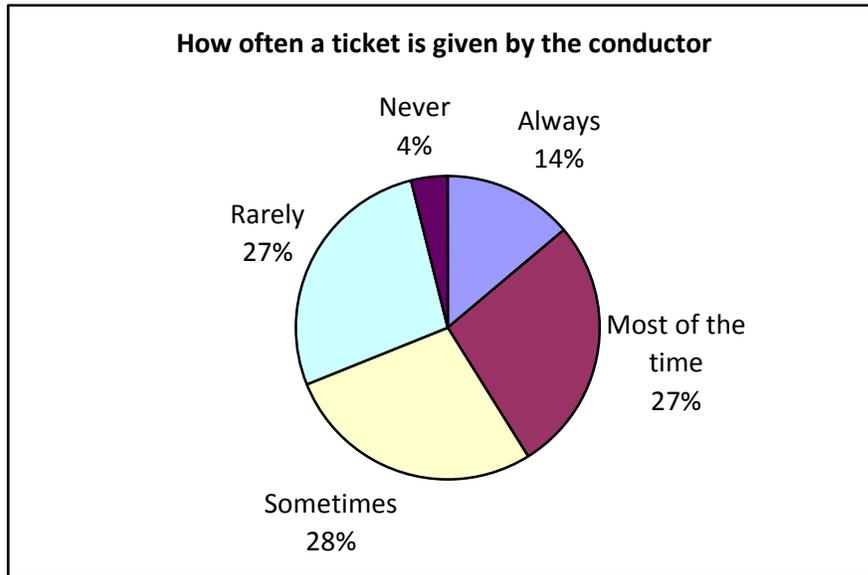
Figure 3.4: How often commuters carry balance



Then, the failure to carry small coins amounts to implicitly legitimizing the transaction which has not been properly completed. Paying for the bus ticket is only part of the transaction. The other part is physically obtaining a ticket or receipt. It was quite surprising to find that only 14 percent of the respondents saying that conductors would always provide the commuter with a ticket for the money given. 28 percent said that conductors sometimes give tickets; another 27 percent said that they rarely give tickets and 4 percent said they never do.

In this context, the argument of the private bus operators of a 25 percent leakage in ticket revenue definitely seems to hold water justifying the supply-side need for a more fool-proof system of collecting, and preserving, collected revenue.

Figure 3.5: How often a ticket is given by the conductor



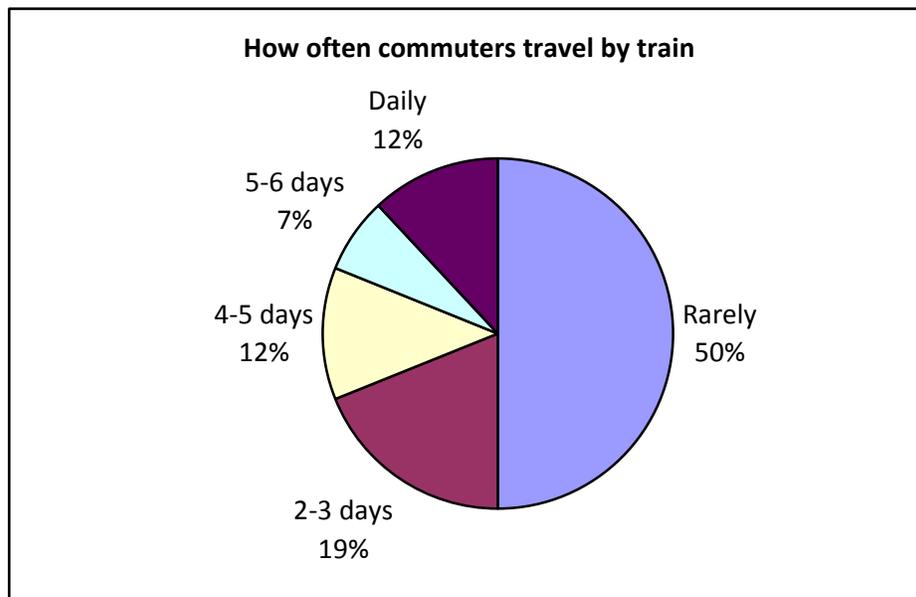
Ironically, the survey found that only a half normally asks for a ticket when the conductor does not issue one, but the other half accepts it as a fact and does not make a request for same. It was the commuters' view that, given that no surprise checks are normally carried out during the journey, there was no real need to actually have a piece of paper as a ticket. This situation then fuels cheating by some passengers. Why pay at all? The survey found that a fifth travel without a ticket at least sometimes. Adding the revenue leakage due to ticket-less travel to that of no tickets being issued for the revenue collected, the need for a better and more efficient revenue collection mechanism becomes even greater.

In terms of regular travelers, the survey found only 11 percent having purchased season tickets; paper passes that 'stores' value for a month in that every time a ride is taken a box is checked. Even here, if the box is not checked, one could use the pass for more than the stipulated occasions. However, these passes are only available with the SLTB.

3.2 Train travel

Of those who traveled by train, the survey found 71 percent also traveled by train. It was found that two-thirds of the train commuters travel more than 10kms a day, while a fifth less than 10kms. The reason for the high level of combined bus-rail travel as opposed to the national figures of only 7 percent, rail travel is the location of the survey being at the Fort Railway Station. However, as depicted in Figure 3.6, a half of even these Fort Railway Station commuters rarely travel by train, with only a less than a third travel up to 5 days a week by train. This group matched exactly with those who said that they travel by train to work as opposed to other purposes.

Figure 3.6: Frequency of train travel



Thus, it is important to note that there is a particular group of people who use both types of public transport and there exists possibilities to develop an efficient and fool-proof solution for them. Given they are office workers for the most part numerous schemes of paying allowances for their transport etc. may be worked out.

In terms of expenditure for the train, the survey found that a quarter of the commuters spend more than Rs.100 on train travel daily. Compared to bus commuters, a very few

train commuters said that they travel without purchasing train tickets. Only 9 percent of all train commuters said that they have traveled without purchasing a ticket. However, even they said that they had to do so because of the inefficiency of issuing tickets; as an adequate amount of ticket counters were not available and, while standing in long queues, sometimes they miss the train. To avoid this, they sometimes board the train without purchasing a ticket. It is noteworthy, however, that the SLR has in place a security service to apprehend those engaging in ticket-less travel which might be a damper for ticketless travel.¹⁸

3.3 Need for a more efficient ticket sale-and-purchase mechanism

Given the discussion thus far, it is apparent that there exists a need for a more efficient ticket sale-and-purchase mechanism. On the one hand, the serious revenue-leakage argument of the operators was corroborated by the commuters; there seems to be a significant amount of cash that is 'lost' between the passenger and the operator in the event the passenger actually pays for her travel. On the other, there seems to be an 'inconvenience' factor from the commuters' perspective; particularly the need for exact change if not to over-pay for the ticket, the time taken to 'write out' a ticket in the SLTB bus and the long lines in purchasing the ticket for trains. In this context, a possible Mobile2.0 solution becomes appealing to both parties to the transaction, operators as well as commuters. The next section considers the use of mobile telephones by the group surveyed in order to assess if the basic infrastructure is in place to even consider a possible service.

