

# **Contactless Prepaid and Bankcards in Transit Fare Collection Systems**

by

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Bachelor of Science, Mechanical Engineering,  
Johns Hopkins University, 2006

Submitted to the Department of Civil and Environmental Engineering  
and the Engineering Systems Division  
in partial fulfillment of the requirements for the degrees of  
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## **Abstract**

Many public transit agencies are considering direct acceptance of contactless credit and debit cards (collectively contactless bankcards) at gates in rail stations and on board buses. Concerns have been raised about riders who may not have or may not want to use contactless bankcards for transit fare payments. This thesis presents contactless prepaid cards as a potential fare payment option to meet the needs of these riders, and assesses customer attitudes toward contactless prepaid cards and bankcards. Two case studies are presented of transit agencies planning to implement contactless bankcard fare collection systems: Transport for London and the Chicago Transit Authority.

A framework for evaluation of transit prepaid card options addresses two independent policy decisions: card function, or how the prepaid card may be used, and program management, the companies that partner with transit agencies to provide prepaid cards. The two card function options are: open loop cards, accepted at any merchant, or closed loop cards, used only for transit. Five possible program management options are addressed: the transit agency, bill payment companies, prepaid card companies, general payment card companies, and financial institutions. Options are analyzed along three primary dimensions: customer experience, cost, and geographic coverage of card servicing locations.

The results show that closed loop and open loop cards may potentially have comparable costs for both the Chicago Transit Authority and Transport for London, although there is substantial uncertainty since no programs have yet been implemented. The cost and revenue uncertainties are higher for open loop cards than for closed loop cards. For all program management options, both transit agencies appear to face a tradeoff between costs and geographic coverage.

Transit agency survey data is used to assess demand for contactless prepaid and bankcards. The results show that a small percentage of riders lacks both credit and debit cards and may have to use prepaid cards. Moreover, the majority of riders in London prefer closed loop prepaid cards, and most riders in Chicago prefer current fare media over bankcards. Discrete choice models are used to analyze factors influencing the choice between bankcards, prepaid cards, and other fare media for riders in London and Chicago. While trends among ridership groups are not strong, age and availability of payment instruments appear to influence fare media choice.

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## Glossary

- **Barclaycard OnePulse:** A multi-application smart card issued by Barclaycard that combines Transport for London's Oyster card application and a credit card application.
- **Chicago Card (CC):** One of two contactless smart cards used by Chicago Transit Authority riders.
- **Chicago Card Plus (CCP):** The second of two contactless smart cards used by Chicago Transit Authority riders. CCP is linked to a credit or debit card and automatically reloads.
- **Chicago Transit Authority (CTA):** The public agency that operates the bus and elevated rail system in the city of Chicago and surrounding suburbs.
- **Closed Loop Prepaid Card:** A prepaid card that can only be used at a single merchant. This is commonly referred to as a gift card.
- **Contactless Bankcard (CLBC):** A credit or debit card with contactless technology that allows the card to be "waved" or "tapped" at the point-of-sale, as opposed to being "swiped" through a magnetic stripe terminal.
- **Contactless Prepaid Card:** A card that the user preloads with value and is not linked to a traditional credit or debit account. Contactless prepaid cards operate on the same standards as contactless bankcards.
- **Docklands Light Railway (DLR):** A light rail line that is managed by Transport for London.
- **EMV:** The contactless bankcard standard in Europe.
- **National Rail (NR):** The passenger rail services in London.
- **Oyster card:** The contactless smart card used by Transport for London riders on the Underground, buses, DLR, Overground, trams, and most National Rail services.
- **Open Loop Prepaid Card:** A network branded prepaid card that is accepted at any retailer that accepts credit or debit payments.
- **Oyster Ticket Stop (OTS):** A network of retail shops and newsagents in London where value can be added to Oyster cards.
- **Smart card:** A small plastic card embedded with an integrated circuit (IC). In this thesis, the term refers specifically to proprietary, contactless stored value cards commonly used in transit fare collection systems, such as the Oyster card and Chicago card.
- **Transport for London (TfL):** The government body responsible for managing most aspects of the transportation system in Greater London, including the Underground, buses, DLR, Overground, and trams.
- **Transaction Systems Ltd. (TranSys):** A consortium comprised of Cubic, HP Enterprise Services, Fujitsu, and WS Atkins that managed the Oyster card system for Transport for London.

# 1 Introduction

Over the past decade and a half, many large public transit agencies have introduced **contactless smart card fare collection systems**, such as Transport for London's Oyster card and the Chicago Transit Authority's Chicago card. The radio frequency identification (RFID) technology used in these proprietary smart card systems has delivered many benefits to transit agencies and transit riders, including reducing ticket fraud, enabling flexible fare policies, improving the customer experience, and enabling faster boarding of buses and throughput of turnstiles in stations (TCRP 2006, Hong 2006).

For many reasons, now is an opportune time to enhance these contactless smart card fare collection systems. Some proprietary smart card systems are nearing the end of their life, and the equipment needs to be upgraded, including the card security standards backing some of these systems (Smart Card Alliance 2008). Furthermore, given the recent financial problems and budget concerns of some transit agencies (Sataline 2009), many transit agencies are looking for ways to reduce costs. One area that has been identified for potential cost reduction is revenue collection, and using new technologies for fare collection systems may lead to cost savings (MIT Transit Bankcard Workshop Discussion 2009).

Over the past few years, financial institutions have begun to issue RFID payment products in the form of contactless credit and debit cards (collectively referred to as contactless bankcards, see Chapter 2). These commercial products appear to meet many of the business needs of transit fare collection systems, including speedy boarding and rigorous security standards, which may create opportunities for convergence between transit fare collection systems and the payments industry (Smart Card Alliance 2006, TCRP Report 115 2006, Dorfman 2007).

Many transit agencies in the USA and Europe have recognized the potential benefits of capitalizing on the economies of scale and expertise of the payments industry (MIT Transit Bankcard Workshop 2009), and some organizations are actively moving towards implementation of **contactless bankcard (CLBC) fare collection systems**, in which contactless credit and debit cards are accepted directly at the gates in rail stations and upon boarding buses. These transit agencies are in different stages of planning and implementing CLBC fare collection systems, including one agency that already accepts CLBCs system-wide (the UTA in Salt Lake City<sup>1</sup>), another agency conducting pilot programs (the MTA in New York City<sup>2</sup>), and others that have recently issued Requests for Proposals to begin procurement processes (such as SEPTA in Philadelphia, WMATA in Washington DC, and the CTA in Chicago<sup>3</sup>).

## 1.1 Motivation

Despite this movement toward contactless bankcard (CLBC) fare collection systems, some significant challenges need to be addressed before these systems are utilized on a larger scale. Specifically, one key issue is how to meet the needs of riders who do not have or do not want to use contactless credit or debit cards for fare payments. Public transportation providers have diverse rider constituencies; transit agencies need to implement fare collection systems that are

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<sup>1</sup> Salt Lake City UTA Fare Collection System: <http://www.rideuta.com/ridingUTA/amenities/electronicFare.aspx>

<sup>2</sup> New York MTA 2006 Trial: <http://www.mta.info/nyc/facts/ffhist.htm>

<sup>3</sup> Chicago Transit Authority Open Fare Payment Collection System: [http://www.transitchicago.com/assets/1/board\\_presentations/Next\\_Generation\\_Fare\\_Collection\\_Project\\_-\\_August\\_2009.pdf](http://www.transitchicago.com/assets/1/board_presentations/Next_Generation_Fare_Collection_Project_-_August_2009.pdf)

accessible to all patrons, including those who may be not utilize electronic payment instruments, such as credit and debit cards.

Notably, opponents of CLBC fare collection systems have identified this as a major concern. Sheehan (2010) argues that mass transit is one of the most socially inclusive activities in America, and that it can be considered a “great equalizer” because all groups of people, from “billionaires and the homeless, immigrants and Daughters of the Revolution,” utilize this mode of transportation. Sheehan further contends that traditional credit, debit, and prepaid cards are inaccessible or prohibitively costly for a large constituency of riders, particularly the unbanked, who do not have a basic checking, savings, or other transactional account at a bank (CFSI 2005).

Proponents of CLBC fare collection systems have also recognized the significance of this challenge. From representatives of the payments industry to transit agency staff, there seems to be general agreement that open payment fare collection systems must be 100% socially inclusive (MIT Transit Bankcard Workshop Discussion 2009). Consequently, transit planners, academic researchers, and industry participants have begun to address equity issues in CLBC fare collection systems. One organization that has recently published on this theme is the Smart Card Alliance, which is a non-profit association that works to stimulate the understanding, adoption, and application of smart card technology.<sup>4</sup> In a 2008 white paper, the Smart Card Alliance discussed opportunities for transit agencies to serve unbanked consumers with prepaid cards, which will be discussed in detail in Chapter 5.

## **1.2 Objectives**

This research addresses the issue of riders who do not have ready access to or do not wish to use contactless credit or debit cards for fare payment. Specifically, this thesis aims to identify these riders and determine if socially inclusive fare collection strategies exist to meet their needs, expressed as the following two objectives.

### **1. Identify and evaluate fare strategies for transit riders not using contactless bankcards**

Potential solutions to meet the needs of these riders in a CLBC fare collection system will be identified, and a framework for evaluating the advantages and disadvantages of each will be presented. One proposed fare payment strategy that will be emphasized is contactless prepaid cards (Smart Card Alliance 2010), and this will be evaluated from the perspective of the transit agency and the transit rider.

### **2. Identify transit riders who may not use contactless bankcards for fare payment**

Transit riders who may not use CLBCs can be generally divided into two groups: those who cannot use a bankcard, and those who prefer not to use bankcards for fare payment. The first group includes the unbanked - those without basic bank accounts. Because they exist outside the financial mainstream, there has been a general lack of understanding of this group. This research aims to estimate the size of the unbanked market in transit, and investigate their socioeconomic characteristics, travel patterns, and current transit fare media choices. Next, there may be other groups of riders who have a bankcard but prefer to use prepaid cards or other media for fare

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<sup>4</sup> More information about the Smart Card Alliance can be found at: <http://www.smartcardalliance.org/>

payment. This could be for many reasons, such as being able to manage personal funds better, general concerns with the banking or payment card industries, or a hesitancy to use new technologies (such as RFID). Transit rider attitudes toward CLBCs and prepaid cards are investigated to assess demand for these new products.

### **1.3 Methodology**

The primary methodology is through two detailed case studies of major transit agencies: Transport for London (TfL) and the Chicago Transit Authority (CTA). The case study method was chosen to provide an in-depth analysis of two transit agencies to examine the complexities of this social issue. Public transportation systems are inherently local and can differ greatly from city to city. Regional economic conditions, local provision of private transportation and public transit fare policies can affect the demographics of public transportation riders. These differences may affect, for example, the size of the unbanked transit market; detailed case studies may provide insight and understanding. Last, the lessons learned may provide insight and help to inform the decisions of other transit agencies planning CLBC fare collection systems.

These case studies were selected for a number of reasons. First, both TfL and the CTA are currently designing open payment fare collection systems, and because of this commitment to CLBCs, both agencies have invested time and resources in the planning process. Qualitative and quantitative data is available from these two agencies. Second, both TfL<sup>5</sup> and the CTA<sup>6</sup> are public agencies that operate large bus and rail systems; because they manage the same modes, fare media implementation challenges may be analogous. Likewise, both TfL and the CTA have proprietary smart card systems (the Oyster card and Chicago card, respectively), which makes their fare planning processes similar.<sup>7</sup> Last, the selection of an American and a European transit agency allows for a comparison of the payments industry, financial regulatory systems, and demographics of those who may not use contactless bankcards between the two countries.

The case studies were conducted using a three step approach that includes both quantitative and qualitative analysis:

#### **1. Overview of contactless bankcard fare collection systems**

In Chapter 2, an overview of contactless bankcards is presented, including information about payment processing, contactless standards, card issuance in the United States and the United Kingdom, and a discussion of the advantages and disadvantages of CLBCs as transit fare collection systems.

#### **2. Evaluation of strategies for transit riders not using contactless bankcards**

The most promising fare media strategy for these riders appears to be contactless prepaid cards (Smart Card Alliance 2010, MIT Contactless Bankcard Workshop Discussion 2009). Literature on the prepaid card market in the United States and the United Kingdom is synthesized in

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<sup>5</sup> Transport for London is the government body responsible for managing most aspects of the transportation system in Greater London, including the underground and London buses. More information is available at: <http://www.tfl.gov.uk/>

<sup>6</sup> The Chicago Transit Authority is the public agency that operates the bus and elevated rail system in the city of Chicago and surrounding suburbs. More information is available at: <http://www.transitchicago.com/>

<sup>7</sup> In comparison to transit agencies transitioning directly from magnetic stripe or token fare systems.



Chapter 3. Then, prepaid cards are discussed in the context of CLBC fare collection systems, in which transit riders could walk up to the gates in stations and tap their contactless prepaid cards.

Chapter 4 provides a framework for evaluation of transit prepaid program options, which is based on two independent policy decisions: **program management**, or possible partner companies that could work with transit agencies to provide a prepaid solution, and **card function**, or how the prepaid card may be used. It is assumed that many companies that were not previously in this market may want to enter the transit fare collection industry; the payments industry is divided into four categories of potential prepaid program managers: (1) bill payment companies, (2) prepaid card companies, (3) payment card companies, and (4) financial institutions. Additionally, (5) transit agencies could continue to manage prepaid programs in-house, in a similar fashion to many smart card fare collection systems. Because contactless prepaid cards use payments industry standards, there are two possible card function options: (1) open loop cards that are accepted at any merchant or (2) closed loop cards that can be used only for transit. The advantages and disadvantages of each option are analyzed along three dimensions: customer experience, geographic coverage of locations for card distribution and replenishment, and cost.

### 3. Quantitative analysis of transit riders who may not use contactless bankcards

Next, the thesis addresses the transit rider perspective by assessing demand for contactless bankcards and prepaid cards. This is broken down into two primary parts. Chapter 5 focuses on the unbanked, and literature on the various segments of society who do not have basic bank accounts is summarized. This group is discussed in a transit context using recent survey data from the Chicago Transit Authority (2008) and Transport for London (2009). Chapter 6 focuses more broadly on consumer attitudes toward contactless bankcards and prepaid cards. Trends among those who do not want to use bankcards are identified using survey data from the CTA and TfL in a two-pronged approach:

1. **Statistical Analysis:** This quantifies the size and demographics of different ridership groups at the CTA and TfL based on stated preference for fare media, including contactless bankcards, prepaid cards and existing fare media such as paper tickets.
2. **Discrete Choice Modeling:** This builds upon fare media choices of riders to further investigate trends between segments of riders using discrete choice modeling. TfL survey data is modeled using multinomial logit, and CTA survey data is analyzed using binary logit.

## 1.4 Summary of Results

The results of the two case studies demonstrate that contactless prepaid cards appear to be a feasible option to complement contactless bankcards. Additionally, there may be many groups of riders who do not utilize contactless bankcards for fare payment, particularly in the early years of CLBC systems, and may prefer to use contactless prepaid cards.

### 1. Prepaid cards appear to be a viable strategy for riders who may not use CLBCs.

Because of the developing nature of the prepaid market, solutions appear to be flexible and capable of meeting the business needs of transit agencies planning CLBC fare collection systems. The evaluation of transit prepaid program options presented in Chapter 4 revealed that **bill payment companies** and **payment card companies** have the potential to offer relatively

low cost prepaid solutions for both the CTA and TfL. These companies already have a relatively large number of locations in both cities, although not as many as current transit card distribution networks. **Prepaid card companies**, while offering good geographic coverage, appear to be a relatively expensive third party provider for both the CTA and TfL. If their costs come down, which may be possible given the size and scale of transit agencies, this may become a more attractive option. Prepaid programs managed by **financial institutions** may be feasible in the longer term in Chicago and London, but this hinges on the introduction of cash scanning ATMs that will enable real-time reloading for prepaid users. Last, **transit agency** managed programs appear to have somewhat higher costs, but this provides customers with a similar experience to current smart card systems and has significant geographic coverage in both London and Chicago.