¹⁸ 'Over 100 ticketless train commuters nabbed', <www.slrfc.org/2009/06/30/over-100-ticketless-train-commuters-nabbed>

3.4 Mobile phone usage

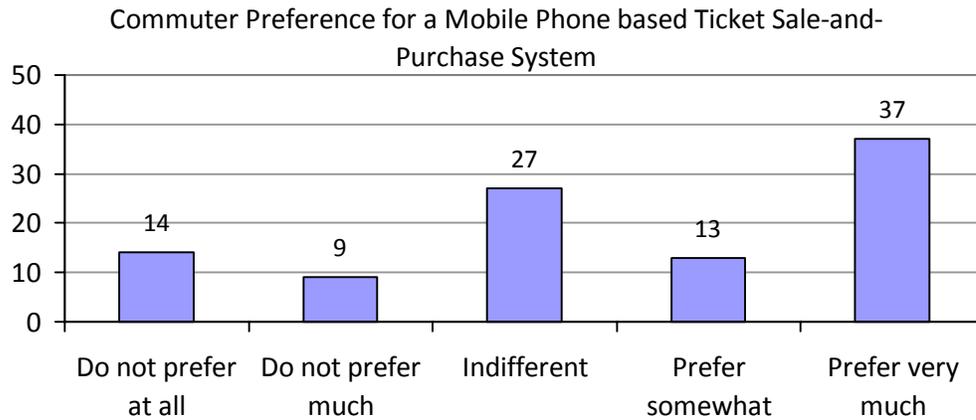
Encouragingly, it was found that 78 percent of the commuters surveyed owned a mobile phone. It is not that the others did not use mobile phones, but only did not own one. Given the objective was to determine if a possible Mobile2.0 solution for purchasing bus and rail tickets could be introduced, the research focused only on these owners. Of the phones owned, 94 percent was their personal instruments, while the remaining 6 percent was owned by the organization they had been employed, but for their exclusive use. Dialog Telekom had a share of 56 percent, Mobitel 35 percent and Tigo 9 percent in the group. There was also an overlap of 3 percent between Dialog and Mobitel, in that, this group used SIM cards from both operators at the same time.

3.5 Commuter preference

Commuters in general were confused as to how mobile phones could be used to improve the current ticket sale-and-purchase system. None of them were able to articulate how such a system could work. However, a few mentioned that booking tickets in advance via SMS would be convenient. This comfort is probably because of the knowledge of the operation of e-channeling service in which doctors' appointments could be obtained, including payment, via mobile phones.

Having explained to the respondents that it is possible to use a mobile telephone to purchase tickets by transferring credit from the phone to the bus conductor's ticket machine, they were asked to express opinion whether such a system would appeal to them or not. The results, as shown in Figure 3.7, indicate that there is no overwhelming preference for such a service. Only 37 percent said that they would very much prefer to have such a service instead of having to pay cash.

Figure 3.7: Commuter preferences for a mobile phone solution



One such reason for this response could be that the BOP in Sri Lanka uses the mobile phone for limited purposes. LIRNEasia (2009) found that except for making and receiving calls and 'missed calls' and to an extent sending and receiving SMS and checking balances, the instrument was not used for numerous other possible services, given the level of sophistication of the phone. The findings are given in Figure 3.8.

Figure 3.8: What the BOP does with mobile phones

What the BOP does with mobile phones	Bangladesh	Pakistan	India	Sri Lanka	Philippines	Thailand
	%	%	%	%	%	%
Taking phone calls	99.8	100.0	99.0	100.0	88.8	99.8
Receiving phone calls	99.9	99.5	98.2	100.0	99.0	100.0
Sending/receiving missed calls / beeps/ flashes / ring-cuts	94.2	84.1	83.7	72.7	86.0	38.8
Sending/receiving SMS	32.4	46.8	32.6	52.5	99.8	52.6
Sending/receiving MMS	0.9	3.8	3.5	5.6	12.9	3.7
Sending/receiving emails	0.1	0.3	0.7	0.0	0.2	1.1
Browsing the Internet	0.2	1.0	0.7	2.0	0.0	2.4
Taking photos /video clips	4.0	2.5	0.9	8.1	3.7	18.3
To play games by myself	12.6	18.3	7.3	21.4	13.7	17.3
To play games with others	1.1	1.5	1.0	1.3	2.7	0.6
To listen to the radio	0.4	6.6	3.5	12.4	5.3	22.3
To listen to music	3.6	4.6	2.6	6.9	3.1	22.2
To share content that you have created	0.9	2.1	2.0	5.9	4.6	3.1
To send or receive or download or upload other content	0.2	1.6	2.6	8.4	10.4	8.6

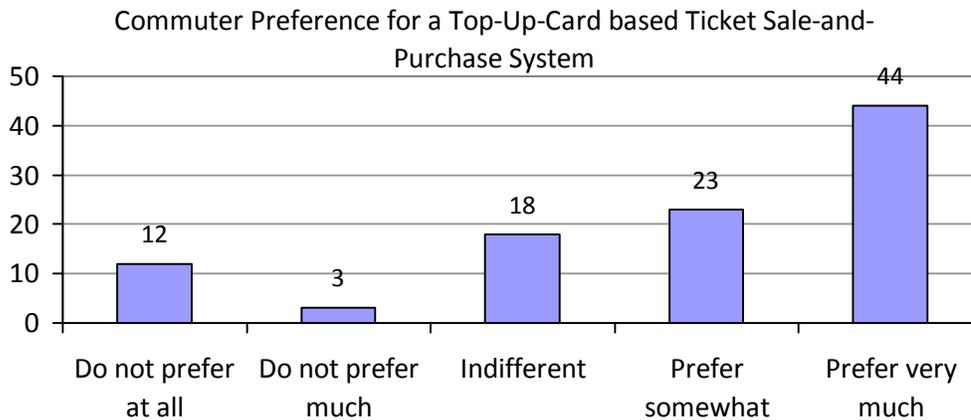
As an organizer	0.8	6.6	8.4	3.6	9.2	13.6
To check my bill / credit balance	10.6	40.2	24.8	50.4	2.9	38.7
Sending/receiving talk-time/load	8.4	34.7	6.8	3.1	24.1	6.3

Source: http://lirneasia.net/wp-content/uploads/2008/04/TaBOP3-LK-JAIC-4Mar09_FINAL.pdf

Another reason could be the speed at which an SMS based ticket sale and purchase transaction could take place. In the context of people getting in to a crowded bus, to type and send an SMS and wait for the same to be received by the conductor that might take up to 10 seconds would be a prohibitively long time.

They were then asked, if an e-reload card or a top-up card that could be swiped by the conductor were to be introduced instead of the current cash only system, how they might react to such a service. This service was considered more appropriate than a mobile phone solution by the respondents as revealed in Figure 3.9

Figure 3.9: Commuter Preferences for a top-up-card solution



Besides the perceived quickness of the transaction, compared to the earlier SMS transaction, another reason for this appeal for an e-card could be the level of familiarity of such mechanisms even now. For instance, LIRNEasia (2009) found that at the BOP in Sri Lanka 78 percent use e-reloads to top-up value in the pre-paid phones [among multiple methods].

4.0 Electronic ticketing systems

There are different types of technologies in use today to make public transport systems efficient. These technologies can be mainly divided in to two. They are [a] contactless smart cards and [b] mobile telephones.

4.1 Contactless cards

A contactless card is typically a smart-card that has an embedded integrated circuit which can process and store data. This means that a contactless card can receive input that can be processed and delivered as an output via radio frequencies. These cards require only close proximity to an antenna to complete the transaction. They are often used when transactions must be processed quickly or hands-free, typically in public transport [in the case of hands-free if no conductor on board but only a driver] where the contactless card can be used without even removing it from a wallet.¹⁹

For this reason such cards are becoming increasingly popular for bus and train ticketing services around the world. Very simply, commuters can purchase a designated card that can be reloaded with monetary value as and when required. This card can then be used on buses and/or trains to pay the travel fare; the ticket.

Such contact-less card systems are becoming popular across the world. Perhaps the most widely known contactless card is Hong Kong's Octopus Card. Launched in September 1997 to collect fares for the territory's Mass Transit Railway the Octopus card system was the first contactless card system in the world.²⁰ Octopus has since grown into a widely used payment system for virtually all public transport in Hong Kong plus for all parking meters. It is also accepted in numerous convenience stores, service stations, vending machines and supermarkets.²¹ Many other countries also use such

¹⁹ Smart Cards, <<http://ewh.ieee.org/r10/bombay/news5/SmartCards.htm>>

²⁰ Octopus cards, www.octopus.com.hk

²¹ Ibid

contactless cards in their public transportation sector from South Korea to UK to Mexico to Finland and more.²² India may become the latest country to introduce such a contactless card system for public buses. It has been revealed by the Delhi Transport Corporation that a pilot service had been tried out in November, 2009 using some 5,000 such cards and it had been a 'tremendous success'.²³ The card appears to be designed specially for the BOP where a card may be purchased for a mere INR 25 [USD 0.54] and topped-up at selected bus stations. Assuming similar leakages in the Indian public transport system as in the case of Sri Lanka and given the enormous size of the Indian market, the economic efficiencies that could be generated if this system becomes successful will be very significant.

4.2 Mobile phones

Primarily there are two methods to make payments using mobile telephones; SMS enabled payments and Near Field Communication [NFC].²⁴ The former method can be completed by just about any handset today by simply typing an SMS and sending it to a designated phone number; as perceived by the survey respondents. The latter is more complex from a technology perspective. In technical terms NFC is a standards-based, short-range wireless connectivity technology that enables simple and safe two-way interactions between electronic devices.²⁵ In this context, one has to bring the handset just near a receiving terminal which then allows the mobile-phone-to-terminal transaction. Here data pertaining to the ticketing transaction; say monetary value available, the routes authorized, the regular route etc., is uploaded and stored in a 'tag' inside the phone. Once the mobile phone is brought within a certain distance to a

²² 'Breakthroughs in the European Mobile Payments Market' Conference Call and White Paper Launch, 6th July 2007, <http://www.atosorigin.com/NR/rdonlyres/5D50EDC1-4E05-4FFA-A62F-75ECC14865D9/0/wp_mobile_payment.pdf>

²³ India's Delhi May Launch Contactless Card System for Buses, <<http://www.paymentssource.com/news/Dehli-india-smart-card-automated-fare-collection-system-3000500-1.html>>

²⁴ "Mobile Commerce - Pay Using Your Cell Phone: Fact or Fiction?", <<http://www.1800mobiles.com/mobile-commerce.html>>

²⁵ Near Field Communication, <www.arrownac.com/services-tools/design/whitepapers/near_field_communication.pdf>

'reader', it can access the information stored in the tag via its Radio-Frequency Identification [RFID] capability. Thus, a mobile phone equipped with NFC technology can very easily be used to purchase a bus or train ticket similar to a contactless card. This is the merging of the mobile phone and the smart card that can create tremendous new opportunities for the future of Mobile2.0.

Figure 4.1: NFC Handset



Source: NFC; arrownac.com/services-tools/design/whitepapers/near_field_communication.pdf

While the logic is the same, NFC technology is more advanced than the contactless card technology because the communication between the reader and the tag can be two-way instead of just one-way in the contactless card.²⁶ It is possible in the context of the ticket transaction for the mobile phone can have a 'conversation' with the reader, for instance, instead of automatically debiting the value of the ticket from the phone when it is brought near the ticket reader device it could 'tell' the reader that a request for debit has been made. The reader will have to wait until the owner of the phone enters a password or just presses a pre-defined button on the keypad if such an instruction has been given. Then, the reader could keep the connection open until the password is typed for the transaction to go through.²⁷ Immediately, the transaction becomes much

²⁶ Ibid

²⁷ Ibid

more secure than a simple contactless card where 'money can be sucked out of pocket' without the owners knowledge.

In terms of practical application of the theory, Nokia had launched the world first NFC enabled mobile phone [Nokia 3220] in early 2005 and in 2007 launched the world's first fully integrated NFC phone [Nokia 6131].²⁸ Thereafter, several other equipment manufacturers have come on board and now a wide choice of NFC enabled handsets are available.

Having the technical capability, public transport ticketing applications using NFC mobile phones, both pilots and operational, appear to be fast gathering momentum. Japan appears to be the leader with an increasing number of bus companies setting up ticketing systems using NTT DoComo Osaifu-Keitai e-wallet phones.²⁹ Passengers pay their fares by simply waving a handset in front of a dedicated terminal installed in the bus. In Spain, Netherlands, France and Germany, mobile bus and rail ticket system are being piloted based on the same technology.^{30 31 32} China has started to incorporate NFC mobile ticketing applications in city transportation in Shanghai after research [by AC Nielsen] had shown that over 80 percent of consumers were interested in the functional integration of public transportation cards and bank payment cards with the mobile phone.³³ UK has announced that by 2015 passengers on public transport in England's major urban areas will be able to travel without a paper ticket and the UK Department

²⁸ Nokia White paper, "Near Field Communication",
<http://www.nokia.com/NOKIA_COM_1/Press/Materials/White_Papers/pdf_files/White%20paper_Nokia_Near%20field%20communication.pdf>

²⁹ Mobility, Docomo newsletter, "Mobile market targets corporate customers"
<<http://www.nttdocomo.com/features/mobility10.html>>

³⁰ NFC Bus ticketing trial to take place in Madrid",
www.nearfieldcommunicationsworld.com/2010/02/12/32732/nfc-bus-ticketing-trial-to-take-place-in-madrid/

³¹ Vodafone tests NFC with Spanish railway operator
<www.nearfieldcommunicationsworld.com/2009/12/03/32445/vodafone-tests-nfc-with-spanish-railway-operator/>

³² www.atosorigin.com/NR/ronlyres/5D50EDC1-4E05-4FFA-A62F-75ECC14865D9/0/wp_mobile_payment.pdf

for Transport is expecting to switch to NFC-compatible ticketing systems across the UK by 2020.³⁴

While major activity around NFC technology is taking place around the world, China Telecom has started trialing non-NFC standard RF SIM technology.³⁵ The new SIMs, which incorporates both a payments chip and a contactless antenna, are said to be widely available and could be purchased for a small one-off fee [USD 22]. Subscribers can simply replace their existing SIM with the new RF SIM and instantly begin to use their existing phone to make payments at the point of sale including in public transport.³⁶

Besides the instant payment via NFC mobile phones [or perhaps the new Chinese alternative], there are several other simpler SMS based m-ticket solutions that the respondents to the survey conducted by this research and quoted above have perceived as viable options. These are in reality more suited for ticket reservations and payment in advance and not for on-board transactions. A typical example is the system adopted by Go North East, a bus company in the UK. Go North East has claimed to be the first in the UK to offer commuters the ability to buy tickets using mobile phones.³⁷ By texting "txt2go" to a dedicated number, passengers can receive digital tickets on their mobile phone minutes later. Payment can simply be added to the monthly bill or deducted from the existing pre-paid value. The phone screen displaying the ticket information can then be shown to the driver when boarding the bus.³⁸

³³ "Nokia Launches China's first NFC Mobile Payment Trial in Xiamen",
<http://press.nokia.com/PR/200606/1060346_5.html>

³⁴ "UK government to fund switch to NFC-compatible transport ticketing",
<www.nearfieldcommunicationsworld.com/.../uk-government-to-fund-switch-to-nfc-compatible-transport-ticketing/>

³⁵ "China Telecom begins RF SIM trial",
<www.nearfieldcommunicationsworld.com/2010/02/11/32685/china-telecom-begins-rf-sim-trial/>

³⁶ Ibid

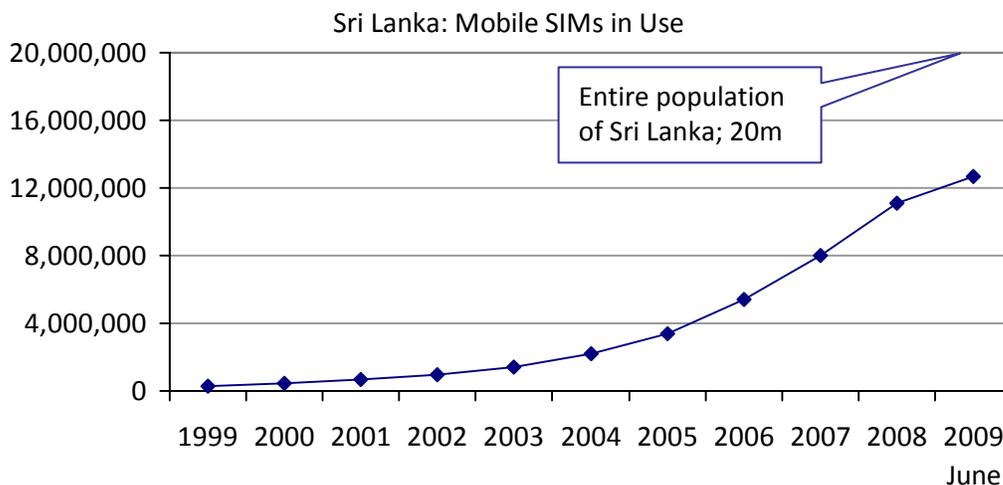
³⁷ "Breakthroughs in the European Mobile payments market", White paper, <[Arriva - www.arrivabus.co.uk/m-ticket/](http://www.arrivabus.co.uk/m-ticket/)>

³⁸ Ibid.