Regarding card function, based on current estimates of costs and conservative assumptions about open loop card penetration, **closed loop** cards appear to have lower costs for both the CTA and TfL. If this is the case, transit agencies can consider the tradeoff between providing customers with additional card functionality (i.e. off-system usage) that may come at a higher cost to both the transit agency and the transit rider. However, it is also possible that **open loop** cards may attract substantial off-transit usage, earning considerable fees on these transactions. For example, the TaiwanMoney card available in southern Taiwan for use on transit and at local merchants saw significant transaction volume after it was introduced in 2006 (MasterCard News Release 2006).<sup>8</sup> If this were the case, open loop cards may be a more attractive option for transit agencies, but little experience currently exists to guide this process.

## **2. There are many groups of transit riders who may not use contactless bankcards.**

Analysis of transit agency customer research revealed that there is a sizable population of riders who may not have or may not want to utilize contactless bankcards for fare payment. Survey data revealed that the majority of riders at the CTA and TfL may prefer prepaid cards, paper tickets, or other forms of existing fare media over CLBCs for fare payment.

**Unbanked transit riders:** Statistical analysis of survey data revealed that 10% of TfL riders do not have credit, debit or prepaid cards.<sup>9</sup> At the CTA, 20% of CTA riders do not have a basic checking account, debit or credit card. Additional analysis of CTA data revealed that these riders, when compared to transit riders as a whole, tend to have lower levels of education and are from lower socioeconomic groups. These results are consistent with national British and American studies of the unbanked market, which generally show that these are often people from the least advantaged groups in society (FDIC 2009, Financial Inclusion Taskforce 2009).

**Statistical analysis of consumer attitudes toward CLBCs:** Stated preference data for TfL revealed that 55% of riders prefer closed loop prepaid cards, 31% prefer CLBCs, and 14% prefer paper tickets (i.e. magnetic stripe) for transit payment. Similarly, only 36% of CTA riders said that they were “very likely” or “somewhat likely” to choose CLBCs over current fare media.<sup>10</sup> Until CLBCs become more widespread (particularly in retail applications) and customer

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<sup>8</sup> The TaiwanMoney card has both a MasterCard PayPass credit card option and an anonymous open loop prepaid card option (Hendry 2007).

<sup>9</sup> These transit riders could be classified as “underbanked,” which will be defined in Chapter 5 as individuals having a basic checking or savings account but not other financial instruments.

<sup>10</sup> Current fare media includes cash, magnetic stripe cards, or contactless smart cards.

awareness of this new technology increases, there may be a large share of transit riders who prefer prepaid cards or existing fare media. This is consistent with the adoption of Oyster smart cards in London, which had limited market share when first introduced, but increased over time.<sup>11</sup> This experience indicates that acceptance may increase significantly over time. Last, the use of CLBCs in a large transit system will, by itself, increase awareness and perhaps acceptance of CLBCs significantly.

**Discrete choice models:** Discrete choice modeling of stated preference data for TfL and the CTA revealed that trends of fare media preference between different groups of riders were not very strong, but a few key factors did emerge. Older riders (ages 65+) showed a preference for existing fare media, while younger riders more frequently chose CLBCs. Banked riders, or those who already have a credit or debit card, were more likely to choose CLBCs. The factors influencing choice of fare media at the CTA and TfL are consistent with categories in standard sociology models describing consumer adoption of new technologies.

In summary, this research has demonstrated that there may be many groups of riders who do not utilize contactless bankcards for fare payment, particularly in the early years of CLBC systems. To meet the needs of these riders, contactless prepaid cards appear to be a feasible option to complement contactless bankcards.

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<sup>11</sup> Acceptance may have slowly increased in part because different fare products, such as weekly travelcards, were gradually made available on the Oyster card. Additionally, price differentiation was used to make the price of the Oyster card less expensive than magnetic tickets.

## 2 Contactless Bankcard Fare Collection Systems

This chapter provides background information about contactless bankcards (CLBCs) and their application to transit fare collection. Because commercial payment technology is not widely used by transit agencies (other than in indirect methods, such as using a credit card to purchase a paper ticket or load a smart card), this chapter serves as background about the financial industry.

The first half of this chapter includes discussion of technical standards, statistics about CLBC penetration and acceptance in the USA and the UK, and a brief explanation of the payment network that supports transaction processing. The second half of the chapter discusses the advantages and disadvantages of contactless bankcards for transit payments, as motivation for the following chapters.

### 2.1 What is a Contactless Bankcard?

A contactless bankcard (CLBC) is a smart card used by the financial industry. It is a credit or debit card with contactless technology that allows the card to be “waved” or “tapped” less than 2-4 inches from a point-of-sale (POS) terminal, as opposed to being “swiped” through a magnetic stripe terminal like a traditional credit or debit card. A CLBC can be “tapped” because the card has an embedded antenna and integrated circuit (IC) that is inductively powered by radio frequency (RF) radiation from the card reader on the POS terminal (Dorfman 2007). CLBCs follow the ISO/IEC 14443 standard for smart cards, which specifies characteristics of the card, such as transmission frequency (13.56MHz) and size ( $85.60 \times 53.98$  mm;  $3.370 \times 2.125$  in).

CLBCs are linked to the customer’s credit or bank account, and transactions are processed through the financial payment network, as discussed in the following section. Some well-known contactless credit and debit cards are listed in the following table, and the symbol that indicates the contactless functionality of these cards is shown in Figure 2-1 (EMVCo 2007). It is possible to have prepaid cards fitted with contactless technology that also utilize the traditional payment network, which will be discussed in Chapter 3.

Payment Network	Card Names
Visa	payWave
MasterCard	PayPass
American Express	Express Pay
Chase	Blink



Figure 2-1 Common Contactless Bankcards and Universal Contactless Symbol

### 2.2 Bankcard Payment Processing

Financial payment processes will be used for CLBC acceptance by transit agencies. Figure 2-2 shows the flow of information and money between organizations involved in processing a standard magnetic stripe credit card transaction, which is based on the Federal Deposit Insurance Corporation’s Multiple Card Issuer Model for Payment Networks (Akers et al. 2005). The same process occurs for contactless credit card transactions.

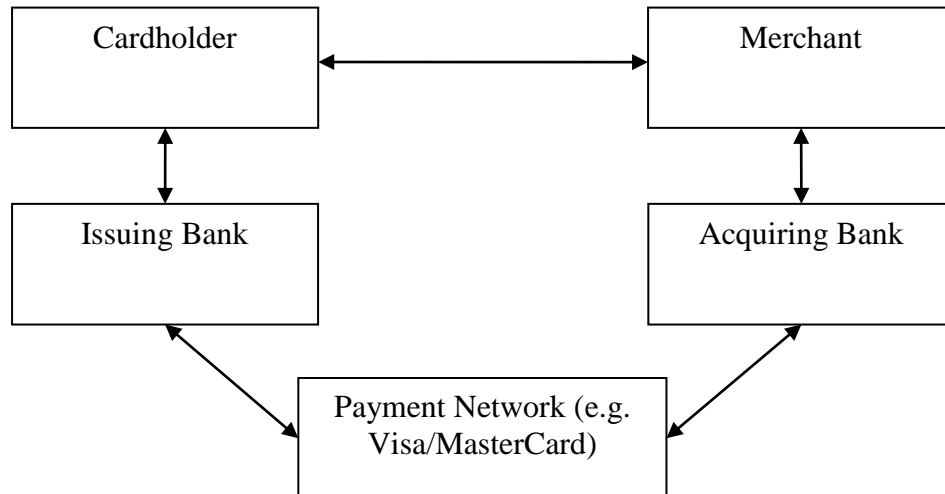


Figure 2-2 Credit Card Payment Process

1. A **cardholder** (top left of Figure 2-2), or customer who has a credit card, wants to make a purchase from a merchant, such as a grocery store. The cardholder swipes or taps the card at a POS terminal.
2. The **merchant** POS terminal (top right of Figure 2-2) sends information about the cardholder (including credit card number, etc.) to the merchant's acquiring bank to request authorization for the transaction.
3. The **acquiring bank** (bottom right of Figure 2-2) sends the authorization request to the payment network, which is often called the card association. The acquiring bank is the financial institution responsible for the merchant's side of the transaction, and it is common practice for acquiring banks to contract out some of their processing functions to third parties (Kjos 2007).
4. The **payment network** (bottom center of Figure 2-2), or card association, which includes well-known companies such as Visa and MasterCard, sends the authorization request from the acquiring bank to the cardholder's issuing bank.
5. The **issuing bank** (bottom left of Figure 2-2), which is the financial institution that offers a line of credit to the customer for his or her network branded card, performs necessary security checks, such as analyzing the cardholder purchasing behavior for fraudulent activities. Then, the issuing bank authorizes or denies the transaction by relaying a message to the payment network. If the transaction is approved, the issuing bank will send the value of the transaction less an interchange fee<sup>12</sup> back through the network.
6. The **payment network** sends the authorization response to the acquiring bank, and the payment network deducts its fee from the transaction value.
7. The **acquiring bank** passes the authorization response on to the merchant. The acquiring bank pays the merchant the value of the transaction, minus the interchange fee, payment processing cost for the network, and a service charge for the acquiring bank. The

<sup>12</sup> An interchange fee is a processing fee paid to the issuing bank by the acquiring bank. These fees are generally set by the payment network, and they represent the bulk of the credit card transaction fee that is passed on to the merchant. The issuing bank receives most of this revenue.

settlement between the merchant and the merchant's acquiring bank usually occurs at the end of the business day.

8. Last, the **issuing bank** receives the full value of the transaction from the cardholder, usually when the cardholder pays his or her monthly credit card bill.

The proceeding paragraphs offer a simple explanation of standard credit card transaction processing, and in reality, there can be additional parties involved in the process (such as rewards program managers, additional payment processors, etc.). Not all credit card companies follow this model; notably, American Express generally uses a simplified process, in which American Express functions as the payments network, the issuer, and the acquirer. Discover and Diners Club cards also utilize simplified models (DeGennaro 2006). Last, debit cards are processed in a similar fashion to credit cards, but the primary difference is that transactions are not routed through the payment networks (Visa/MasterCard), but instead they are generally "switched" through debit networks, such as NYCE, STAR, or PULSE (Arminio 2008). In summary, there are many players who have a stake in the industry, and they will all play important roles if contactless bankcards are accepted directly by transit agencies.

## **2.3 State of the Technology in the United Kingdom**

Many major financial institutions are rapidly issuing contactless bankcards in the United Kingdom. The payments industry has converged on a contactless standard in Europe (and most of the world), which is known as EMV, and they are moving forward to promote its utilization.

### **2.3.1 UK Standard**

The standard for contactless bankcards in Europe is known as EMV, which is an abbreviation for Europay, MasterCard and Visa, the companies that initiated its specification in 1994. These three entities sought to organize a globally interoperable standard for smart card based payments, and this specification has been adopted in most countries, with the United States being the primary exception (Smart Card Alliance 2010). One of the key features of EMV is its high security standards, which include advanced encryption and authentication requirements. These technical details will not be described in this thesis, but for more information, the reader is referred to EMVCo, which is the organization that manages and maintains the standard.<sup>13</sup>

### **2.3.2 UK Card Issuance & Retail Acceptance**

The issuance and acceptance of contactless bankcards has increased significantly in the past few years. The UK Card Association, which is a trade association for cards issuers and merchant acquirers, recently released a report on the status of contactless card issuance and acceptance in the UK, which included the following statistics.

- **UK Card Issuance:** By the end of 2009, approximately 7.8 million payment cards<sup>14</sup> had been issued with contactless technology in the UK, and forecasts by the UK Card Association predict that there will be over 12 million contactless cards issued by the middle of 2010 (Contactless Cards 2009). Barclays and Barclaycard are the largest

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<sup>13</sup> See [www.emvco.com](http://www.emvco.com)

<sup>14</sup> To put this statistic in perspective, there are approximately 61 million people living in the UK.

issuers, and in December 2009, they announced that they have issued over 5 million contactless enabled cards in the UK (Press Release 2009).

- **UK Retail Acceptance:** As of the end of 2009, over 24,500 terminals were capable of accepting contactless transactions in the UK (Contactless Cards 2010). Many major chain retailers are rolling out new terminals to enable contactless payment, including Cafe Nero, Pret A Manger, and Yo! Sushi, to name just a few (Barclays Press Release 2009).

In summary, the rate of issuance of contactless cards by financial institutions and the acceptance of contactless payments by major retailers is growing at a quick pace in the UK, and this growth is anticipated to continue in the coming years.

## **2.4 State of the Technology in the United States**

Contactless bankcards are quickly gaining a foothold in the American payments industry, but the standards used by the payments industry in the United States are different from that in Europe.

### **2.4.1 USA Standards**

Contactless bankcards in the USA adhere to ISO/IEC 14443, which is the same smart card standard used for EMV in Europe, but the protocols used by US cards do not meet EMV standards (Heydt-Benjamin et al. 2007), nor are they standardized between payment card providers. US cards essentially send the same information that is present on magnetic stripe cards; each provider has a different set of messages to perform this exchange and related security steps. While these differences will not be described in detail in this document, the North American standards are generally considered to be less rigorous in terms of security than EMV (Heydt-Benjamin et al. 2007, Smart Card Alliance 2009).

### **2.4.2 USA Card Issuance & Retail Acceptance**

The incidence of bankcards with contactless functionality in the USA has been increasing significantly in the past few years, and the Smart Card Alliance, which is a non-profit association that works to promote the application of smart card technology, has reported the following statistics.

- **USA Card Issuance:** Contactless cards have been issued in the United States since 2004. As of June 2009, more than 90 million contactless bankcards (including other form factors, such as key fobs) had been issued under the brand names American Express, MasterCard, and Visa (Smart Card Alliance 2009).
- **USA Retail Acceptance:** As of June 2009, over 130,000 merchant locations accept contactless payments (Smart Card Alliance 2009). This includes many major retail chains that have rolled out contactless terminals, including 7-Eleven, BP, Arby's, Cold Stone Creamery, CVS/pharmacy, KFC, and Walgreens.

In summary, the rate of contactless card issuance by financial institutions and acceptance of contactless payments by major retailers has increased significantly over the past five years, and this growth is anticipated to continue in the coming years.

## 2.5 Contactless Bankcard Fare Collection Systems

In a contactless bankcard (CLBC) fare collection system, transit riders can walk up to the gates in rail stations and simply tap their CLBC as they walk through; likewise, when they board buses, they can simply tap their cards upon entering (Smart Card Alliance 2006). In other words, transit riders would be able to pay directly at rail gates and on buses, without having to purchase a ticket or load a smart card before entering. The cost of their trips would then be billed to them via their debit or credit card. CLBC users can also purchase period passes and other products online or through other channels; they again tap their card upon entry and are allowed to travel on the fare product purchased.

Direct payment with CLBCs should not be confused with co-branded multi-application smart cards. For example, Transport for London offers the Barclaycard OnePulse product. This is a contactless bankcard from Barclaycard that also has the Oyster smart card application on the same contactless chip. When a customer taps the card at a retail location, the financial application is utilized, but when a transit rider taps a Barclaycard OnePulse at a rail gate, the transit Oyster application is utilized. Because there is no interaction between the two applications on the contactless chip, this is essentially like putting an Oyster card onto a contactless bankcard and using one card for retail purchases and the other for transit rides (Lau 2009). While this configuration is a step beyond traditional smart cards, it does not allow for many of the advantages of direct payment by CLBCs that are discussed in the following sections.

## 2.6 Examples of CLBC Fare Collection Systems

Two American transit agencies, New York City and Salt Lake City, have successfully implemented programs that demonstrate the feasibility of direct payment with CLBCs at rail gates and on board buses.