4.3 Use of Mobile2.0 applications: Mobile money transactions in Sri Lanka

Given the theoretical possibility and practical applicability of a possible Mobile2.0 service for bus [and also train] ticketing system, the next question is whether such a service would be feasible in Sri Lanka. The adoption of mobile telephony in Sri Lanka has been nothing but remarkable in the last several years. With close to 13 million mobile SIMs now in use³⁹ and average revenue per user [ARPU] falling dramatically, operators are beginning to introduce Mobile2.0 applications in order to slow down the falling revenues per user or in the best case to change direction.

Figure 4.2: Sri Lanka: Mobile SIMs in Use

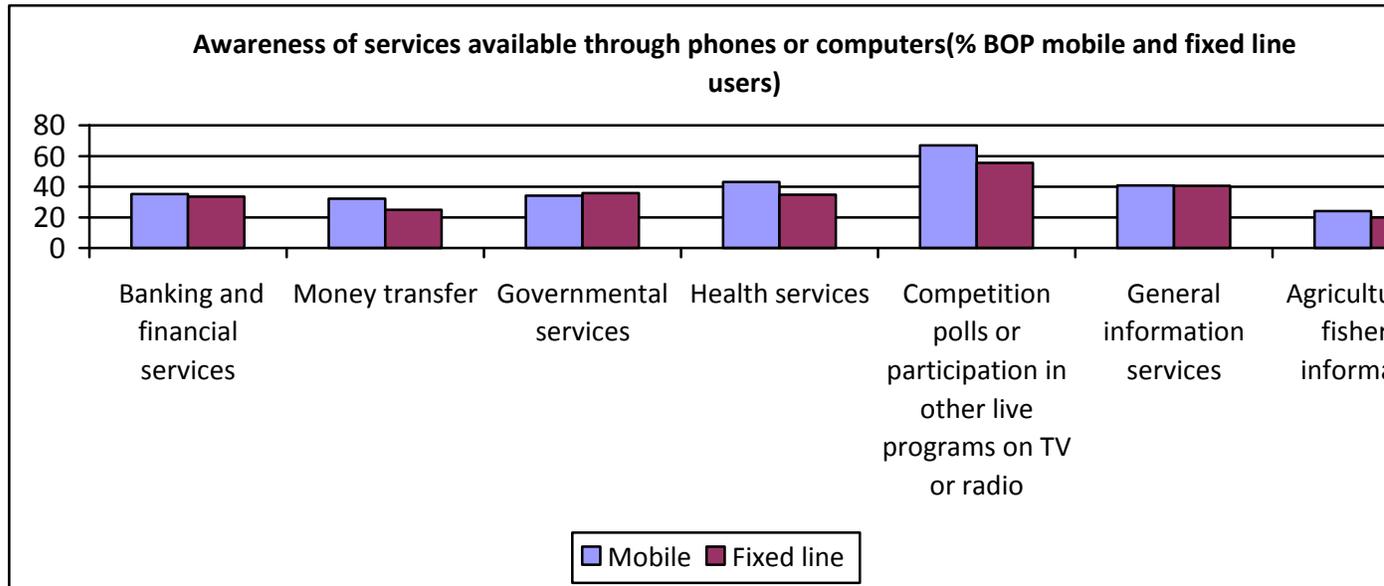


Source: www.trc.lk

LIRNREasia (2009) provides a snapshot of the ownership of mobile phones among the BOP in Sri Lanka as at the third quarter of 2008. 36 percent of the BOP owned a mobile phone, while another 37 percent owned a fixed [including CDMA] phone. However, of the mobile phone owners, 16 percent had more than one active SIM. In terms of awareness of Mobile2.0 services, the study found the BOP had only limited knowledge of available services as seen in Figure 4.3

³⁹ www.trc.gov.lk/information/statistics.html

Figure 4.3: Awareness of value-added-services available through phone



Source: http://lirneasia.net/wp-content/uploads/2008/04/TaBOP3-LK-JAIC-4Mar09_FINAL.pdf

The highest awareness is on voting or polling; particularly on reality shows on television followed by health services, the earlier mentioned doctor-channeling service. A similar service whereby movie tickets could be purchased via mobile phones also exists, but its usage is said to be very limited. Recently, a service to provide spot and forward prices of agricultural produce, without any transaction capability though, was launched by Dialog Telekom and Govi Gnana Seva [GGS] based on either push or pull mode depending on the needs of the user.⁴⁰

In terms of payment services, the study found that, while just under 40 percent was aware of the ability to make payments via the mobile phone, only 3 percent were using such services and that too, not on a regular basis. The primary reason attributed by those who were aware of the existence but were not using the service was the belief

⁴⁰ Dialog Tradenet- GGS partnership set to Revolutionize Agri Market Business
www.dialog.lk/news/dialog-tradenet-ggs-partnership-set-to-revolutionise-agri-market-access/

that the applications were not applicable to them as opposed to not knowing how to use them.⁴¹

Besides person-to-person transfers of credit in lieu of monetary payments which seem to be fairly commonplace at least for the purpose of purchasing talk-time⁴², there are a few dedicated payment systems available in the market in Sri Lanka. eZ Pay by Dialog Telekom is one such system; in fact the first m-commerce service as claimed by the Operator.⁴³ This is essentially a virtual card that facilitates purchases of goods and services at eZ Pay accepting merchants by transferring money to them via the mobile phone from existing accounts at NDB Bank and Seylan Bank. Besides such over-the-counter transactions, eZ Pay can also be used to settle Dialog Telekom mobile phone bills and utilities bills. Even though the service was launched in mid 2007, its growth appears to be slow.⁴⁴ Besides eZ Pay, in 2008, Bank of Ceylon announced a payment system tied up with Indian mobile commerce firm PayMate to start an SMS based mobile payment system.⁴⁵ The service was to begin at several large stores and subsequently move in to small retail outlets with the bank promising to provide point-of-sale terminals necessary for the transaction to be completed.⁴⁶ However, there is hardly any news generated on this service and it is difficult to say to what extent the application has been successful. PayMate claims to have partnered with a 'bus transport service providers association' and the Bank of Ceylon to offer unspecified

⁴¹ LIRNEasia (2009)

⁴² IMFTI Working Paper on Mobile Finance and Consumption Smoothing among the Poor with Irregular Income Streams: Case of Sri Lanka

⁴³ 'eZ pay', <www.dialog.lk/personal/mobile/features-and-vas/mobile-credit/ezpay/>

⁴⁴ No data is available to prove that the service growth is actually slow, but market talk is that if the growth was good more acquisition merchants would be enrolled; more people would be talking about the services etc.

⁴⁵ 'Paymate',

<www.lankabusinessonline.com/fullstory.php%3Fnid%3D2074734161+paymate+lanka+Bank+of+Ceylon&cd=4&hl=en&ct=clnk&gl=lk>

⁴⁶ 'When Mobile=Wallet', <http://voicendata.ciol.com/content/service_provider/109100102.asp>

services; however our research did not find any mobile payment scheme in transport services in existence in Sri Lanka.⁴⁷

Another quasi-payment service is Dialog Star Points system; a loyalty program. This is a straight forward and widely used scheme where one could purchase products or services from authorized dealers using Star Points which are collected based on one's expenditure on specified services including the mobile service.⁴⁸

5.0 Mobile2.0 to improve the bus ticketing system in Sri Lanka

Is there a need for a Mobile2.0 service in public transportation in Sri Lanka and are the conditions conducive to launch such a service? The answer to this question and the identification of bottlenecks, both technology and policy, are discussed in this section.