1. **Salt Lake City:** Since 1970, the Utah Transit Authority (UTA) has operated the bus and light rail system in Salt Lake City with a proof of purchase fare collection operation. In 2006, the UTA launched a pilot program for contactless bankcard acceptance on 41 buses that served nearby ski resorts. This pilot program included the direct acceptance of contactless American Express, MasterCard and Visa cards, as well as ski resort season passes, employees IDs, and bus passes issued by the Salt Lake Visitor Bureau (Smart Card Alliance 2006).

After the successful pilot program, the UTA decided to expand electronic fare collection to system-wide. In January 2009, the CLBC system went live on 520 fixed bus route readers and 170 validators on 35 light rail platforms (MIT Transit Bankcard Workshop 2009). In the first six months of system-wide operation in 2009, the UTA found that the vast majority of electronic payments were made using third party passes, comprised of the “Eco” pass offered through local employers, the “Ed” pass offered to students, and ski passes. Contactless bankcards could only be used to pay full single adult fares, and this accounted for a very small percentage of all contactless transactions (MIT Transit Bankcard Workshop 2009). The UTA hopes to extend contactless bankcard acceptance to additional fare products in 2010.



Although the UTA is only the 37<sup>th</sup> largest public transit agency in America (based on the number of unlinked passenger trips, APTA 2009), this relatively small public transit agency is now a major leader in fare technology and policy innovation because they have successfully demonstrated that CLBC fare collection systems are indeed feasible system-wide.

2. **New York City:** The Metropolitan Transportation Authority (MTA) in New York City operates the largest transit agency in the United States, and currently, they manage a magnetic stripe fare collection system known as MetroCard. In 2006, the MTA partnered with MasterCard and Citibank for a contactless bankcard trial program. The trial included acceptance of MasterCard PayPass at 30 stations on the Lexington Avenue subway line, where PayPass could be used to pay the \$2 fare directly at the gate or to pre-pay \$20 using the agency's website.

After receiving positive feedback from riders participating in the trial, the MTA is now planning a phase II pilot program that will expand CLBC acceptance to 275 buses operating on 8 routes, include all fare products (e.g. passes, transfers, and reduced fare products), from all issuing banks and two networks (MasterCard and Visa), and on 3 bus routes operated by New Jersey Transit, and the PATH rail line (MIT Transit Bankcard Workshop 2009).

Both New York City and Salt Lake City have demonstrated that CLBC fare collection systems are feasible, and they are leading in terms of advancing acceptance on both bus and rail systems for a variety of fare products. The success of these two programs has inspired continued interest in open payment fare collection systems because of the many advantages that accompany the introduction of direct payment with CLBCs, which are briefly discussed in the following section.

## **2.7 Advantages of CLBC Fare Collection Systems**

CLBC fare collection systems offer many advantages over traditional proprietary smart card, paper, and token fare collection systems. The key advantage is that the use of CLBC for direct transit fare payments enables transit agencies to capitalize on the expertise of financial institutions and the payments industry. When transit agencies act in a similar fashion to regular merchants, such as retailers like CVS/pharmacy, Wal-Mart or 7-Eleven, and use standardized commercial payment technology, they will be able to decrease or eliminate some of the fare collection functions that previously utilized proprietary technologies. Functions such as card issuance and risk management have been performed by the financial industry for decades, allowing these companies to develop significant expertise in the area of advanced payments systems and to benefit from economies of scale across sectors. To sum this up in one sentence: the core mission of transit agencies is to provide transportation services, while financial institutions focus on banking; capitalizing on this specialization could be advantageous for both parties (MIT Transit Bankcard Workshop Discussion 2009).

Specific advantages of CLBC fare collection systems are divided into three major categories, as they would be viewed by the major stakeholders. In addition to opportunities for transit agencies and financial institutions, another critically important viewpoint is that of the transit rider. Last, this list is not comprehensive; it is intended to highlight the primary benefits to these groups, which are summarized in Figure 2-3.

Transit Riders	Transit Agencies	Financial Industry
Travel Time Savings	Reduced Card & Ticket Issuance	Consumer Awareness
Easy for Visitors	Reduced Retail Commissions	Cash Replacement
Interoperable between Cities	Reduced Customer Support Costs	Top-of-Wallet Effect
One Card & Billing Statement	More Standardized Equipment	
Reduced Queuing in Stations	Revenue Uplift Opportunities	
Additional Card Security	Co-branding & Rewards Program	
	Positive Public Relations	

Figure 2-3 Primary Advantages of CLBC Fare Collection Systems

### 2.7.1 Advantages for Transit Riders

Transit riders could realize many benefits from the use of contactless bankcards as fare media, including increased convenience and ease of access to transit system and improved payment security.

- Travel Time Savings:** One of the major user advantages of CLBC fare collection systems is a significant travel time savings for regular users who will not have to purchase a ticket or reload a smart card. For CLBC bus users, this is particularly advantageous, as many regular bus riders may have to visit retail locations to reload smart cards before boarding the bus. This is common in London, where Oyster Ticket Stops (OTS) at retailers and newsagents are prevalent, and these diversions can add a few minutes to the journey times of bus riders. Additionally, because many of these retail locations are not open 24 hours, bus users would not have to worry about stopping at reload retail locations before late night trips. Likewise, rail users will not have to queue at ticket windows or vending machines in stations to reload their smart cards. Users can pay by the ride or purchase period passes and other products online or via call centers.
- Ease of Access for Visitors:** When occasional riders and visitors want to use a transit system that they are unfamiliar with, determining which ticket to buy and how to use the fare media can be a confusing and complicated task. Transit agencies often have additional marketing and customer information at rail stations that cater to infrequent transit users, such as Heathrow Airport in London. In a CLBC fare collection system, users do not need to undergo this decision-making process regarding what ticket to buy. Instead, they can simply tap a CLBC at the gates in stations and have confidence that the correct fare will be charged automatically to their bankcard billing statement. This has the potential to significantly ease access and increase user-friendliness when complicated fare policies may otherwise confuse and frustrate visitors.
- Reduced Queuing in Train Stations:** Because CLBC users do not have to purchase tickets before boarding trains, there could be improved circulation of riders in crowded stations. Instead of long lines at ticket windows and vending machines, riders will be able to walk directly through the fare gates, which could potentially increase throughput and circulation in stations, resulting in a more pleasant traveling experience.

- **Interoperability between Transit Agencies:** CLBCs offer a market-based solution to standardization between fare media accepted by transit agencies. Currently, most metropolitan transit authorities do not have compatible smart card systems, and customers have to use a different smart card (or paper ticket) for each city they visit (TCRP 2006). The Baltimore-Washington D.C. regional acceptance of the SmarTrip card is one of the few notable exceptions in which multiple transit agencies have agreed to accept the same smart card (Smart Card Alliance 2006). If many transit agencies begin to accept CLBCs, customers who frequently travel between public transportation systems will have an interoperable means to pay for public transit, which will simplify their intercity traveling experience.
- **One Card and One Billing Statement:** Consolidation of payment media and processing is yet another advantage for the regular CLBC user. Instead of having to carry both a credit card and a ticket or smart card in his or her wallet, the CLBC user will have one less card or ticket. Likewise, CLBC users will not have to worry about having sufficient cash on hand to purchase tickets. Additionally, CLBC users will have the ability to examine all of their public transit charges with the rest of their regular bills when they receive their monthly statement.<sup>15</sup>
- **Security:** The Payment Card Industry (PCI) has developed Data Security Standards (DSS) that define required security measures to protect cardholder data. This is particularly advantageous in light of recent concerns over hacking of proprietary smart card systems (Nohl et al. 2008, Garcia et al. 2009). Additionally, the payments industry has existing policies regarding billing disputes and lost/stolen cards that may enhance protection and coverage for transit riders in CLBC transit systems.

### 2.7.2 Advantages for Transit Agencies

CLBC fare collection systems offer significant advantages to transit agencies, including fare collection related operating cost reductions in the areas of card issuance, customer support, and retail commission savings.

- **Reduction in Card Issuance:** Issuance of fare media is a major cost component in many proprietary smart card systems. For example, Transport for London estimated that approximately 9% of all revenue collection costs could be attributed to the production, issuing, and handling of Oyster cards (including photocards for special pass programs), which totaled nearly £32 million in fiscal year 2007-2008.<sup>16</sup> If transit agencies were to move to a CLBC fare collection system, there could potentially be a large reduction in these costs because financial institutions would have the primary responsibility for CLBC issuance and distribution related activities.

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<sup>15</sup> While these changes could simplify the customer experience, it is noted that some transit riders may prefer to keep their transportation funds separate from other bills, and the ability to “ring fence” their transportation spending by having a separate smart card may actually be viewed as a positive feature of traditional fare media systems by some budget conscious transit users.

<sup>16</sup> This value was calculated by the author while at Transport for London in 2009 as part of an annual activity known as the Cost of Revenue Collection. The goal of the analysis is to compile all costs, direct and indirect, related to revenue collection at Transport for London on an annual basis, and it includes annualized capital expenses, operational expenses, maintenance costs, staffing costs, etc. This model will be discussed in more detail in subsequent chapters.

- **Reduction in Retail Commissions:** As previously mentioned, many regular bus riders visit retail locations to reload cards before boarding the bus. This is particularly common in London, where Oyster Ticket Stops (OTS) are common at retailers and newsagents, and Transport for London must pay commissions to the retailers for each transaction in which an Oyster card is reloaded.<sup>17</sup> Likewise, the Chicago Transit Authority has a retail network of grocery stores, pharmacies and currency exchanges that sell magnetic stripe transit cards, and the CTA also pays commissions to these retailers on a per transaction basis. If CLBC users do not need to visit retail locations to reload their smart cards or purchase magnetic stripe tickets, transit agencies could see a substantial reduction in the cost of retail commissions.
- **Reduced Customer Support:** Many transit agencies have telephone hotlines, websites, and other customer support services to answer queries about smart cards, such as disputes related to transactions or questions about card balances. Transport for London has a dedicated telephone support service for smart card-related queries known as the Oyster Helpline, and again, this represents a significant annual cost to transit agencies.<sup>18</sup> In a CLBC system, many of the customer service functions currently performed by transit agencies may be provided by the financial institutions issuing CLBCs (i.e. the transit rider's bank), resulting in cost savings for transit agencies. The New York City CLBC pilot experience found this to be substantial (MIT Contactless Bankcard Workshop Discussion 2009).
- **Standardized Equipment:** Use of a CLBC fare collection system could reduce the capital costs of equipment, such as card readers. Transit agencies will be able to shift away from proprietary equipment designed by specialized providers, and they may now have equipment more similar in design to major retailers in other sectors.
- **Co-branding and Reward Program:** Credit card companies often offer reward programs for frequent card users. Specifically in the transportation industry, airline miles were among the first credit card reward programs (Henry and Salik 2006). More recently, studies have shown that customer satisfaction is particularly high for customers who use gasoline reward cards (First Data 2009). Given that reward programs can encourage transport-related purchases on credit cards, there may be opportunities for transit agencies to collaborate with the financial industry to offer co-branded cards (e.g., a Chicago Transit Authority branded credit card) or reward programs for frequent travelers to increase loyalty and satisfaction.
- **Revenue Uplift:** Because of the ease of access and simplification of payments for CLBC users, as discussed in the previous section, transit agencies may see new customers beginning to use the system and/or an increase in trips made by existing transit riders. This increase in system utilization could result in a direct increase in farebox revenues. Also, if riders do not need to preload value on transit cards, they may be more likely to tap and pay with the full fare; this could result in an increase in the average fare collected.

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<sup>17</sup> In FY 2007-2008, these OTS commissions totaled approximately £26 million, which represents a substantial cost to the agency.

<sup>18</sup> In FY 2007-2008, the Oyster Helpline cost TfL approximately £11.5 million to operate and maintain.

- **Positive Public Relations:** CLBC fare collection systems may also generate positive public relations (PR) for transit agencies. Using an innovative technology that simplifies the customer experience could result in local news broadcasts, newspaper articles, or blogs that discuss this product favorably and enhance the public image of the transportation agency.

### 2.7.3 Advantages for Financial Institutions

Financial institutions also need incentives to enter into this new market for commercial payment media, including:

- **Cash Replacement:** In the United States and the United Kingdom, many consumers use cash for small value transactions, particularly for micropayments, which are transactions less than \$5. In the past few years, new approaches for micropayments have begun to shift some customers from cash to bankcards (Smart Card Alliance 2006); for example, consumer signatures are not required for transactions below a certain value in the USA (usually \$25). Use of CLBCs in transit may catalyze a shift of customers from cash to bankcards for small value transactions, thereby increasing the number of customers for financial institutions and opening up the market that competes with cash.
- **Top-of-Wallet Effect:** A customer who uses one credit card for a transaction is likely to use that same card for his or her next transaction because it is at the top of his or her wallet, and the payments industry has coined the term “top-of-wallet” to describe this effect. Being top-of-wallet could influence a consumer’s choice of credit/debit cards if CLBCs were used in transit (MIT Transit Bankcard Workshop Discussion 2009). For example, if a regular commuter uses his or her CLBC every morning to travel to work, that customer may then use that same CLBC to purchase his or her morning coffee on the way into the office. Transit could provide an opportunity to increase brand loyalty and choice of credit cards because a large number of people would be using these cards every day for commuting.
- **Consumer Awareness:** CLBC usage in transit would necessitate additional customer education and raise awareness of RFID technology because traditional magnetic stripe payments would not be accepted at turnstiles in rail stations or when boarding the bus. This could increase awareness of CLBC technology in major metropolitan areas and help to expedite increases in CLBC usage desired by financial institutions.

## 2.8 Challenges of CLBC Fare Collection Systems

As is evident from the previous discussion, CLBC fare collection systems offer many advantages over traditional proprietary smart card, paper, and token fare collection systems, but as with any new technology, CLBC fare collection systems also have some challenging aspects that need to be addressed. Many of these challenges arise from the fundamental differences between transit agencies and traditional merchants who accept CLBCs. Some of the key differences include both institutional challenges and technical challenges that may be specific to transit, and these are discussed in the following paragraphs and are summarized in Figure 2-4. This list is intended only to highlight some of the major challenges facing transit agencies transitioning to CLBC fare collection systems and is not comprehensive.

Technical Challenges	Institutional Challenges
Transaction Speeds	Distanced-based and Zonal Fares
Bus-based Transactions	Revenue Protection
Fare Processing	Riders who do not have or want to use CLBCs
Standardization	Fees for Micropayments

Figure 2-4 Challenges of CLBC Fare Collection Systems

### 2.8.1 Technical Challenges

Technical challenges include:

- **Standardization:** There are differences between EMV and North American standards. Before contactless card rollouts become universal, it may be advantageous to determine methods for convergence, which some experts argue should be an American migration to the EMV standard (Smart Card Alliance 2009).
- **Transaction Speeds:** Because of the need for fast boarding on buses and quick passage through gates in rail stations, transit agencies must determine the appropriate transaction speed required for CLBC fare collection systems to maintain current levels of passenger throughput. In general, if transaction speeds take more than one second, there could be significant operational challenges to maintain current levels of passenger throughput. The transaction speed requirement for CLBCs may be on the order of 300-600 milliseconds, but transit agencies are still investigating this (MIT Transit Bankcard Workshop 2009).
- **Bus-based Transactions:** CLBC transactions on buses may need to be authorized in real-time (or near real-time). In rail stations with access to fiber data networks, this does not pose a significant technical challenge, but for bus-based transactions, this will require a reliable wireless communication link to a central server (Lau 2009). This appears to be feasible, given the recent successful introduction of CLBCs on buses in Salt Lake City.
- **Fare Processing Engine:** A fare processing engine is needed to take the bankcard transactions from gates and validators and then convert the contactless card “taps” into billable charges consistent with the fare policy, including single journeys, period passes, etc. A prototype fare engine for Transport for London was developed by Lau (2009), and similar processing capabilities are needed for agencies with different fare policies.

### 2.8.2 Institutional Challenges

Institutional challenges include:

- **Distance-based and Zonal Fare Policies:** Some major transit agencies have zonal or distanced-based fare policies. These policies require that a customer taps-in when he or she begins a journey and taps-out upon reaching his or her final destination, with the appropriate fare calculated based on the total distance traveled or the number of zones entered. This “tap-in tap-out” procedure is fundamentally different from a traditional merchant that has one swipe (or tap) per transaction, and some transit agencies may have different transaction models than regular merchants. A number of strategies to authorize a transaction could be

employed while the transit rider is making his or her journey. For example, when a transit rider first taps a CLBC at a rail gate, there could be (1) authorization of the card without value, (2) authorization of the maximum fare, or (3) no authorization at all, depending on how transit agencies want to trade off risks and speed of authorization (Lau 2009).

- **Revenue Protection:** Many transit agencies have revenue protection policies to assure that people riding the system have a valid ticket. In London, this includes revenue inspectors who board buses, request to see smart cards from customers, and use handheld devices (known as ‘Movies’) to verify that the smart card has indeed been tapped at a bus or rail validator. This verification is easily done because transaction data is written directly onto Oyster cards in a writable space commonly known as a *scratchpad*. In a CLBC fare collection systems, transit agencies may not have the ability to write data directly onto bank-issued cards, and transaction data may only be stored and processed in back office systems, as opposed to directly on the card. If bankcards are not issued with built-in scratchpads, transit agencies may need to develop other mechanisms to verify that passengers have valid tickets for revenue protection purposes.
- **Fee Structure for Micropayments:** Settlement of a standard credit card transaction includes fees paid to the payment network, issuing bank and acquirer, which are generally done on a per transaction basis. Because of the low value of many transit fares, these fees may be uneconomical for transit agencies. To remedy this, transit agencies may consider lumping payments together before sending them to the merchant acquirer in a process known as *aggregation*.<sup>19</sup> Transit agencies and financial institutions will need to negotiate the exact terms of the aggregation process should this be deemed an acceptable solution (Lau 2009).
- **Riders who do not have or want to use CLBCs:** Public agencies providing transportation service must be accessible to all patrons for reasons of equity, but a significant portion of riders may not have or may not want to use a contactless bankcard. Transit agencies will need to provide a solution that is amenable to these segments of the population, but because of the high costs of cash handling, this may be in the form of a contactless prepaid card. This institutional challenge will be the focus of the rest of this thesis.

## 2.9 Summary

If acceptable solutions to these challenges are developed, transit agencies, transit riders, and financial institutions may realize many benefits from the implementation of CLBC fare collection systems. Because each of these challenges requires significant effort to investigate and evaluate solutions, the rest of this thesis aims to tackle just one of the major institutional challenges: how to evaluate solutions for those who cannot or will not use CLBCs.

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<sup>19</sup> Period passes and pre-purchased fares could also be considered a form of aggregation.

### 3 Prepaid Cards in CLBC Fare Collection Systems

Prepaid cards are a potential solution to meet the needs of riders who do not have or do not want to utilize contactless bankcards (CLBCs) for transit fare payments (Smart Card Alliance 2010). Because prepaid cards have generally not been used for transit payments, they are discussed in the following two chapters as a guide to transit agencies considering this new form of fare media.

This chapter is divided into two sections. The first part provides background information about card functionality, business models, and payment processing requirements for existing prepaid card programs. Additionally, prepaid card issuance in the USA and UK is discussed, as well as key government regulations. The second half of this chapter focuses on the prepaid card proposition for public transit agencies, and a model for contactless prepaid cards in CLBC fare collection systems is proposed. This forms the basis of an analysis that compares potential prepaid card scenarios in the next chapter.

#### 3.1 Motivation: Why Prepaid Cards?

There are several reasons why contactless prepaid cards are considered an attractive option to complement CLBCs. Transit agencies transitioning to CLBC fare collection systems have many fare media options for riders who may not use CLBCs, and each option has different benefits for the transit rider and different costs to the transit agency. For example, direct payment with **cash** is available to all transit riders, but cash is expensive to collect and could decrease operational efficiencies by increasing dwell times to board buses. Transit agencies may want to reduce this means of payment (TCRP 2006). Likewise, riders in many major cities are familiar with **magnetic stripe tickets** and contactless **smart cards**. Transit agencies may want to continue to accept these well-known media for a period of time to assure a smooth transition to CLBCs, but the proprietary nature of these systems causes them to be costly to operate (MIT Transit Bankcard Workshop Discussion 2009). Additionally, **disposable contactless tickets** are not widely used in transit,<sup>20</sup> and unless they can be issued in a more cost effective manner, they may be less attractive. On the other hand, **contactless prepaid cards** offer the advantages of contactless (i.e. quick boarding, flexible fare policies, etc.) without the proprietary, expensive nature of smart cards and disposable contactless tickets. Contactless prepaid cards may be a favorable new option for transit fare payment (Smart Card Alliance 2010).

#### 3.2 What is a Prepaid Card?

A prepaid card is a plastic card associated with an account that the user loads with value, but it is not linked to a traditional debit or credit card account. The term prepaid card is often used interchangeably with stored value card, but these two terms can actually be defined in different ways. A **stored value card** exists when funds or data are physically stored on the card (such as with proprietary smart cards used by transit agencies), while prepaid cards could also have value or data maintained on back office computer systems affiliated with the card issuer. In the context of transit payments and for the rest of this thesis, the term **prepaid cards** will refer to preloaded cards that utilize the same operating standard as bankcards in which data and funds are stored in a back office computer system.

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<sup>20</sup> MARTA in Atlanta, GA utilizes disposable contactless tickets (known as the Breeze ticket), in addition to their reloadable contactless smart card (Breeze card) in an all contactless proprietary smart card fare collection system. [http://www.breezecard.com/htm/ticket\\_card.html](http://www.breezecard.com/htm/ticket_card.html)



### 3.3 Prepaid Card Functionality

Prepaid cards are currently used in many industries for different applications.

1. **Closed Loop Prepaid Cards:** Closed loop cards can only be used at a single merchant or chain of retailers, and the funds are non-transferrable. Closed loop cards are commonly referred to as *gift cards* because they were originally issued to replace paper gift certificates at major retailers (McDevitt 2009). While closed loop gift cards have traditionally targeted larger value transactions (such as department stores and gas stations), in recent years, closed loop prepaid card models have expanded to merchants with low value transactions, such as the well-known Starbucks<sup>21</sup> card in the USA.
2. **Open Loop Prepaid Cards:** Open loop prepaid cards are also commonly known as *network branded prepaid cards* or *general purpose prepaid cards*. As the names would imply, these cards carry the label of a major payment network, such as American Express, Discover, Visa and MasterCard, and they are accepted at any major retailer that accepts credit payments. Additionally, they can generally be used to withdraw cash from ATM networks. Open loop cards are often aimed toward consumer groups that cannot or will not use a traditional prepaid card, such as the unbanked or teenagers (Hendry 2008). Some examples of general purpose reloadable cards include Green Dot MasterCard and Visa<sup>22</sup> in the USA, and Tuxedo MasterCard<sup>23</sup> in the UK.
3. **Government Cards:** In the USA, prepaid cards administrated for government benefits programs have also been increasing in recent years (Smart Card Alliance 2010). Instead of mailing a check to the benefit recipient, the state or federal government deposits benefit money into a prepaid account. At the federal level, the most notable program is the Direct Express Card<sup>24</sup> that was introduced for social security payments for recipients without bankcards. At the state level, similar programs have also emerged for food stamp recipients (e.g. Illinois's Link card<sup>25</sup>), for unemployment (e.g. Illinois's Unemployment Insurance Debit Card<sup>26</sup>), for child support (e.g. New Mexico's Prepaid Debit Card<sup>27</sup>), and Temporary Assistance for Needy Families (e.g. North Dakota's TANF ReliaCard<sup>28</sup>).
4. **Corporate Cards:** Prepaid cards are also commonly used by major corporations for a variety of functions. First, prepaid cards can be used as incentives or rewards for employees or clients. Second, some companies use prepaid cards for payroll functions to deposit money into an employee's prepaid account if the employee opt-outs of direct deposit. Third, companies have also begun to use prepaid cards for pre-tax programs, such as healthcare reimbursements accounts and transit benefits program. Last, corporations have also begun to use prepaid cards for reimbursement of employees, including business-related travel expenses and per diems (Smart Card Alliance 2010).

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<sup>21</sup> Starbucks card: <http://www.starbucksstore.com/StarbucksCard/>

<sup>22</sup> Green Dot About our Products: <https://www.greendotonline.com/contents/login.aspx>

<sup>23</sup> Tuxedo Prepaid MasterCard: <http://www.tuxedo-eccount.co.uk/>

<sup>24</sup> Direct Express MasterCard: <http://www.usdirectexpress.com/edcfdtclient/index.html>

<sup>25</sup> Illinois Department of Human Services (DHS) Link Card: <http://www.dhs.state.il.us/page.aspx?item=30371>

<sup>26</sup> IDES Unemployment Insurance Debit Card: <http://www.ides.state.il.us/pdf/forms/debit/infbro.pdf>

<sup>27</sup> State of New Mexico Prepaid Debit Card: <http://www.hsd.state.nm.us/csed/dcfqa.html>

<sup>28</sup> North Dakota Department of Human Services ReliaCard: <http://www.nd.gov/dhs/info/pubs/docs/dn-1203-tanf-relia-card-handbook.pdf>

In addition to these four common types of prepaid cards, there are some additional uses of prepaid cards that have recently emerged. These include university **campus cards**, which allow students to make on-campus purchases, **insurance cards**, which make claim payments through a prepaid card, and **gambling cards** (Hendry 2008). Last, in the USA, hybrid closed-open loop prepaid card programs have also emerged, and these are commonly used within, e.g., a specific shopping mall where a limited number of merchants accept the same prepaid card.

While there are many types of prepaid cards in use today, the first two categories outlined above (open loop cards and closed loop cards) appear to have the most potential for transit agencies to meet the needs of riders not using contactless bankcards. The remaining card types are noted because of the availability of these programs to provide riders with prepaid cards that could be used for transit fare payments while being issued from outside sources (provided that they are contactless enabled). Last, open and closed loop prepaid cards are generally issued as either **reloadable** or **non-reloadable** (single use) cards. For the purpose of this thesis, it is assumed that prepaid cards have reloading capabilities because transit agencies have large numbers of low value transactions and want to avoid high issuing costs by decreasing churn and encouraging riders to use the same card repeatedly.

### 3.4 Prepaid Card Business Models

Because of the potential for open and closed loop cards in transit fare collection systems, the existing business models for these two types of cards in retail applications are discussed below. Closed loop and open loop cards typically follow different business models.

#### 3.4.1 Closed Loop Prepaid Card Business Model

Closed loop reloadable prepaid cards often follow a retail gift card model. Generally, revenue is not generated by cardholder fees, but instead, cards are issued for a variety of business reasons, including reducing cash handling costs, improving the customer experience, and expediting transaction speeds at cashiers. Additionally, closed loop cards may generate revenue for the company in the following manner:

- **Float:** This is the amount of money held by the card issuing company once the card has been loaded but before it is spent at the retailer. It can be treated like a deposit and earn interest.
- **Breakage:** This is the amount of money abandoned by the cardholder once he does not use the card anymore. Breakage can be subject to abandoned property rules (escheatment), which vary from state to state in the USA (DiSanto 2009) and may be subject to new rules under the Credit Card Accountability Responsibility and Disclosure (CARD) Act of 2009 (see below).
- **Spend:** Closed loop cards may help to encourage additional spending because the user may be less likely to perceive the cost of the payment when using with a card instead of cash, and increase spending.

### 3.4.2 Open Loop Prepaid Card Business Model

Open loop reloadable prepaid cards can generate some revenue from the factors listed above, including breakage and float, but the primary revenue generating mechanism for open loop cards consists of cardholder paid fees (Smart Card Alliance 2010). There is a variety of user paid fees that typically accompany prepaid schemes, including the following:

- **Card Issuance Fees:** When the card is initially acquired, the user will often pay a fee. This goes to fund the distribution process and the shelf space provided by the retailer.
- **Monthly Service Fees:** Some cards charge a flat fee each month that includes basic services, such as checking cashing, wire transfers, etc.
- **Transaction Fees:** Some general purpose card schemes charge the cardholder for each pin or signature transaction. This often covers costs such as interchange fees paid to the issuer of the card.
- **Reload Fees:** Many general purpose card schemes charge users each time that they add cash value to their cards. Unlike bank accounts, reloading is generally not done at bank tellers or at ATMs, but instead, through reload networks at retailers. Additionally, many prepaid programs allow for direct deposit of money to prepaid accounts and bank transfers, although fees for these services vary.
- **ATM Fees:** Withdrawing money or balance checking at ATMs is often accompanied by a user fee. ATM networks charge the issuer for this service, and this cost is commonly passed on to the consumer.
- **Other Fees:** Consumers are often charged a variety of other fees depending on the prepaid scheme. These include inactivity fees, which are charged when the card has not had any activity in a set period of time, customer service fees, which are charged when the cardholder queries about the account, and online bill payment fees (Smart Card Alliance 2010).

For example, Figure 3-1 summarizes user fees for two open loop prepaid programs: Green Dot in the USA and Tuxedo in the UK. Tuxedo offers a MasterCard, and Green Dot has both Visa and MasterCard.



	
£10 card issuance fee; Free reloads at Barclays bank; 99p reload fee at the Post Office; 3% reload fee at PayPoint (bill pay) locations; £12 monthly service fee; £10 to redeem the end balance; No transaction fees. <sup>29</sup>	Card issuance fee varies by retailer up to \$4.95; Reload fees vary by retailer up to \$4.95; Free cash withdrawals at participating ATMs; \$5.95 monthly service fee (unless loads over \$1,000 or 30+ purchases); No transaction fees. <sup>30</sup>

Figure 3-1 User Fees for Tuxedo and Green Dot Open Loop Prepaid Cards

<sup>29</sup> Tuxedo User Guide: [http://www.tuxedo-eccount.co.uk/documents/TMS\\_GEN\\_ONLINE\\_01\\_0110.pdf](http://www.tuxedo-eccount.co.uk/documents/TMS_GEN_ONLINE_01_0110.pdf) Accessed April 2010.

<sup>30</sup> Green Dot About our Products: [https://www.greendotonline.com/contents/products.aspx#gd\\_fees](https://www.greendotonline.com/contents/products.aspx#gd_fees) Accessed April 2010.

In summary, the business models for closed loop and open loop cards are very different. Closed loop cards are often utilized by large merchants to reduce cash handling costs and improve the customer experience, while open loop cards generally charge user fees in order to fund the program itself. Additionally, consumer advocate groups have begun to express concerns over the high cost of fees associated with many open loop prepaid cards programs (Martin 2009). Transit agencies considering prepaid card schemes may have to evaluate how these business models can be adapted to a transit context, where riders have generally not had to pay fees to use fare media in the past.

### 3.5 Prepaid Card Payment Processing

Payment processing using prepaid cards also varies with the type of the card. Closed loop cards have a much simpler model, while open loop cards are similar to standard payment processing for credit cards.