First, the need. The significant revenue-leakage from the current cash based ticketing system, identified by the operators and corroborated by the commuter survey, is ample evidence to establish the need from the operator side for a more secure mechanism for revenue collection without which they are in constant difficulty in terms of viability. The resulting increase in transaction costs and thereby the cost of operation reflecting in higher than otherwise ticket fare is obviously not the ideal situation for the commuter. Add to that, the difficulty in carrying exact change, not being provided with a receipt [physical ticket] for the fare paid, unacceptable overcrowding⁴⁹, long queues and other hassles are all negatives of the current system. Furthermore, from the perspective of the Government, a more efficient mechanism to allocate the transport subsidy to the user by being able to target pre-determined groups instead of the current supplier driven programme would be a major benefit in terms of budget allocations and

⁴⁷ Ibid

⁴⁸ Dialog Loyalty,< <http://wiki.dialog.lk/Loyalty>>

⁴⁹ Our discussions indicated that unacceptable overcrowding is sometimes due to the conductor needing to meet minimum collections packing the bus to make his 'extra' amount from unaccounted for passengers.

management. Therefore, in all, there is a multi-faceted need for a better system for the sale-and-purchase of tickets for the use of public transportation in Sri Lanka.

Next, what kind of service would be the ideal? This is a complex problem and a function of numerous variables that together determine the market supply and the demand along with regulatory, legal and other policy that together forms the business environment for the success of such a service.

In principle, there are two groups of services as previously explained; contactless cards and mobile phone based solutions. From the operators' perspective of reducing fraud by eliminating the leakage of cash at the conductor interface, the difference between contactless cards and mobile solution would not be very significant. As long as no cash is exchanged, in the ideal case, the possibility for cash to be pilfered does not theoretically exist in either option, even though it will still be possible to 'sell rides for a discounted but, unaccounted for, cash price'. From the perspective of the commuter, the contactless card seems to be the preferred option as seen in the survey but that preference is only marginally ahead of that for a mobile phone solution. Given the lack of awareness of NFC type possibilities via the mobile phone, the difference may not be significant. Then, finally from a policy angle, the difference between a contactless card and an NFC enabled mobile phone may not be material as both systems could meet the objectives of the various state agencies including the National Transport Commission and the Treasury.

5.1 Contactless cards

In fact, it will be easier and cheaper to launch a contactless card than an NFC enabled mobile solution. As explained previously almost all private busses in Sri Lanka already use a digital ticket machine which, according to the agents for the most widely used

brand, can be upgraded to one that could read contactless smart cards at a cost.⁵⁰ Once a card is obtained, commuters could top up the value as and when required at designated bus stations or other outlets. With the existing familiarity with top-up cards for mobile phones, it is likely that commuters would not find this new experience any different to current practice. The question that remains is will commuters adopt the cards? In many programs, there is no choice; adoption is mandatory. The Octopus card in Hong Kong was made mandatory within a three month period of its official release to ride its mass transit system.⁵¹ It is likely that, inter alia, this coercion made the first such contactless transport card a huge success. Currently in the UK, all existing ticket machines at rail stations are being upgraded to read contactless cards under a project called "All Change".⁵² Once the conversion is completed, paper tickets will be rendered useless forcing adoption of the cards. India has still not determined how and when its pilot programme with contactless cards will be implemented. At the end of 2009, Delhi Integrated Multi Modal Transit System started a project to use contactless card technology aboard busses on one of the many bus routes operated in New Delhi.⁵³ Some 5,000 contactless cards, as well as validators and 'on-bus' processing platforms have been installed. Beyond automatic sale-and-purchase of bus tickets, the system also creates intelligent transportation system applications such as GPS-based vehicle tracking, passenger counting and security systems that would help improve the overall public transport service in the city.⁵⁴

⁵⁰ Lisvin Trading Company www.lisvin.com/trading/about.html has the largest share of the digital bus ticket machines in operation. Its Managing Director indicated that the upgrade can be easily done at a nominal cost as the option for reading contactless cards is available in the machine. They only need to insert new chips to the existing machines.

⁵¹ Lucia L.S. Siu, "Coercing Consensus: Unintended success of the Octopus electronic payment system", <www.ln.edu.hk/socsp/staff/luciaindex.php#publications>

⁵² Old ticket machines in UK to be upgraded to accept smart cards, <www.contactlessnews.com/2009/08/26/old-ticket-machines-in-uk-to-be-upgraded-to-accept-smart-cards>

⁵³ Cubic Transportation Systems (India) Launches Smart Card Trial on Delhi Buses, <www.indiaprwire.com/pressrelease/transportation/2009120939166.htm>

⁵⁴ Ibid

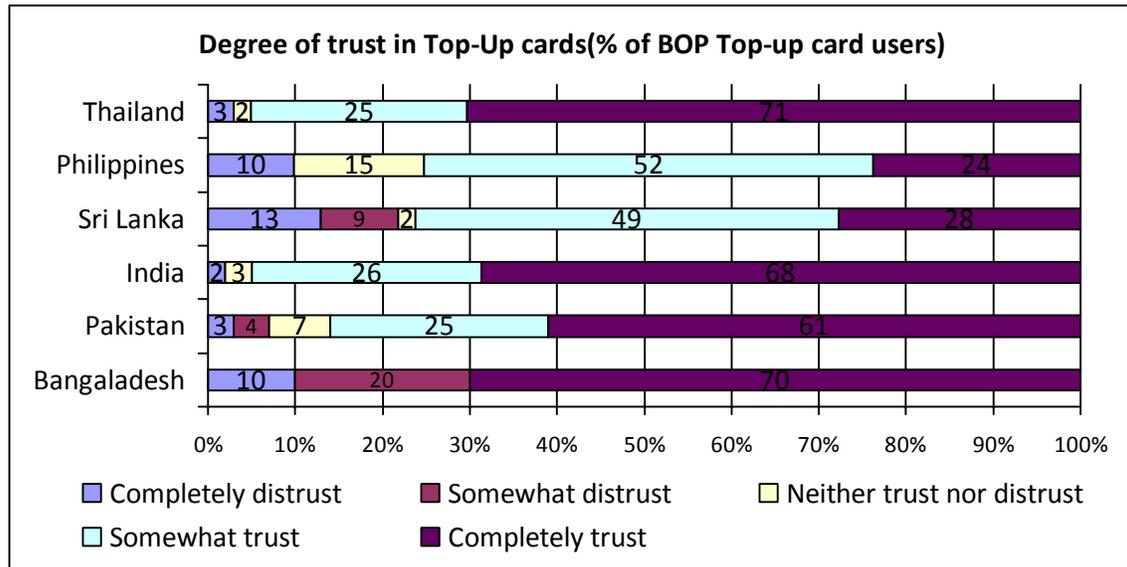
The Lanka Private Bus Owners Association [LPBOA] has been interested in a possible contactless card solution for some time.⁵⁵ But, without a framework to assess the pros and cons of such a project and any research to verify the various claims made by agents marketing various types of equipment, no progress has been made.⁵⁶

Next is the question of adoption of such a system. Under a mandatory regime, adoption will have to take place but there would be several genuine concerns among commuters. The first and perhaps the most important would be the privacy issue; with the ability for 'authorities' to track the movement of people via the smart card the comfort level of the usage may come in to question. But, the fact that such cards are in use across the world indicates that these apprehensions have been overcome. Another issue could be trust. LIRNEasia [2009] found that trust was indeed a significant concern among the BOP in Sri Lanka in top-up cards for reloading value in mobile phones as depicted in Figure 5.1

⁵⁵ The idea for this research paper came from a discussion the author had with the President of the LPBOA on the subject. Given the complete lack of background understanding and any research to base a decision on how best to proceed it was felt that an intervention to develop a discussion paper, given LIRNEasia's own objectives, would be much use. This paper is expected to play a catalytic role in that regard.

⁵⁶ According to the President of LPBOA an agent has imported 6,000 units of a GPRS enabled contactless card readable machine which it wants to sell to the operators for RS 35,000 each. However, given no contactless cards exist they wish to use it as a digital machine that would merely printout a ticket upon payment of cash. Even though these Hong Kong manufactured machines are apparently more advanced than the existing ones conductors are said to be unhappy because they heavier than the ones currently in use. Thus the idea of fixing it on board has been discussed, but with passengers entering the bus from both the entrance and exit doors and the general lack of discipline of orderly ticket purchase the proposal has not moved ahead.

Figure 5.1: Degree of trust in top-up cards



Source: http://irneasia.net/wp-content/uploads/2008/04/TaBOP3-LK-JAIC-4Mar09_FINAL.pdf

5.2 Mobile2.0

The other alternative would be a Mobile2.0 service. Here the two options are a simple SMS driven solution or an NFC enabled mobile phone solution that would be more advanced than the contactless card discussed earlier.