- **Closed Loop Reloadable Cards:** Closed loop reloadable cards generally follow a gift card model in which the merchant works with a payment processing or payments technology company to manage the scheme. The retailer usually pays the partner company for operating the processing services, card production, card packaging, back office reporting, etc. Some well known companies that manage closed loop prepaid card schemes for major retailers are Ceridian,<sup>31</sup> First Data,<sup>32</sup> and TSYS.<sup>33</sup>
- **Open Loop Reloadable Cards:** Open loop reloadable prepaid cards have a more complicated transaction process than closed loop cards. It is similar to the standard credit card process outlined in Figure 2-2. This process includes the merchant, the acquiring bank, the payment network, and the issuing bank, as well as additional parties. Most prepaid schemes have a *program manager* that is responsible for designing the scheme, developing the business and marketing plan, and managing the network of card distributors. Additionally, a *processor* (or member service provider) develops a software platform for supporting the card program, maintains a system of records for prepaid accounts, facilitates authorization and settlement, etc. Last, there is a *reload network* that provides a channel by which the cardholder adds funds to her prepaid card (Smart Card Alliance 2010). The model for open loop prepaid card processing can vary from program to program, and the parties can overlap in their roles and responsibilities.

### 3.6 Prepaid Card Regulation

Because open loop reloadable prepaid cards are similar to credit card transactions, some financial regulations also apply to open loop prepaid cards. These regulations are still evolving as prepaid cards become more commonplace (Smart Card Alliance 2010). The following paragraphs provide a brief discussion of the most relevant financial regulations in the USA and the UK, particularly those related to anti-money laundering (AML) and consumer protection laws. If transit agency fare collection systems move to prepaid cards, particularly open loop cards, these

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<sup>31</sup> Ceridian Stored Value Solutions: <http://www.storedvalue.com/index.php>

<sup>32</sup> First Data Gift and Incentive Card: [https://www.firstdata.com/en\\_us/products/merchants/gift-and-incentive-card](https://www.firstdata.com/en_us/products/merchants/gift-and-incentive-card)

Also, First Data recently partnered with Bank of America in a joint venture known as Banc of America Merchant Services.

<sup>33</sup> TSYS: <http://www.tsys.com/index.cfm>

regulations could play an important role in the design of fare collection systems and accompanying fare policies.

### 3.6.1 USA Prepaid Card Regulations

If an open loop prepaid card is reloadable, then the card issuer is generally considered to have established a “financial relationship” with the consumer and is subject to the financial regulations associated with depository accounts (Smart Card Alliance 2010). If a financial relationship exists, the **Bank Secrecy Act (BSA) of 1970** and the **United States Patriot Act of 2001** require creation of an Anti-Money Laundering (AML) program by financial institutions to prevent, detect, and report potential money launderers (McGimpsey 2009). Banks must also implement Customer Information Programs (CIP) in order to collect certain information from cardholders, commonly referred to as Know Your Customer (KYC) requirements. KYC requirements generally include personal information such as name, physical address, date of birth, and tax information number or Social Security number (Smart Card Alliance 2010). This information is then screened by the Office of Foreign Assets Control (OFAC), which maintains a federal list of oppressive governments, international terrorists, and narcotics traffickers (McGimpsey 2009). Furthermore, cardholder transactions are monitored, and suspicious activity is reported to the Financial Crimes Enforcement Network (FINCEN) within the Department of Treasury (McGimpsey 2009).

Additionally, on May 22, 2009, President Obama signed into law the **Credit Card Accountability Responsibility and Disclosure (CARD) Act of 2009**. Title IV of the Credit CARD Act sets limitations on the fees charged for general purpose prepaid cards and gift cards, limits on their expiration dates, and includes disclosure requirements for fees and expiration dates. The Federal Reserve Board is responsible for prescribing regulations to implement this new legislation, which should take effect on August 22, 2010 (Schwartz 2009). This legislation represents the first time Congress has acted to protect consumers using prepaid cards (Keitel 2009).

### 3.6.2 UK Prepaid Card Regulations

In a similar fashion to the US, the UK government implemented the **Money Laundering Regulations 2007** that are supervised by the Financial Services Authority (FSA). Prepaid companies with open loop cards generally conduct similar Know Your Customer (KYC) checks upon account creation and monitor transactions to prevent money laundering.

Last, some open loop reloadable prepaid cards in the UK do not require verification of registration information to comply with KYC requirements. One example is the Visa O<sub>2</sub> Money Card,<sup>34</sup> which has a load limit of £1,800 and cannot be used at all merchants, such as those with open-ended purchases like hotels. Similar cards may emerge in the USA in the near future. This area continues to evolve as solutions are proposed to meet the needs of different business while still meeting the goals of government regulations.

In summary, in both the US and the UK, anti-money laundering rules generally play a role in the implementation of open loop prepaid card programs because they require information to be

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<sup>34</sup> O2 Money Card FAQs: <http://money.o2.co.uk/faqs.php>

acquired about the customer. This could have implications for use for transit, specifically for riders who may not have the necessary documentation to meet these requirements or riders who prefer to remain anonymous. Additionally, because transit agencies have generally not required registration for smart cards, requiring registration for open loop prepaid cards could cause customer confusion and raise concerns of privacy.

### **3.7 The Prepaid Card Market**

The prepaid card market has emerged and grown over the past decade in the UK and the USA. One similarity between these two countries is that these markets are developing in a relatively fragmented manner. Unlike the issuance of contactless bankcards, which has been led by just a few major financial institutions in each country, the market for prepaid cards involves many small companies, often operating in niche markets (Hendry 2008). The rapidly growing, decentralized natures of these markets make it difficult to assess the overall size and utilization of prepaid cards in the UK and the USA.

#### **3.7.1 USA Prepaid Card Market**

The issuance of prepaid cards in the USA has grown at a fast rate over the past decade and is emerging as an important component of the payments industry (Bachelder 2008). Numerous studies have been conducted to estimate the size of the open and closed loop prepaid markets, but the results have varied significantly. The Federal Reserve has summarized these studies in the 2007 Electronic Payments Study, in which they estimated the value of the US open loop prepaid card market to be \$13.3 billion and closed loop prepaid cards to be \$36.6 billion in 2006 (Bachelder 2008). The Mercator Group estimated \$197.7 billion for closed and open loop cards in 2006 (Bachelder 2008), which is significantly greater than the Federal Reserve's estimate for the same year. More recently, a 2008 study by the Mercator Group estimated that open loop cards total \$60.42 billion in 2008, closed loop cards were approximately \$187.24 billion, and the combined open and closed loop cards totaled \$247.7 billion (Mercator Advisory Group 2009). This shows substantial growth over the Mercator Group's 2006 estimate.

The number of consumers who use prepaid cards has also been studied. The Federal Reserve Bank of Boston, in conjunction with the RAND Corporation, conducted a Survey of Consumer Payment Choice in 2008, which was a nationally representative survey designed to assess the adoption and use of different payment instruments in America (Foster et al. 2009). This survey concluded that 17.2% of Americans currently have a prepaid card (see Figure 3-2). Furthermore, the Federal Reserve found that prepaid adopters had, on average, 2.4 prepaid cards, and prepaid card users reloaded their cards 1.1 times per month. Although prepaid cards showed relatively small utilization and penetration rates compared to other payment cards, this survey demonstrates that they are now being recognized alongside traditional, longstanding payment instruments (such as cash, checks, and credit cards).

<b>Financial Instrument</b>	<b>Current Adoption (Percent of Consumers)</b>
Any Payment Card	93.4%
Debit Card	80.2%
Credit Card	78.3%
Prepaid Card	17.2%

Figure 3-2 Adoption of Payment Cards

Source: 2008 Federal Reserve Survey of Consumer Payment Choice

### 3.7.2 UK Prepaid Card Market

The prepaid market in the UK is growing, but it is not as developed as the US market. At this time, APACS, who collects statistics on credit and debit cards, has not yet released statistics on the overall number of prepaid cards in the UK (Hendry 2008).

One reason the British prepaid card market may not be as large as the American market is that the British government has taken significant steps to increase financial inclusion over the past decade (Financial Inclusion Taskforce 2009). As will be seen in Chapter 5, only 2% of British households are considered to be unbanked, and a large number of these households have basic accounts provided by the Post Office (Financial Inclusion 2009). Because of government efforts to increase financial inclusion and provide basic bank accounts to the public, there may be less demand for prepaid cards, particularly open loop programs that are intended for the underserved.

### 3.7.3 Contactless Prepaid Cards

While prepaid card issuance and utilization has generally been growing in recent years, these products (particularly open loop cards) have not been widely issued with contactless technology in the UK (Hendry 2008) or the USA (Smart Card Alliance 2010). Prepaid companies would need to include a contactless chip in the card if contactless prepaid cards were used in transit CLBC fare collection systems. Prepaid program managers and issuers may be more inclined to upgrade from contact to contactless cards because of the increasing number of merchants now accepting contactless (see Chapter 2), which makes the business proposition more attractive (Smart Card Alliance 2010).

## 3.8 Contactless Prepaid Cards: Los Angeles Transit

While prepaid cards have generally not been issued with contactless functionality, one notable exception is a pilot program recently announced in Los Angeles for transit fare payment. The Los Angeles County Metropolitan Transportation Authority, which is the third largest provider of transit in the USA (APTA Fact Book 2009), is working with Visa to offer a special Visa payWave card that also incorporates the transit system's TAP smart card application. This will be a dual-use card (similar to the OnePulse Barclaycard offered by Transport for London, in which the transit funds are separate from the financial funds), but the financial application is a *prepaid* Visa card. Two types of Visa prepaid cards are planned to be introduced. The first will be sold and reloaded through automated kiosks<sup>35</sup> located in LA Metro System locations. The second will have similar features to the first card, except it will also include ATM cash access

<sup>35</sup> The kiosks are known as ReadySTATIONS and are designed by ReadyCredit Corp.

and the possibility to link direct deposits of paychecks to the prepaid account (Business Wire 2008). This program will target the underserved, unbanked community in Los Angeles.

This pilot is different from the transit prepaid model that is outlined in the next section because it is a dual-application card, and transit payments are held separate from regular prepaid payments.

### **3.9 Prepaid Cards in CLBC Fare Collection Systems**

The remainder of this chapter describes one potential model for contactless prepaid cards in CLBC fare collection systems, and it has not yet been implemented by any transit agency in the USA or UK. Contactless prepaid cards accepted in CLBC fare collection systems would allow transit riders to walk up to the gates in stations and tap their contactless prepaid cards. The primary difference between prepaid cards and smart cards would be that contactless prepaid cards would utilize the same standards as regular contactless bankcards (i.e. EMV in the UK). The prepaid value would not be stored directly on the card, as is the case for smart card systems such as the Oyster card or Chicago card, but instead, the value is stored in a back office account. The prepaid account would be similar to a debit account, but it would be available to all riders, even those without bankcards. Because contactless prepaid cards operate on payment industry standards and store information in an account similar to debit cards, cards could be either open loop or closed loop. Last, because this prepaid model is similar to that of companies in the payments industry, it is assumed that many companies may want to enter into the transit fare collection industry that were previously not in this market.

### **3.10 Elements of a Transit Prepaid Card Program**

In order to implement this model for contactless prepaid cards, many policy decisions must be made by transit agencies. For example, unlike contactless bankcards, prepaid cards may not be issued directly by financial institutions, and transit agencies may need channels to distribute them to customers. Likewise, because the account is prepaid, transit agencies need means for customers to load value into their account using cash. Other elements of a transit prepaid program are defined in Figure 3-3, and potential options for each are presented in the following paragraphs. These elements are intended to highlight the primary parts of a transit prepaid program, but other policies may be needed. For example, revenue protection policies to assure correct payment by riders (such as via revenue inspectors) may be necessary. Many of these decisions are similar to current smart card systems.



<b>Elements of a Transit Prepaid Card Program</b>	<b>Definition</b>
1. Card Function	This refers to the how and where the card can be used for transactions.
2. Fare Policy	This refers to the fare charged to those using prepaid cards in comparison to contactless bankcards.
3. Customer Service	This refers to channels to provide information to the customer about the prepaid program.
4. Program Manager and Bus Distribution Channels	This party is responsible for the overall design of the prepaid program. Based on the program manager, businesses throughout the city would be used to distribute and reload prepaid cards, which could serve bus customers who do not regularly enter rail stations.
5. Rail Distribution Channels	Rail stations would have channels to distribute and reload prepaid cards, such as self service vending machines or ticket offices.
6. Additional Distribution Channels	Additional channels to distribute and reload prepaid cards include websites and call centers.

Figure 3-3 Elements of a Transit Prepaid Card Program

### 3.10.1 Card Function

The first element shown in Figure 3-3 is card function, which refers to the how and where the card can be used for transactions. Because this is new to transit fare media, it will be discussed in greater detail in the following chapter.

1. **Closed loop contactless prepaid cards:** Closed loop cards could only be used for transit fare payments, and the customer experience would be similar to current smart card systems. The customer could use cash to load value into a prepaid account, such as at vending machines in rail stations, and then the customer could tap the card at gates in stations. The correct fare would then be debited from their prepaid account.
2. **Open loop contactless prepaid cards:** Transit fare payments using open loop prepaid cards would be similar to that of closed loop cards. The main difference would be that the customer could also use the same prepaid card at retailers and other merchants. A transit rider could walk into a coffee shop that accepts contactless payments at the register, and the customer could pay using the open loop prepaid card because it operates on the payment industry standards and networks.

### 3.10.2 Fare Policy

The fare policy for prepaid cards in comparison to contactless bankcards is another important policy decision for transit agencies. Prepaid fare policies can be divided into four main categories, which are fare prices, fare products, card issuance fees, and concessions.

1. **Fare Prices:** Transit agencies need to consider if fares on prepaid card will be priced at the same rate as fares on contactless bankcards. Because of equity considerations, it is presumed that transit journeys on prepaid cards will have the same prices as those on CLBCs.

2. **Fare Products:** Transit agencies must also decide if the same products (i.e. period passes, pay per ride) will be offered on CLBCs and prepaid cards. Because of equity considerations, it is again assumed that the same fare products will be offered on both CLBCs and prepaid cards. This is particularly relevant at the CTA and TfL, where period passes are popular and are often viewed as offering the best value for money (Hong 2006).
3. **Card Issuance Fees:** CLBCs are distributed directly by financial institutions, and card issuance fees are generally set by banks or may be done in conjunction with the transit agency for co-branded cards. For prepaid card issuance, transit agencies have three possible options: they could either charge an initial fee, a refundable deposit, or distribute the card free of charge. Currently, the Chicago card has an initial fee of \$5, and the Oyster card has a refundable deposit of £3. It is unlikely that prepaid cards would be offered for free because this could increase churn and customers would treat cards as disposable.
4. **Concessions:** Many transit agencies have concession programs that offer reduced or free fares to specific groups of riders, such as children and retired persons. These discounts are often mandated by the government, and many of them require special considerations in the fare planning process (including issuance of special cards with a photo, verification of eligibility, etc.) These programs could be instituted on prepaid cards in a similar manner to current concession schemes on smart cards, such as the Freedom Pass for older and disabled riders in London.<sup>36</sup>

### 3.10.3 Customer Service

Transit agencies would require means to communicate information to the customer regarding prepaid cards, accounts, and queries. This could overlap with customer service channels for contactless bankcards, which could include the following.

1. **Website:** Information could be posted on the transit agency website; likewise, customers could email queries to the transit agency.
2. **Call Center:** There could be a call center to answer questions from customers.
3. **SMS:** Customers could receive SMS balance alerts and other information directly on their cell phones. This is becoming a popular feature of some prepaid card programs, such as the O<sub>2</sub> prepaid card in England, which sends prepaid account balance alerts via text message.<sup>37</sup>

### 3.10.4 Program Manager and Bus Distribution Channels

The term *program manager* will be broadly used to describe the party responsible for the overall design and operation of the prepaid program. In a similar fashion to many smart card systems, transit agencies could manage the prepaid program in-house. Additionally, the use of common standards creates the possibility for collaboration between transit agencies and companies in the payment industry. Many companies have the capability to manage a transit prepaid program, and broad categories of possible partners are defined in the following paragraphs to help transit agencies navigate the payments industry.

Moreover, many companies in the payments industry already have channels to load value into prepaid (or similar) accounts. Transit agencies may be able to utilize existing channels at

<sup>36</sup>TfL Getting Around with Discounts: <http://www.tfl.gov.uk/assets/downloads/getting-around-with-discounts-january-2010.pdf>

<sup>37</sup>O2 Money Card: <http://money.o2.co.uk/>

businesses throughout the city to distribute and reload transit prepaid cards. This could serve bus customers who do not regularly enter rail stations and is referred to as the *bus distribution channel*. Because of this linkage between program manager and bus distribution channels, these two elements are presented together. Five possible options are defined in the following paragraphs, and these options will be evaluated in greater detail in the next chapter.

1. **Transit Agency**: The transit agency could manage a transit prepaid program in a similar fashion to current smart card systems. The CTA currently manages the Chicago card program in-house, and TfL outsources the management of the Oyster card system to TranSys, a private consortium including Cubic Transportation Systems. Both of these agencies have bus distribution channels that are used for smart card reloads and/or distribution of magnetic stripe tickets. In London, Oyster Ticket Stops (OTS) are located in approximately 4,000 retail shops and newsagents, where customers can add value to Oyster cards.<sup>38</sup> The CTA has approximately 60 Touch'n'Go locations<sup>39</sup> in currency exchanges and retail shops where Chicago cards can be loaded; additionally, the CTA distributes magnetic stripe tickets at approximately 700 supermarkets, currency exchanges, and other retailers in the Chicago metropolitan area.<sup>40</sup> If equipment were installed or upgraded at these locations, these could serve as bus distribution channels for prepaid card programs.
2. **Bill Payment Companies**: Companies that specialize in bill payments and other alternative financial services could potentially partner with transit agencies. For example, in London, companies such as PayPoint<sup>41</sup>, ePay<sup>42</sup>, and Payzone<sup>43</sup> operate real-time payment processing networks for utility bills, mobile phone top-ups, and reloads of closed and open loop prepaid cards. This is done at the checkout counter of retailers and newsagents. Bill payment companies in Chicago include Western Union<sup>44</sup> and MoneyGram,<sup>45</sup> which process open loop prepaid cards, utility bills, money transfers, etc. These companies are often located in currency exchanges, and some have locations in chain retailers such as pharmacies. The transit agency could partner with a bill payment company, and customers could load money into their transit prepaid account, in a similar fashion to the way that they currently pay utility bills or top-up other prepaid cards. Last, it should be noted that, in the UK, these companies generally do not issue prepaid cards, so it may be possible for the transit agency to manage the program and simply use the bill payment locations to serve as a bus distribution and reload channel.
3. **Prepaid Companies**: A subset of companies in the payments industry specialize in managing open loop prepaid card programs. This includes CashPlus<sup>46</sup>, Bread<sup>47</sup>, ClearCash<sup>48</sup>,

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<sup>38</sup> Oyster Ticket Stop Locator: <http://ticketstoplocator.tfl.gov.uk/LocationLocator/>

<sup>39</sup> CTA Chicago Card Touch'n'Go Locations: <http://www.chicago-card.com/cc/pos/index.html>

<sup>40</sup> CTA Transit Card Sales Outlets: [http://www.transitchicago.com/assets/1/fare\\_information/Transit\\_Card\\_Sales\\_Outlets\\_-\\_updated\\_3\\_30\\_10.pdf](http://www.transitchicago.com/assets/1/fare_information/Transit_Card_Sales_Outlets_-_updated_3_30_10.pdf)

<sup>41</sup> Paypoint: <http://www.paypoint.co.uk/>

<sup>42</sup> ePay: <http://www.epayworldwide.co.uk/>

<sup>43</sup> Payzone: <http://www.payzone.co.uk/>

<sup>44</sup> Western Union: <http://www.westernunion.com>

<sup>45</sup> MoneyGram: <https://www.moneygram.com>

<sup>46</sup> CashPlus Prepaid Products: <http://www.mycashplus.co.uk/>

<sup>47</sup> Bread Prepaid Products: <http://www.breadcard.com/>

Eclipse<sup>49</sup> and Tuxedo<sup>50</sup> in the UK and companies such as Green Dot<sup>51</sup> and netSpend<sup>52</sup> in the USA. In order for customers to top-up their prepaid cards, the British companies generally utilize bill payment networks (above) for reloading. American companies often have their own loading locations in retailers, such as Wal-Mart or CVS/pharmacies. These locations could then be used as a bus distribution and reload channel for transit prepaid card programs.

4. **Payment Card Companies:** Some payment card companies currently participate in open loop prepaid programs. This includes Visa, which manages ReadyLink<sup>53</sup> reload locations, and MasterCard, which has the rePower<sup>54</sup> program. Both ReadyLink and rePower exist in the USA, and their reload locations are typically in chain retailers, such as 7-Eleven convenient stores. Only MasterCard rePower currently exists in Britain, and this prepaid program utilizes a bill payment company (Payzone<sup>55</sup>) for reloading.
5. **Financial Institutions:** Financial institutions could manage a prepaid program. In the UK, High Street banks are beginning to enter the prepaid card market, and some allow for prepaid cards to be reloaded using ATMs and bank branches.<sup>56</sup> In the USA, some banks are beginning to offer increased prepaid card services, such as Citibank, which has a prepaid card services division.<sup>57</sup> It is envisioned that ATMs and bank branches could be used for transit prepaid card programs as a bus distribution and reload channel.

There are other players who may emerge in the prepaid market. Companies that manage **debit networks** could become potential partners; for example, in London, VocaLink<sup>58</sup> manages the Link ATM switching network, which could potentially be used for prepaid top-ups. Likewise, **payment processing** companies, such as First Data,<sup>59</sup> have also begun to enter the prepaid market. These other options will not be evaluated in this thesis due to time and information constraints, but transit agencies should be aware of them.

Last, multiple companies in these broad categories could work together to offer a transit prepaid solution. For example, a financial institution could issue and distribute a transit prepaid card, and they could partner with a bill payment company to increase the number of distribution and reload locations. For simplicity, these hybrid options will be not evaluated in this thesis.

### 3.10.5 Rail Distribution Channels

In addition to distribution channels for bus riders, it is envisioned that rail riders would also have means to acquire and reload prepaid cards in stations. Traditionally, transit riders have been able

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<sup>48</sup> ClearCash Prepaid Products: <http://www.clearcash.co.uk/>

<sup>49</sup> Eclipse Prepaid Products: [www.eclipsocard.co.uk/](http://www.eclipsocard.co.uk/)

<sup>50</sup> Tuxedo Prepaid Products: <http://www.tuxedo-eccount.co.uk/>

<sup>51</sup> GreenDot Prepaid: <https://www.greendotonline.com/contents/login.aspx>

<sup>52</sup> netSpend Prepaid: <https://www.netspend.com>

<sup>53</sup> Visa ReadyLink Prepaid: [http://usa.visa.com/personal/cards/prepaid/readylink\\_card.html](http://usa.visa.com/personal/cards/prepaid/readylink_card.html)

<sup>54</sup> MasterCard rePower Prepaid: <http://www.mastercard.com/us/personal/en/aboutourcards/prepaid/rePower/index.html>

<sup>55</sup> Payzone News: <http://www.payzone.co.uk/pages/posts/payzone-signs-major-agreement-with-ukash-to-roll-out-mastercard-repowertrade94.php>

<sup>56</sup> For example, Tuxedo open loop prepaid cards can be loaded at Barclays bank ATMs.

<sup>57</sup> Citi Prepaid Services: <http://www.corp.prepaid.citi.com/>

<sup>58</sup> VocaLink: <http://www.vocalink.com/en/Pages/Default.aspx>

<sup>59</sup> First Data Prepaid Card Solutions: [https://www.firstdata.com/en\\_us/products/financial-institutions/debit-solutions/prepaid](https://www.firstdata.com/en_us/products/financial-institutions/debit-solutions/prepaid)

to walk into rail stations and purchase tickets at either ticket windows or via self service vending machines, and this practice will probably continue with prepaid programs.

1. **Vending Machines:** Transit card vending machines are currently provided by specialized companies such as Cubic<sup>60</sup>, GenFare<sup>61</sup>, Shere<sup>62</sup>, or Scheidt & Bachmann.<sup>63</sup> There may be opportunities for other ATM or kiosk providers to enter this business (such as NCR<sup>64</sup> or Wincor Nixdorf<sup>65</sup>), or companies that specialize in prepaid reloading (such as ReadyCredit<sup>66</sup>) because vending machines would read payment industry standards. Bank ATM machines can also serve the rail distribution function for transit, as well as providing general banking functions.
2. **Ticket Offices:** Ticket offices in stations could allow riders to queue to load value to prepaid cards at tellers. TfL currently has ticket offices, while the CTA does not.

### 3.10.6 Additional Distribution Channels

Transit agencies may want other channels to distribute and reload prepaid cards. Many of these capitalize on new information and communication technologies.

1. **Online Payments:** Online person-to-person payment services, such as PayPal,<sup>67</sup> could be used to load prepaid accounts.
2. **Websites:** Websites could be used to load value into prepaid accounts; TfL currently does this for Oyster card top-ups.<sup>68</sup> Since cash cannot be accepted via a website, this option must be integrated with an online payment service or other similar channel.
3. **Call Centers:** Call centers could be used to sell and reload value via the telephone, which would function in tandem with another channel since call centers cannot accept cash.
4. **Mobile Payments:** Mobile commerce is rapidly emerging as a new form of payment, and technologies such as SMS could be used to transfer money into a prepaid account. For example, Obopay<sup>69</sup> offers an SMS mobile payment service.
5. **Direct Deposit:** Money could be loaded into prepaid accounts using direct deposit through the Automated Clearing House (ACH) electronic network used by financial institutions.<sup>70</sup> This may be particularly advantageous in the USA, where many companies offer transit benefit programs to employees in which transportation subsidies are provided on a monthly basis and could be transferred directly to transit prepaid accounts.

## 3.11 Summary

The first half of this chapter provided background information on prepaid cards, including functionality, business models, market size, and government regulations for prepaid cards. From

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<sup>60</sup> Cubic Transportation Systems Vending Machines: <http://www.cubic.com/cts/Publications/DataSheets/A4/Universal%20Vendor%201000.pdf>

<sup>61</sup> GenFare Vending Machines: <http://www.gfigenfare.com/Products/TVM.html>

<sup>62</sup> Shere Vending Machines: [http://www.shere.com/products\\_services/rail\\_ticket\\_vending\\_machines](http://www.shere.com/products_services/rail_ticket_vending_machines)

<sup>63</sup> Scheidt & Bachmann Vending Machines : <http://www.scheidt-bachmann.com/content/blogcategory/172/181/>

<sup>64</sup> NCR Kiosks: [http://kioskmarketplace.com/storefronts\\_15.php](http://kioskmarketplace.com/storefronts_15.php)

<sup>65</sup> Wincor Nixdorf Kiosks: [http://www.wincor-nixdorf.com/internet/site\\_EN/EN/Products/Hardware/KioskSystems/node.html](http://www.wincor-nixdorf.com/internet/site_EN/EN/Products/Hardware/KioskSystems/node.html)

<sup>66</sup> ReadyStation by ReadyCredit: <https://www.myreadycard.com/aboutus.aspx> :

<sup>67</sup> PayPal: <https://www.paypal.com/>

<sup>68</sup> TfL customers can make Oyster card purchases online at: <https://oyster.tfl.gov.uk/oyster/link/0001.do>

<sup>69</sup> Obopay: <https://www.obopay.com/>

<sup>70</sup> The ACH program is known as BACS in the UK.

this discussion, it can be concluded that the market for open and closed prepaid loop cards is growing in the USA and the UK, and prepaid card products are rapidly emerging to meet the business needs of many organizations, including government agencies and large corporations.

A model for prepaid cards in CLBC fare collection systems was presented. Transit agencies will have many options for implementation of prepaid card programs, including card function, program manager, rail distribution channels, additional distribution channels, fare policy, and customer service. Because card function and program manager options are significantly different from current smart cards systems, these two will be analyzed in the following chapter for the two case studies that have been discussed in this thesis: the Chicago Transit Authority and Transport for London.

## 4 Evaluation of Transit Prepaid Card Programs

In the model for prepaid cards in contactless bankcard (CLBC) fare collection systems, two key policy decisions may be significantly different from current smart card systems: program manager and card function. These two elements are presented in possible future scenarios to help transit agencies compare them. An evaluation framework is presented based on three primary dimensions: cost, coverage, and customer experience. This framework is then applied to the two case studies used in this thesis: Transport for London (TfL) and the Chicago Transit Authority (CTA).

### 4.1 Transit Prepaid Card Program Scenarios

Five general categories of potential program managers were presented in the previous chapter. Likewise, two possible options for card function were defined (see Figure 4-1 below). It is assumed that it would be possible for each of the program managers to offer either type of card function. For example, a prepaid card company that currently sells open loop cards may choose to offer transit agencies a closed loop product, if the economics are favorable.

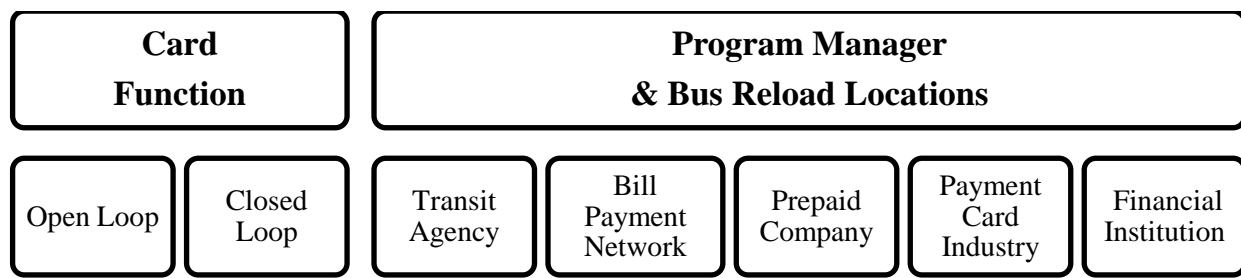


Figure 4-1 Transit Prepaid Card Program Scenarios

### 4.2 Dimensions for Analysis of Transit Prepaid Card Program Scenarios

Key business requirements must be chosen for transit agencies to compare prepaid scenarios. For this analysis, three primary dimensions are chosen for evaluation.

#### 1. Customer experience

Transit agencies may aim to have a simple, streamlined prepaid customer experience that gives customers maximum flexibility and functionality.

#### 2. Coverage for reloads

Transit agencies may want to assure sufficient geographic coverage for distribution and reloading of prepaid cards, which is especially important for bus users who do not regularly enter rail stations. Additionally, these channels must operate in (near) real-time to assure that customers who load value into a prepaid account can immediately board buses or trains.

#### 3. Costs

Transit agencies may want to keep costs for the prepaid card program as low as possible. This could include operational costs, as well as capital costs for installation of hardware, communications technology, and back office systems.

Customer experience, coverage, and cost will be important factors for most transit agencies evaluating prepaid card programs.

## 4.3 Customer Experience

The following sections explain the possible differences between the customer experiences for prepaid scenarios based on card function and the program manager options for TfL and the CTA.

### 4.3.1 Card Function

This policy decision has important consequences on two parts of the transit prepaid customer experience: the initial acquisition of the card and the usage of the card.

- **Initial Acquisition:** When a customer initially acquires a reloadable open loop prepaid card, he will probably be required to register it because open loop cards are generally subject to Anti-Money Laundering (AML) rules in the UK and the USA, which are referred to as Know Your Customer (KYC) requirements (see Chapter 3). The customer may have to give personal information, such as name, address, and social security number. This could have implications for riders who may not have the necessary documentation to meet these requirements or riders who prefer to remain anonymous.<sup>71</sup> Moreover, this process costs money to perform, which will be reflected in the cost analysis later in this chapter. However, Visa has begun offering an open loop prepaid cards without this registration process, which could address these issues in a transit context.<sup>72</sup> Closed loop prepaid cards are generally not subject to KYC requirements. Registration could be encouraged but not required for closed loop cards, which will keep card issuance costs lower.
- **Card Usage:** Because open loop cards can be used for transactions at regular merchants, the rider has the added convenience of being able to use the same card to purchase everyday items in shops as well as on transit. For closed loop cards, transit riders would not have this additional convenience.