5.2.1 SMS and or Short Code driven Mobile2.0 solutions

What could an SMS driven Mobile2.0 service provide in the public transport space in Sri Lanka? There are a range of services; but primarily they would range from the simplest of time-tables enquiries [in the rare instance of busses keeping to time but more so applicable for trains] to sale-and-purchase of tickets in advance and finally to the most advanced sale-and-purchase of tickets onboard.

Already, Sri Lanka Railway has introduced a service called 'Mobitel Ticketing' where subscribers of a mobile service provider, Mobitel, could check the availability and reserve train tickets up to 28 days prior to their journey by dialing a short-code. At the start, the service is available for one of the most used routes; the Colombo-Kandy

Intercity service. The actual tickets have to be physically collected at selected railway stations [Colombo, Gampaha, Kandy or Peradeniya] or at any Mobitel service location.⁵⁷

Given Sri Lanka's archaic financial regulations that do not allow a third party [Mobitel] to collect government revenue [railway ticket fare], the operator has to actually purchase a pre-determined number of tickets months in advance. It is these already purchased tickets that are re-sold to commuters for which the payment is then collected by the operator. Ideally, SLR could have been able to dynamically manage the load-factor by being able to know the passenger demand prior to the service via such a service, but in this case, such innovation is not possible. In addition to the mobile reservations, the SLR website is regularly updated and provides some amount of commuter information including train time tables and delays. The management of SLR indicated that the Department is currently developing a Mobile2.0 system where commuters who have subscribed will receive SMS based information on train delays and other details. They are also desirous of making the ticketing system efficient and are considering the implementation of a comprehensive e-ticketing system; details of which were not available.⁵⁸

It is possible to have a similar service for long-distance bus services which have at least some kind of a set time table. This would be no different from the already existing train ticket system; perhaps even simplified with no requirement for the collection of a paper ticket as in the case of e-Channeling or movie tickets. In fact, with no administrative restrictions as in the case of State owned SLR, private bus operators could pilot numerous schemes including simply using m-transfers where potential passengers transfer credit to the designated mobile phone of the operator and receives an m-ticket via an SMS. The bottleneck here is the ability to then exchange credit on the phone for actual cash. A possible, but not the best-case, solution would be to link up with e-reload

⁵⁷ "Phone Booking for Train Commuters", <www.slrhc.org/2009/12/08/phone-booking-for-train-commuters>

⁵⁸ Discussions with former General Manager Railways, Dr Lalithasiri Gunaruwan

sellers who have a bulk demand for mobile phones to be retailed to numerous pre-paid mobile phone users. Ideally, the bus operator should be able to sell the credit back to the Operator or an agent of the operator that distributes credit.

The question that needs an answer is to what extent such a prior-purchase application would help resolve the genuine revenue-leakage problem faced by the operators even if the service can be successfully launched? The answer is quite obvious; not much. This is because only very few passengers would be able to reserve tickets given the lack of a proper time table particularly at bus stops other than the starting location.

However, there could be benefits to commuters of developing a system to even help them determine schedules of busses even within the terminals. At the main bus terminal at Pettah, there is a fairly rudimentary system where every so often buses leave the terminal for various destinations and based on a manual log kept with the Time OIC [Officer in Charge] on departure and arrival times journey slots are allocated. Payments for adjusting slots are commonplace.⁵⁹ This time table is known to the OIC and must be physically checked with him in his office. There is no display or any other communication mechanism. If passengers come early, they could find out details from Time Keepers and pay LKR20 and 'reserve' a seat. However, there is no guarantee that the reserved ticket would receive a seat; it is always first come first served or based on various other priority allocations. In this background, APIIT [2009] describes a plan to 'computerize' the bus scheduling system in Sri Lanka and provide a detailed information system design and development architecture which could be considered as the foundation to provide schedule and ticket reservation information to commuters via a Mobile2.0 service.⁶⁰

⁵⁹ Discussions with President of LPBOA

⁶⁰ "Computerizing the bus transportation in Sri Lanka", <www.scribd.com/doc/19500132/Computerizing-the-Bus-Transportation-in-SriLanka>

5.2.2 NFC enabled mobile phone solutions

As discussed earlier, Near Field Communication enabled mobile phones would be able to perform every function of a contactless card could perform particularly in addressing the primary concern of the operators; plugging the revenue leakage. Given such a system would be able to complete a sale-and-purchase of a bus ticket within a fraction of a second on board a bus it meets the criterion for consideration.

Technically, the process is simple: Step one: the commuter purchases value either independent of a bank or by linking to a bank card stored in the phone; step two: the commuter, once onboard, flashes the phone at the NFC reader which prompts for an authentication and once authorized the details of the required amount of money would be debited from the stored value or from the bank if connected to one and the transaction will be displayed on screen and an electronic ticket issued.

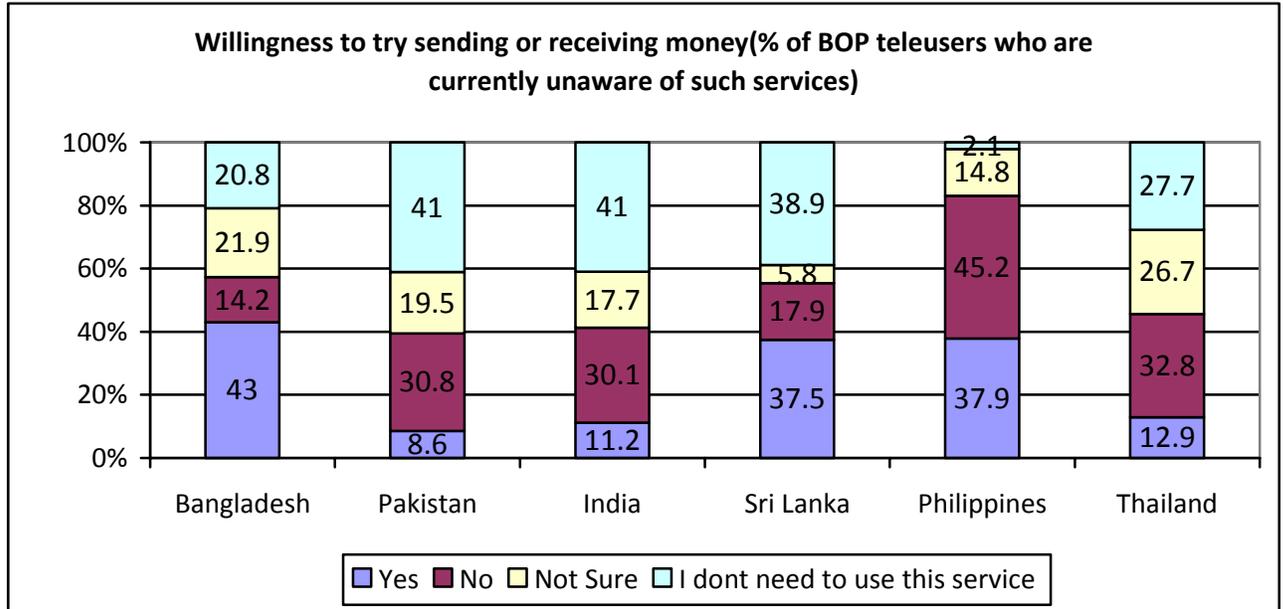
Unlike in a contactless card where the user may not know the balance remaining unless verified using a reader, the mobile solution will be able to keep the commuter abreast of her balances and other account details after each transaction. In the ideal situation, the ticketing function would complement a number of other Mobile2.0 services already available on the phone creating the opportunity for powerful and comprehensive transport solutions with benefits to all stakeholders.

In addition to these advantages, reloading value to these phones will be much easier than for contactless cards in that it could be done along with normal reloads electronically without having to physically visit a reload location.

In this background, it is likely that an appropriately designed and developed NFC enabled solution could become a widely used Mobile2.0 application. LIRNEasia [2009] provides an interesting insight in to the probability of adoption of such services among the BOP in five countries including Sri Lanka. Even though the questions asked from the

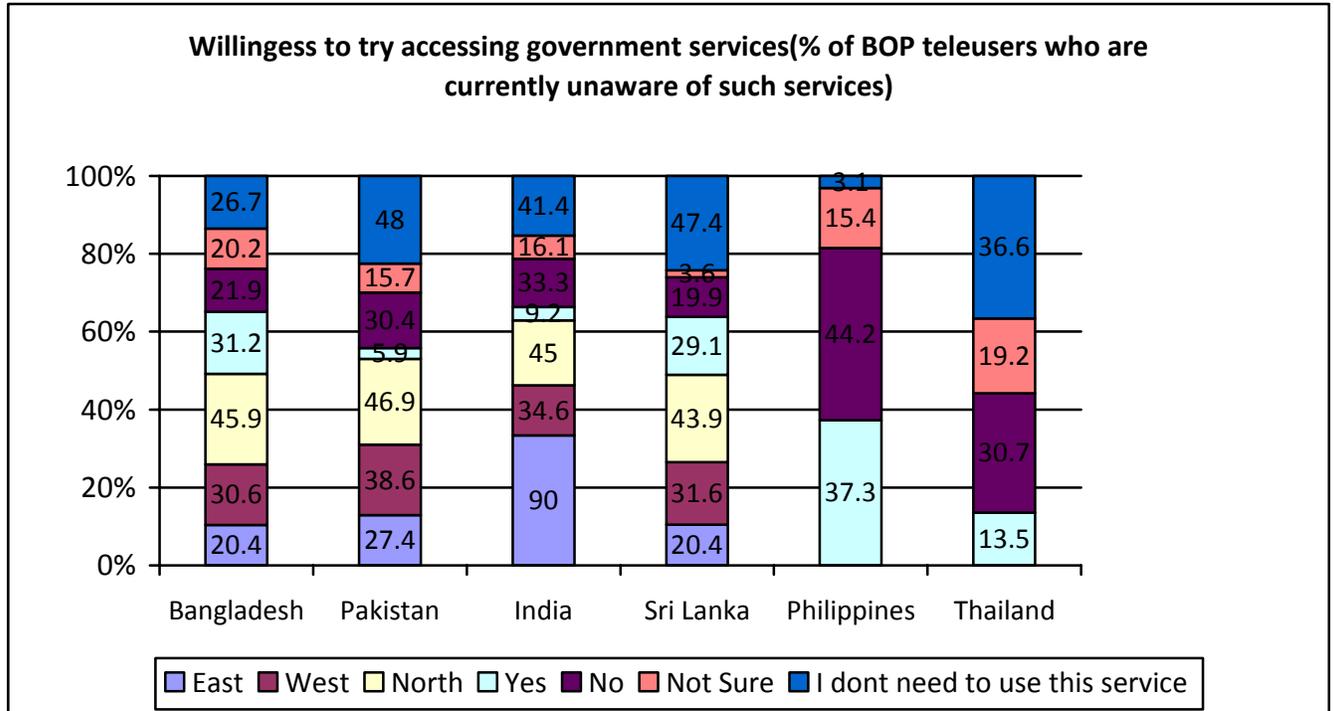
respondents [who were aware of the existence of a given Mobile2.0 service on their willingness to use the same] does not specifically refer to using a Mobile2.0 bus ticket service, the answers provides a good sense of possible take up, as only 20 percent indicated they were not willing to try out money transfer services and other government services; see Figure 5.2 and 5.3

Figure 5.2: Willingness to try sending or receiving money



Source: http://lirneasia.net/wp-content/uploads/2008/04/TaBOP3-LK-JAIC-4Mar09_FINAL.pdf

Figure 5.3: Willingness to try accessing government services



Source: http://lirneasia.net/wp-content/uploads/2008/04/TaBOP3-LK-JAIC-4Mar09_FINAL.pdf

6.0 Challenges, policy responses and concluding comments

6.1 Challenges and policy responses

6.1.1 Conversion of NFC phone readers

While there are a number of benefits, there are equal or more challenges too in introducing an NFC mobile solution in Sri Lanka. The first challenge is that the current ticket machines must be converted to read NFC phones. However, because NFC phones emulate contactless cards and communicate using the same frequencies, they can be read by normal card readers without any upgrade.⁶¹ This is of immense benefit as it means that no additional infrastructure become necessary beyond what is required for contactless card readers. As mentioned by the officials of LPBOA and the agents for the ticket machines now in use, the upgrade can be done at a nominal cost.

However from a policy angle, the Government could further facilitate this conversion by offering a one-time conversion subsidy. In the UK at present, the Government has announced an increase in what is referred to the Bus Service Operator Grant for those that install the new NFC ticketing technology on their buses.⁶² In the case of Sri Lanka, perhaps, the import duties of the equipment can be removed.

6.1.2 Procuring NFC enabled mobile phones

The second challenge is that mobile telephones must be NFC enabled. Even though data are not available to know precisely what percentage of mobile phones in the country is NFC enabled, it can be safely assumed that the vast majority is not. The reason is that most phones in circulation are from a pre-NFC enabled era. Given the obvious 'chicken and egg' situation, it can be safely concluded that, until NFC applications

⁶¹ Developing a strategy for smart and integrated Ticketing, Consultation paper, Department for Transport,UK, <www.dft.gov.uk/consultations/closed/smartticketing/consultation.pdf>

⁶² UK government to fund switch to NFC compatible transport ticketing, <www.nearfieldcommunicationsworld.com/2009/12/17/32494/uk-government-to-fund-switch-to-nfc-compatible-transport-ticketing/>

for phones are widespread, there will not be a sufficient level of demand for the handsets. However, there is evidence within the mobile phone industry to suggest that NFC enabled phones will become commonplace in the short to medium term with major phone manufacturers expected to release NFC enabled models soon.⁶³ Juniper Research [2009] has forecast that NFC phones will surge and, by 2014, one in every six mobile phones will be NFC enabled. The expectation is that NFC will become just a feature of any device, for instance what the camera or Bluetooth is now.⁶⁴ But with Nokia's most recent launch of its 6216 Phone, these forecasts might be a reality achieved even earlier. The reason is the breakthrough in technology that this particular mobile telephone is the first SIM-based NFC device.⁶⁵ This means that operators could now build NFC services directly onto the SIM card paving the way for widespread opportunities. It is thus quite possible that NFC enabled SIM cards, as in the case of China with RFID SIMs, could be available at affordable prices and suddenly a leap-frogging could take place from the SMS to NFC. In fact, the Nokia 6216 is currently retailing for just INR 8,700 [USD 165] in India.⁶⁶ While this may not be high on average, LIRNEasia [2009] found that the mean price paid by the Indian BOP for a brand new mobile phone was USD 48 in 2008; down from USD 72 in 2006. For Sri Lanka, these prices were USD 65 and USD 93, respectively.⁶⁷ Given the phone was only launched mid 2009, it is likely that with time, prices would fall further making it affordable to the BOP besides the NFC enabled SIM option which theoretically would not cost any significant amount. Therefore, NFC enabled Mobile2.0 solution may not be as far away as one would have originally believed.

⁶³ Ibid

⁶⁴ NFC mobile phone set to explode, <<http://connectedplanetonline.com/mobile-apps/news/nfc-mobile-phone-explode-1110/index.html?imw=Y>>

⁶⁵ Nokia 6216 marks the coming of age of near field communication, <<http://conversations.nokia.com/2009/04/23/nokia-6216-classic-marks-the-coming-of-age-of-near-field-communication/>>

⁶⁶ Nokia 6216 classic, <http://mobiles.sulekha.com/nokia_6216-classic_compare_prices.htm>

⁶⁷ Teleuse@BOP3, <http://lirneasia.net/wp-content/uploads/2008/04/TaBOP3-LK-JAIC-4Mar09_FINAL.pdf>

From a policy angle, it could be that the Government temporarily reduces some of the levies, taxes and surcharges applied on NFC enabled phones to encourage increased take up of such phones. Another possibility could be to provide an incentive for operators to increase their efforts to market the NFC phones by providing specific exemptions on identified expenditure. Of course, the overall tax rate on the use of mobile phones in Sri Lanka is very high and, as a general policy, these rates must be reduced to encourage greater use; particularly in the instance where tax on tax may be levied when multiple service providers are working together to provide a combined service as is the case here. Yet another possibility is that the Telecommunication Regulatory Commission mandate that mobile phones imported to Sri Lanka be NFC enabled at some given time frame in the future.