### 4.3.2 Program Manager and Bus Distribution Channels

The choice of program manager primarily affects how and where prepaid cards are distributed and reloaded through the bus distribution channel. These five options are discussed for London and Chicago in the following sections.

1. **Transit Agency:** The customer experience for a transit agency managed prepaid program could be very similar to current smart card systems. In London, customers could continue to go to Oyster Ticket Stop (OTS) locations to load cards, but the equipment at these locations would be upgraded to be compatible with payment industry standards. Likewise, CTA bus riders could continue to visit currency exchanges or supermarkets, but because many of these locations currently vend only magnetic stripe tickets, equipment would need to be installed for prepaid cards. In summary, the customer would experience very little change in his or her current method for card acquisition and reloading, and this would require little additional customer information and education.
2. **Bill Payment Company:** The customer experience would be slightly different if bill payment companies provided the bus distribution channel. In London, bill payment companies are primarily located in retailers and newsagents, but some of these locations are

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<sup>71</sup> Some riders would not have the required documentation for registration, or riders such as foreign visitors, registration would be cumbersome. Therefore, a non-reloadable, non-registered card may need to be offered.

<sup>72</sup> O2 Money Card FAQs: <http://money.o2.co.uk/faqs.php>



different from OTS locations, which may require some customer education depending on the company selected. Additionally, one bill payment company currently allows for payments of the TfL Congestion Charging<sup>73</sup> scheme in downtown London (ePay), so some TfL customers may already be familiar with these locations. In Chicago, bill payment companies are primarily located in currency exchanges and retailers, but locations may be different from the current distribution channels. Some customer education campaigns may be necessary to assure that riders know where locations are.

3. **Prepaid Company:** The customer experience for prepaid companies in London could be an expanded form of the previous option. For example in London, the company Tuxedo manages a prepaid MasterCard program, and customers can load value into their prepaid account at bill payment locations in retailers and newsagents (PayPoint), at the Post Office, and using Barclays bank ATMs. All of these reload locations could then be used for the transit prepaid program. In Chicago, prepaid companies are primarily located in retailers, such as 7-Eleven, Walgreens, and CVS/pharmacy. Again, customer education campaigns may be necessary to inform riders of reload locations.
4. **Payment Card Company:** In London, MasterCard rePower utilizes a bill payment company (Payzone) for card loading, so the customer experience would be similar to previous options. In Chicago, payment card companies utilize multiple channels for prepaid card loading, and the transit prepaid card customer experience could be different from the previous options. For example, Visa ReadyLink allows open loop prepaid cards to be reloaded through a bill payment network (Money Gram), as well as many retail locations (such as Randall grocery stores), and ATMs (Visa 2008). Some customer education campaigns may be necessary to assure that riders are aware of all of these possible channels.
5. **Financial Institutions:** If financial institutions become more active in the prepaid card market, prepaid card reloads could occur at banks and ATMs. This is a significantly different customer experience than the other options that primary operate in retail locations. This option could capitalize on new “no envelope” ATMs, which allow the user to input cash directly into the ATM without an envelope. Cash could be counted in near real-time, and the value could be added to prepaid accounts. The roll-out of this technology is happening at various rates between financial institutions. For example, Chase (Feig 2008) and Bank of America (Bank of America 2007) are expanding their rollout of cash scanning ATMs, but this technology appears to be more limited in the UK.

## 4.4 Coverage

The following section compares geographic coverage of bus distribution channels for each program manager option for TfL and the CTA. First, a geographic area is defined in which the number of locations is evaluated. For London, the M25 ring road approximately 20 miles from the city center serves as a convenient boundary for TfL bus and rail services. For Chicago, a 20 mile radius from the Loop assures sufficient coverage.<sup>74</sup> Then, the number of locations for each potential program manager is counted within this zone. Last, many companies are quickly adding new locations within these areas, so this measure could be used as a baseline to compare the relative size of companies and evaluate if significant expansions would be necessary.

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<sup>73</sup> Transport for London ePay locator: <http://ccshoplocator.tfl.gov.uk/resultipay.htm>

<sup>74</sup> O'Hare airport is approximately 18 miles from the Loop in downtown Chicago.

For the two case studies in this thesis, coverage was evaluated using company website locators or by contacting customer service representatives. Figure 4-2 shows the results for a single company in each broad category. The geographic boundary is defined in the footnotes if it differs from the areas presented above. Because of uncertainties, these numbers should not be treated as precise.










Program Manager	Transport for London	Chicago Transit Authority
<b>1. Transit Agency</b> Transit agency manages the program and uses existing locations.	 ~ 4,000 Oyster Ticket Stops	 ~ 700 Retailers & currency exchanges
<b>2. Bill Payment Company</b> Bill payment company locations used for reloading. (example company shown)	 ~ 2,990 PayPoint locations in retailers (such as SPAR & CostCutter) <sup>75</sup>	 ~ 220 Money Gram locations in retailers & currency exchanges <sup>76</sup>
<b>3. Prepaid Company</b> Prepaid card company locations are used for reloading. (example company shown)	 ~ 2,990 PayPoint Locations; ~ 400 Post Office Branches <sup>77</sup> ; and Barclays ATMs; = ~ 3,500 locations total <sup>78</sup>	 Over 200 retail locations (i.e. Wal-Mart, 7-11, Walgreens) <sup>79</sup>
<b>4. Payment Card Industry</b> Payment card company locations are used for reloading. (example company shown)	 ~ 4,000 PayZone locations in retailers and newsagents <sup>80</sup>	 ~ 370 locations in currency exchanges and retailers (i.e. CVS/pharmacy, Walgreens, Radioshak) <sup>81</sup>
<b>5. Financial Institution</b> Bank branches and ATMs are used for reloading. (sample company shown)	 <b>Lloyds TSB</b> ~80 branches & over 100 ATMs <sup>82</sup>	<b>Citi® Prepaid Services</b> ~170 Citibank ATMs & Banks <sup>83</sup>

Figure 4-2 Coverage of Program Manager and Bus Distribution Channels

<sup>75</sup> An email from PayPoint Customer Service stated that there are 2,984 PayPoint agents within the M25 ring road. April 23, 2010.

<sup>76</sup> MoneyGram Find a Location: <https://www.moneygram.com/wps/portal/moneygramonline/home/sendmoney/> Accessed April 2010 for the City of Chicago. Does not include surrounding suburbs.

<sup>77</sup> Post Office Branch Finder: <http://www.postoffice.co.uk/portal> Search for London. Accessed April 2010.

<sup>78</sup> Discussion with Tuxedo employees, July 2009.

<sup>79</sup> Green Dot Store Locator for City of Chicago. Maximum of 200 locations returned from query.

<https://www.greendotonline.com/AcctMgmt/Content/Common/AddFunds/RetailLocator.aspx?siteid=mymccard> Accessed April 2010.

<sup>80</sup> Discussion with Payzone employees, July 2009.

<sup>81</sup> MasterCard rePower Merchant Locator: [http://www.mastercard.com/us/personal/en/aboutourcards/prepaid/rePower/merchant\\_locator.html](http://www.mastercard.com/us/personal/en/aboutourcards/prepaid/rePower/merchant_locator.html) Accessed April 2010. 374 locations within 15 miles of the center of Chicago.

<sup>82</sup> Lloyds TSB Branch and CashPoint Locator: [http://www.lloydstsb.com/branch\\_locator/search.asp](http://www.lloydstsb.com/branch_locator/search.asp) Accessed April 2010. 80 Branches in Greater London. Maximum of 100 Cashpoints returned from query.

<sup>83</sup> Citibank Locator ATMs & Branches within 15 miles of downtown Chicago: <http://go.mappoint.net/citibankV2/Index.aspx?city=Chicago&state=IL> Accessed April 2010.

## 4.5 Costs

Costs of implementing a prepaid program are a key dimension for evaluation. The following section discusses current costs to the customer for prepaid programs. These costs are then used to estimate potential costs to transit agencies, which form the basis of an analysis of scenarios for program manager and card function.

### 4.5.1 Costs to the Customer

This section summarizes the current user paid fees associated with prepaid programs. These figures are publicly available, and they are taken directly from example company websites. Only one company was chosen to represent each option; similar fees are often charged by competing companies. The cost may vary between closed loop and open loop cards. Last, this cost information is intended to demonstrate the current prepaid program business models, and these user paid fees may change substantially for a transit prepaid program.











Option	Transport for London	Chicago Transit Authority
<b>1. Transit Agency</b> Transit agencies manage closed loop smart card programs (i.e. Oyster card and Chicago card).	 £3 deposit for initial acquisition of Oyster card; No other fees	 \$5 fee to initially acquire a Chicago Card; No other fees
<b>2. Bill Payment Company</b> Bill payment companies allow for payment of specific bills (i.e. to a utility company), as well as reloading of open loop prepaid cards.	 For most bill payments, the customer is not charged. For open loop prepaid cards, the customer is charged reload fees per the prepaid program.	 Billers choose the customer fee that is charged, which range from \$0.00 to \$9.95 per payment. <sup>84</sup>
<b>3. Prepaid Company</b> Prepaid companies generally manage open loop card programs, and these charge a variety of user-paid fees.	 £10 initial acquisition fee; Free loads at Barclays bank; 99p loads at the Post Office; 3% at PayPoint locations £12 monthly service fee £10 to redeem the end balance No transaction fees <sup>85</sup>	 Initial fee varies by retailer up to \$4.95; \$5.95 Monthly Charge (unless load over \$1,000 or 30+ transactions); Reload varies by retailer up to \$4.95 No transaction fees <sup>86</sup>
<b>4. Payment Card Company</b> Payment card companies manage reload locations for open loop card programs, and these charge a variety of user paid fees.	 Not Available	 Not Available
<b>5. Financial Institutions</b> Financial institutions generally have limited involvement in the prepaid card market at this time.	 Not Available	 Not Available

Figure 4-3 Prepaid Program Customer Fees

<sup>84</sup> MoneyGram FAQs: <https://www.moneygram.com/wps/portal/moneygramonline/home/CustomerService/FAQs/> Accessed April 2010.

<sup>85</sup> Tuxedo User Guide: [http://www.tuxedo-eccount.co.uk/documents/TMS\\_GEN\\_ONLINE\\_01\\_0110.pdf](http://www.tuxedo-eccount.co.uk/documents/TMS_GEN_ONLINE_01_0110.pdf) Accessed April 2010.

<sup>86</sup> Green Dot About our Products: [https://www.greendotonline.com/contents/products.aspx#gd\\_fees](https://www.greendotonline.com/contents/products.aspx#gd_fees) Accessed April 2010.

#### 4.5.2 Costs of Transit Prepaid Card Programs

Based on the previous table of costs to customers, cost drivers for existing prepaid programs appear to be card issuance, reloading, and processing transactions. These cost drivers are used to compare transit prepaid card scenarios, and they are defined in the following manner.

1. **Transaction Costs:** This is the cost to process prepaid card transactions. Fees may be paid by the transit agency for on-transit prepaid card usage, but the agency may receive revenue for off-transit usage for open loop cards, if they act as the card issuing entity. These costs are generally a function of the value of prepaid transactions. They are calculated on an annual basis.
2. **Card Issuance Costs:** This is the cost to produce and distribute cards to customers, and it is a function of the number of cards distributed per year.
3. **Retail Reload Costs:** The cost for prepaid reloads at bus distribution channels is divided into two parts: one to retailers and the other to the program manager. Individual retailers are generally paid a percentage of the value of the reload. Program managers would be paid a flat fee for every reload.

Based on current charges in the industry and estimates of cost reductions due to increased use for transit, these three costs could have different ranges for open and closed loop transit prepaid cards, which are summarized in Figure 4-4. Open loop cards are subject to additional security and fraud prevention measures,<sup>87</sup> which could cause costs to be greater. On the other hand, the size of the open loop card market is significantly smaller than that of closed loop cards,<sup>88</sup> and open loop costs may be higher due to lack of economies of scale. These costs could decrease as open loop cards become more widely utilized, which was the case with one Asian transit agency (see e.g. MasterCard News Release). Given the developing nature of the prepaid market, there are significant uncertainties in these estimates, as is reflected in the large ranges.

Cost Driver	Closed Loop	Open Loop
<b>Transaction Costs</b> (% Value Transaction)	0% - 1.5%	0.5% - 3%
<b>Card Issuance Costs</b> Flat Fee per Transaction	\$2-\$6; £1-£6	\$4-\$10; £2-£10
<b>Retail Reload Costs</b> (% of Reload Value + Flat Fee per Reload)	0.5%-5% -AND- \$.10-\$2; £.07-£2	0.5%-5% -AND- \$.50-\$5; £.13-£2

Figure 4-4 Cost Driver Ranges

These costs drivers are not representative of an entire transit prepaid card program. Items that would be similar between prepaid scenarios are not included in the following cost analyses. For example, rail reload locations would presumably have the same number of vending machines and ticket offices regardless of the prepaid option.<sup>89</sup> Additionally, initial set-up costs (i.e. capital expenditures to update software or equipment) are only included in the option in which the

<sup>87</sup> Chapter 3, KYC requirements.

<sup>88</sup> Chapter 3, the Mercator Group study.

<sup>89</sup> Some of the options could result in a reduction in these costs. For example, if financial institutions were to install ATMs for prepaid reloading in stations, the number of self-service vending machines could be reduced. Because this has a high degree of uncertainty, this is not evaluated.

transit agency is the program manager because the capital costs would be significant. For the other options, the program manager might cover additional upgrade costs for the preexisting network, given the size and magnitude of the transit contract.<sup>90</sup>

## 4.6 Transport for London Analysis

The following paragraphs describe how TfL prepaid program scenario costs were estimated. First, input values were based on current Oyster card figures, which are summarized in Figure 4-5. According to the FY 2007-2008 Cost of Revenue Collection analysis,<sup>91</sup> the total annual TfL farebox revenue was approximately £2.7 billion. The FY 2007-2008 annual revenue that was collected through Oyster Ticket Stop (OTS) retail loads was approximately £730 million, and this occurred via 90 million OTS loads. 390,000 regular Oyster cards were issued in the first month of 2009, and extrapolating this to one year means that approximately 5 million Oyster cards were issued on an annual basis.

TfL Oyster Card Revenue Data	OTS Loads	Other Channels (i.e. Vending Machines)	Total	Source
TfL Farebox Revenue in FY07-08	~£730 million	~£1970 Million	~£2700 million	TfL Cost of Revenue Collection Analysis
Percent of Revenue by Channel	27%	73%	100%	TfL Cost of Revenue Collection Analysis
Number of OTS Loads in FY07-08	~90 million	N/A	N/A	TfL Cost of Revenue Collection Analysis
Oyster Cards Issued	~5 million			January 2009 TfL Revenue Report (extrapolated)

Figure 4-5 TfL Revenue Data

### 4.6.1 Transport for London Closed Loop Prepaid Card Scenarios

Assumptions were made for how current Oyster card behavior might translate into prepaid card behavior for five closed loop prepaid card options. First, half of all farebox revenue would come from prepaid cards,<sup>92</sup> and the remaining revenue would come from contactless bankcards, concession passes, or paper tickets. This revenue would be collected through many channels, including retail reload locations, station self service vending machines, etc. Next, half of the value of current OTS reloads would occur on prepaid cards, and the remaining value of OTS reloads would not occur because they would be CLBC users. Likewise, the annual number of OTS loads would be cut in half. Last, half of regular Oyster card users would utilize prepaid cards; the remaining Oyster card users would utilize CLBCs. These assumptions are summarized below:

Closed Loop Prepaid Program	Retail Loads	Other Channels (i.e. Vending Machines)	Total	Assumption
TfL Farebox Revenue from Prepaid Cards	~£365 million	~£985 Million	~£1350 million	50% of TfL Farebox Revenue in FY07-08; remaining 50% from contactless bankcards, etc.
Percent of Revenue by Channel	27%	73%	100%	Proportional to Oyster card channel percentage
Annual Number of Retail Loads	~45 million	N/A	N/A	50% Number of OTS loads in FY07-08
Annual Prepaid Cards Issued	~2.5 million			50% Oyster cards issued per year

Figure 4-6 TfL Closed Loop Prepaid Card Assumptions

<sup>90</sup> Capital costs for upgrades by program partners could potentially be passed on to the transit agency, but this is very uncertain.