6.1.3 Regulatory bottlenecks

A third challenge would be regulatory bottlenecks; in terms of telecommunications, transport and banking. At the outset the Telecommunication Regulatory Commission would need to clear all licensing and frequency issues as NFC phones operates within the unlicensed radio frequency ISM band of 13.56 MHz with a bandwidth of 14 kHz; then the National Transportation Commission will need to ensure no issues that may cause difficulties in launching the service do exist and that the equipment meet the specifications of the NTC. Finally, but currently the most important, banking regulations that do not allow mobile phone operators to independently manage money storage and transfer services should be relaxed at least for limited amount transactions without the need to go through banks. Unless the latter relaxation is made, it will be impossible to attract the vast un-banked BOP in to the service.

Hayat [2009] commenting on the Central Bank of Sri Lanka's statement in early 2009 to finalize a framework for mobile payments before the end of that year points out that the genuine concerns of banking regulators on mobile payments should be addressed from the perspective of the country's own financial system and refers to legal powers

entrusted under the 'Payment and Settlement System Act of 2005' and also under the broad framework of the 'Money, Payment, Clearing and Settlement Service Providers Regulations No.1 of 2007'. It is noteworthy that the undertaking has not materialized and the Central Bank has been relatively quiet on the issue with no relaxation of rules restricting mobile operators engaging in payment functions independent of a bank even for small denomination transactions.

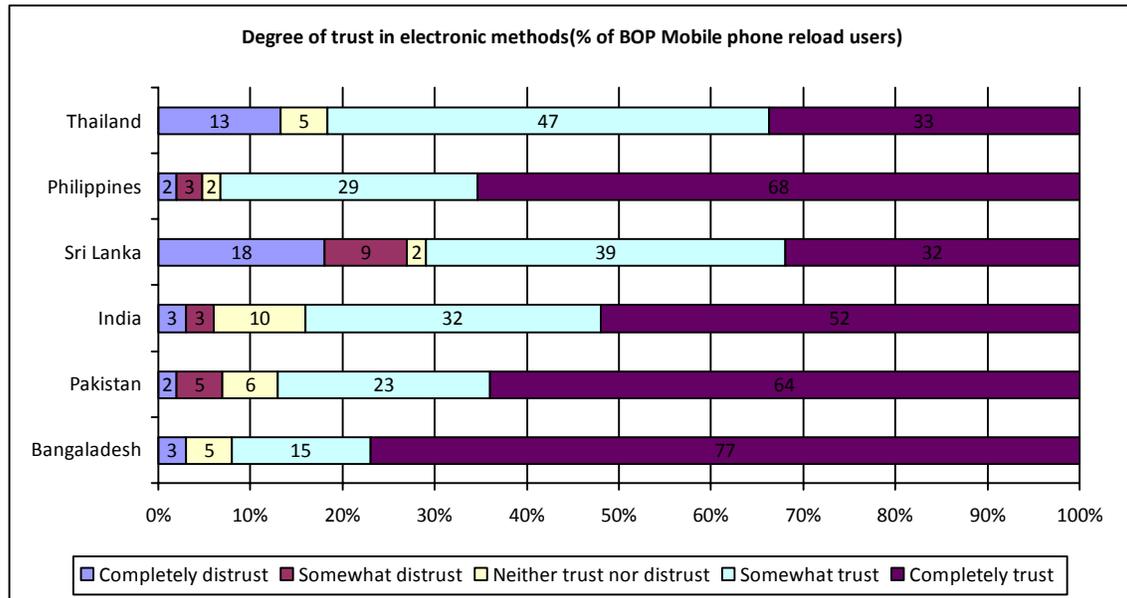
6.1.4 Shifting from cash to cashless operations

A fourth challenge is to get the buy in of all stakeholders to shift from cash to the Mobile2.0 solution. Given the current "incentive" system, in terms of the recipient of the bulk of the revenue leakage, the bus conductor will be the most resistant to change and offer support to a cashless system. This issue must be approached in a manner that the new ticketing system can reward the conductors and drivers, perhaps by formulating a commission out of the day's earnings. This way, they could be encouraged to motivate more commuters to use the Mobile2.0 service.

6.1.5 Trust and privacy issues

Finally, the trust and privacy issue associated with the service would have to be considered and appropriate remedies found. As depicted in Figure 6.1 LIRNEasia [2009] found that there is significant distrust on electronic reloads on to mobile phones among the BOP in Sri Lanka.

Figure 6.1: Degree of trust in electronic reloads onto mobile phones



Source: http://lirneasia.net/wp-content/uploads/2008/04/TaBOP3-LK-JAIC-4Mar09_FINAL.pdf

Privacy is another important issue. Using either a contactless card or a Mobile2.0 service for public transport presents a risk for privacy because such a system enables the service provider to track the movement of individuals. In some countries the collection of such data is restricted; for instance in Finland, the Data Protection Ombudsman prohibited a transport operator from collecting such information, in spite of the operator's argument that the owner of the card has the right to get a list of journeys paid with the card, privacy laws in Sri Lanka are not very stringent.⁶⁸

6.1.6 Other policy issues

Besides the already discussed issues that have policy relevance, there are two other aspects that need some attention. One is the subsidies for public transport. Many governments subsidize public transport due to an array of social, economic and environmental reasons and Sri Lanka is no different. As discussed previously in this paper, the state owned public transport services; the SLTB and the SLR that receive large direct and indirect subsidies from the Treasury, are making massive and sustained losses

⁶⁸ Privacy and Human Rights 2003: Finland.
<www.privacyinternational.org/survey/phr2003/countries/finland.htm>

due to structural inefficiencies and the inability to increase fares to cover costs. The introduction of a Mobile2.0 solution [or for that matter a contactless card] makes it possible for the provision of direct subsidies to targeted groups or individuals instead of untargeted transfers to the loss making institutions. This provides an opportunity for upward adjustments of fares for the groups not in need of subsidies.

A final point is that such a service allows for variable pricing and dynamic demand management thus ensuring smooth flows of passengers by dynamically adjusting the available service up and down based on need, perhaps by location and by time. However dynamic discounting can generate public policy issues. Thus indicators to inform the public at which time the tariff could possibly be low or high and in case of increases, what the upper limits are etc. will have to be put in place. Congestion pricing is an intermediate option with pre-defined time of day pricing along with perhaps lower tariffs for senior citizens etc.

6.2 Concluding Remarks

This paper approached the question of a Mobile2.0@BOP service from several angles. One was how people could enter the world of convenience that is rapidly becoming available via the Internet; in this context, the discussion was on how contactless cards or mobile phones could exchange information among passengers, bus conductors and banks instantly and seamlessly to complete bus [or train] ticket purchases. Another was to consider the need for such a service. The paper considered the needs of the bus and train operators and the needs of the passengers and concluded that there was sufficient demand for an appropriate solution from both sides. A third was to consider the technical issues. The discussion was on alternative methods. Here, the conclusion was two fold. One was that, while SMS based Mobile2.0 solutions are possible; their impact on addressing the needs of the stakeholders was low. The other was that either contactless cards or NFC enabled mobile phones could fulfill the identified needs and that it would be easier and more cost efficient to move ahead with a contactless card

solution. However, an NFC enabled Mobile2.0 solution would be much more useful given its ability to 'talk to' the user and take instructions, be it to authenticate a debit or to direct from which account to debit [which is not possible with the card]. The discussion also highlighted the advancement in the NFC phone arena, particularly the latest developments of the technology being incorporated in to a SIM card thereby removing the need for a new and perhaps a somewhat expensive handset. Finally, the paper looked at the use patterns of mobile and Mobile2.0 applications in Sri Lanka and identified the various challenges and possible policy actions to help overcome them.

While this paper does not endorse any particular technology, it is believed that evidence and discussion has been presented for the stakeholders to use it as a discussion paper to move this dialogue to the next level.

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- 1) Dr. Lalithasiri Gunaruwan, Former General Manager, Sri Lanka Railway
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- 3) Mr. Gunawardena, Operations Manager, Sri Lanka Transport Board
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- 8) Mr. Upali De Silva, General Manager, Lisvin Trading (Pvt) Ltd.