<sup>91</sup> This analysis was performed by the author while at Transport for London in 2009. The goal of the analysis is to compile all costs, direct and indirect, related to revenue collection at Transport for London on an annual basis, and it includes annualized capital expenses, operational expenses, maintenance costs, staffing costs, etc.

<sup>92</sup> As will be seen in Chapter 6, consumer demand for transit prepaid cards may be high, and 50% is reasonable.

It was presumed that all costs for reloading and transaction fees would be borne by the transit agency, except for an initial refundable card deposit (i.e. £3) that would be paid by the transit rider to acquire the card. Because this is refundable, this must still count as a cost to the transit agency in the annual estimates.

The number of prepaid transactions, cards issued, and reloads at retailers could be converted to cost estimates based on possible ranges of charges shown in Figure 4-4. This procedure was followed for the four program manager options involving private companies, but the costs for the first option, a TfL managed program, were calculated in a different manner based on a percentage of current costs for installing and operating Oyster Ticket Stops.

Figure 4-7 displays annual cost estimates for a TfL closed loop card prepaid program. The high values are most similar to current estimates for these options. Mid-range values appear to be possible if transit agencies are successful in negotiating during the procurement process. Low values may or may not be possible, and they represent a scenario that significantly capitalizes on economies of scale. The “Low” column takes the most optimistic assumption in all cases; the “High” column takes the most pessimistic assumption in all cases; and the “Mid” column is the average value.

Annual Costs (£m)	Low	Mid	High	Closed Loop Assumptions
<b>TfL Managed</b>	£19	£28	£37	Sum of Capital & Operating Costs
<i>Annual Capital Costs</i>	£2	£2	£3	50%-100% Annual Prestige Sales Service Charge for Capital Costs; <sup>93</sup> 5 Year Recovery Factor
<i>Annual Operating Costs</i>	£18	£26	£34	50%-100% Annual Prestige Sales Service Charge for Operating Costs; £1-£3 Card Issuance Costs; 3%-5% Retail Commissions
<b>Bill Payment Company</b>	£8	£24	£45	0%-1% Transaction Fee; £1-£3 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; £.07-£.13 Flat Reload Fee
<b>Prepaid Company</b>	£36	£76	£144	0.5%-1.5% Transaction Fee; £2-£6 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; £.50-£2 Flat Reload Fee
<b>Payment Card Company</b>	£11	£44	£92	0%-1% Transaction Fee; £1-£3 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; £.10-£1 Flat Reload Fee
<b>Financial Institutions</b>	£14	£34	£66	0%-1% Transaction Fee; £1-£3 Card Issuance Costs; 0% Retail Reload Commissions; £.25-£1 Flat Reload Fee

Figure 4-7 TfL Closed Loop Prepaid Program Annual Cost Estimates

#### 4.6.2 Transport for London Open Loop Prepaid Card Scenarios

Similar cost estimates were calculated for open loop cards. The revenue data from current Oyster cards shown in Figure 4-5 was again utilized. The key difference between these scenarios and the closed loop options was that riders can use open loop cards to make regular purchases at merchants in London. The value of these off-system purchases was assumed to be half of the value of all prepaid revenue that enters TfL fareboxes. Because there is an increase in the total value loaded onto prepaid cards (to account for off-system usage), the total number and value of reloads at retailers should increase, which was calculated proportionally to that for closed loop

<sup>93</sup> Prestige Sales Service Charges are costs for the Oyster Ticket Stop network paid by Transport for London to TranSys, the private consortium that manages the Oyster card system.

cards.<sup>94</sup> Last, the same number of prepaid cards was presumed to be issued in the open and closed loop cases.

Open Loop Prepaid Program	Retail Loads	Other Channels (i.e. Vending Machines)	Total	Assumption
TfL Farebox Revenue from Prepaid Cards	~£365 million	~£985 million	~£1350 million	50% of TfL Farebox Revenue in FY07-08; same as closed loop prepaid cards
Off-System Revenue from Prepaid Cards	~£183 million	~£492 million <sup>95</sup>	~£675 million	50% of TfL Farebox Revenue in FY07-08
Sum of TfL Farebox Revenue and Off-System Revenue from Prepaid Cards	~£548 million	~£1477 million <sup>96</sup>	~£2025 million	
Percent of TfL & Off-System Revenue by Channel	27%	73%	100%	Proportional to Oyster card channel percentage
Annual Number of Retail Loads	~67.5 million	N/A	N/A	75% of OTS loads in FY07-08
Annual Prepaid Cards Issued	~2.5 million			50% Oyster cards issued per year; same as closed loop prepaid cards

Figure 4-8 TfL Open Loop Prepaid Program Assumptions

Additionally, transit riders may pay a per transaction fee for off-system usage, which was estimated to be 1-3% the value of transactions.<sup>97</sup> Then, this off-system transaction fee is assumed to be shared equally between the transit agency and other prepaid program partners.<sup>98</sup> This split accounts for the costs that the partners incur to operate the program, manage financial risk, and earn a return on investment; this figure is highly uncertain and depends strongly on the value created for the partner by the transit agency co-branding and accepting the card.

Figure 4-9 displays annual cost estimates for TfL's open loop card prepaid program. As in the closed loop cost calculations, the TfL managed program was calculated based on a percentage of current costs for installing and operating Oyster Ticket Stops. The four program manager options with private companies were estimated using ranges for transaction, commissions, and card issuance costs. These ranges generally have higher values than those for closed loop cards, which accounts for the added functionality and complexity associated with open loop cards. Additionally, revenue from user fees for off-system transactions has been deducted from these values.

<sup>94</sup> It is noted that there could also be increased costs for loads in stations (i.e. at fareboxes and at ticket offices), but these are not accounted for.

<sup>95</sup> Figure not used in prepaid calculations.

<sup>96</sup> Figure not used in prepaid calculations.

<sup>97</sup> It is common practice that open loop prepaid cards are associated with user paid fees. For simplicity, rider fees were only associated with off-system purchases on a per transaction basis. Other revenue sharing models could be envisioned and implemented.

<sup>98</sup> For the transit agency managed option, it was assumed that agency would receive all of this revenue.

Annual Costs (£m)	Low	Mid	High	Open Loop Assumptions
<b>TfL Managed</b>	£26	£36	£45	Sum of Capital & Operating Costs
<i>Annual Capital Costs</i>	£3	£5	£6	100%-200% Annual Prestige Sales Service Charge for Capital Costs; 5 Year Recovery Factor
<i>Annual Operating Costs</i>	£23	£31	£39	100%-200% Annual Prestige Sales Service Charge for Operating Costs; £2-£6 Card Issuance Costs; 3%-5% Retail Commissions; Revenue 1-3% Off-System Transactions
<b>Bill Payment Company</b>	£20	£62	£127	0.5%-2% Transaction Fee; £2-£6 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; £.13-£1 Flat Reload Fee; Revenue 0.5-1.5% Off-System Transactions
<b>Prepaid Company</b>	£53	£110	£212	0.5%-2.5% Transaction Fee; £5-£10 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; £.50-£2 Flat Reload Fee; Revenue 0.5-1.5% Off-System Transactions
<b>Payment Card Company</b>	£25	£67	£132	0.5%-2% Transaction Fee; £4-£8 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; £.25-£1.50 Flat Reload Fee; Revenue 0.5-1.5% Off-System Transactions
<b>Financial Institutions</b>	£42	£68	£100	0.5%-1.5% Transaction Fee; £2-£6 Card Issuance Costs; 0% Retail Reload Commissions; £.50-£1 Flat Reload Fee; Revenue 0.5-1.5% Off-System Transactions

Figure 4-9 TfL Open Loop Prepaid Program Annual Cost Estimates

Figure 4-10 shows the total value of transit rider paid fees to utilize the prepaid cards off-system. These fees are spread among all transit riders using open loop prepaid cards and are the same regardless of the program provider.

Total Annual Costs to Riders (£m)	Low	Mid	High	Assumptions
Rider fees for off system transactions	£14	£27	£41	1%-3% Transaction Value Off-System; Half to transit agency; half to program manager

Figure 4-10 TfL Open Loop Prepaid Program Annual Cost Estimates for Riders

#### 4.6.3 Transport for London Open Loop Prepaid Card Lower Bound

The private sector may choose to bear some of the costs associated with introducing an open loop transit prepaid card to gain market share and revenues. In such a scenario, the partner company may charge the agency low or no fees for a prepaid card program, and would cross-subsidize the on-transit usage of open loop cards with user paid fees for off-transit system transactions. While it is unclear if the private sector would be willing to offer transit agencies a proposition such as this, the cost calculations provide an interesting point for comparison, which could broadly be viewed as a “lower bound” for transit agency costs for an open loop prepaid program. Figure 4-11 shows the results of this calculation, in which the only fees charged to the transit agency were for card issuance and retail commissions. The transit agency pays lower fees than in any other option, and riders who use their open loop card only for transit pay no fees (except a card issuance deposit to discourage card churn). Riders and non-riders who use the transit agency-issued open loop card pay a variety of fees for non-transit use. The prepaid card industry notes that its fees are lower than many other alternative financial services (AFS) providers, and it suggests that the fee-paying users may be better off with a widely-available, lower-fee open loop card than the present AFS offerings being used.



TfL Annual Costs (£m)	Low	Mid	High	Open Loop Assumptions
Bill Payment Company	£4	£14	£32	0% Transaction Fee; £2-£6 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; £0 Flat Reload Fee; Revenue of 0.5-1.5% Off-System Transactions
Prepaid Company	£12	£22	£43	0% Transaction Fee; £5-£10 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; £0 Flat Reload Fee; Revenue of 0.5-1.5% Off-System Transactions
Payment Card Company	£9	£19	£38	0% Transaction Fee; £4-£8 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; £0 Flat Reload Fee; Revenue of 0.5-1.5% Off-System Transactions
Financial Institutions	£2	£3	£5	0% Transaction Fee; £2-£6 Card Issuance Costs; 0% Retail Reload Commissions; £0 Flat Reload Fee; Revenue of 0.5-1.5% Off-System Transactions

Figure 4-11 TfL Open Loop Prepaid Program Lower Bound of Annual Costs

## 4.7 Chicago Transit Authority Analysis

The following sections evaluate transit prepaid card program costs for the CTA in a similar manner to the TfL analysis. First, current revenue data was gathered from the CTA Fare Media Operations Department. Figure 4-12 shows these values.

CTA Revenue Data	Retail Loads	Other Channels (i.e. Vending Machines)	Total	Source
CTA Farebox Revenue in FY07	~\$160 million	~\$297 million	~\$457 million	2007 Annual Report; Fare Media Operations
Percent of Revenue by Channel	35%	65%	100%	2007 Annual Report; Fare Media Operations
Number of Retail Purchases in 2007	~18 million	N/A	N/A	CTA Fare Media Operations (magnetic stripe)

Figure 4-12 CTA Revenue Data

### 4.7.1 Chicago Transit Authority Closed Loop Prepaid Card Scenarios

Assumptions were made for a closed loop prepaid program, and these are summarized in Figure 4-13. First, a proxy for the number of smart cards issued per year was utilized. In 2009, there were approximately 253,000 active smart card users in a single month.<sup>99</sup> If CTA riders shift away from magnetic stripe tickets, the number of prepaid card users could be greater than smart cards.<sup>100</sup> For this calculation, the number of users was presumed to double, and the average lifetime of a card was set equal one year, so there would be approximately 500,000 prepaid cards issued per year. Additionally, half of the value of current retail transit fare purchases would occur on prepaid cards, and half of all farebox revenue would come from prepaid cards.

Closed Loop Prepaid Program	Retail Loads	Other Channels (i.e. Vending Machines)	Total	Assumption
CTA Farebox Revenue from Prepaid Cards	~\$80 million	~\$149 million	~\$229 million	50% of CTA Farebox Revenue in 2007; remaining 50% from contactless bankcards, etc.
Percent of Revenue by Channel	35%	65%	100%	Proportional to Input Values
Annual Number of Retail Purchases	~9 million	N/A	N/A	50% Number of Retail Purchases in FY07-08
Annual Prepaid Cards Issued	~500,000			Twice Active Chicago Cards/Plus in 2009

Figure 4-13 CTA Closed Loop Prepaid Card Assumptions

<sup>99</sup> Figure provided by Kevin O'Malley, CTA Analytics Planning.

<sup>100</sup> Currently, only approximately one-third of rides are on smart cards.

In this analysis, all costs for reloading and transaction fees are borne by the transit agency, except for an initial refundable deposit (i.e. \$5) that would be paid by the transit rider to acquire the card. Because this is refundable, the CTA must count this as a cost in the calculations.

Figure 4-14 displays annual cost estimates for a CTA closed loop card prepaid program. Because the CTA only has a limited number of Chicago card reload locations at retailers, costs for a CTA managed program were estimated based on TfL figures, which were converted to dollars and pro-rated based on the number of locations. For the four program manager options involving the private sector, costs were estimated using the ranges for transactions, commissions, and card issuance costs. Last, high values are most similar to current estimates for these options, mid-range values appear to be possible if the CTA is successful in negotiating during the procurement process, and low values may or may not be possible if significant economies of scale are achieved.

Annual Costs (\$m)	Low	Mid	High	Closed Loop Assumptions
<b>CTA Managed</b>	\$5.4	\$8.7	\$12.0	Sum of Capital & Operating Costs
<i>Annual Capital Costs</i>	\$1.1	\$1.7	\$2.2	Based on 100-200% TfL Prestige Costs, Pro-rata by 700/4000 Locations; Converted to Dollars; 5 Year Recovery Factor
<i>Annual Operating Costs</i>	\$4.3	\$7.1	\$9.8	Based on 100-200% TfL Prestige Costs, Pro-rata by 700/4000 Locations; Converted to Dollars; 5 Year Recovery Factor
<b>Bill Payment</b>	\$3.3	\$14.3	\$27.3	0%-1% Transaction Fee; \$4-\$6 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; \$.10-\$2 Flat Reload Fee
<b>Prepaid Company</b>	\$8.1	\$15.4	\$28.5	0.5%-1.5% Transaction Fee; \$4-\$6 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; \$.50-\$2 Flat Reload Fee
<b>Payment Card Industry</b>	\$3.3	\$9.8	\$18.3	0%-1% Transaction Fee; \$4-\$6 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; \$.10-\$1 Flat Reload Fee
<b>Financial Institutions</b>	\$3.3	\$11.7	\$31.3	0%-1% Transaction Fee; \$2-\$4 Card Issuance Costs; 0% Retail Reload Commissions; \$.25-\$1.50 Flat Reload Fee

Figure 4-14 CTA Closed Loop Prepaid Program Annual Cost Estimates

#### 4.7.2 Chicago Transit Authority Open Loop Prepaid Card Scenarios

Cost estimates were then calculated for open loop cards. The values from current Chicago card information shown in Figure 4-12 were again utilized. The key difference between open loop cards and closed loop calculations is for off-system card usage, which was assumed to be equal to the value of all prepaid revenue that enters CTA fareboxes. This is twice the value used in the TfL analysis, which is intended to reflect the larger size of the open loop prepaid card market in the USA.

Transit riders pay a per transaction fee for off-system purchases, which was estimated to be 1-3% the value of transactions. This off-system transaction fee is assumed to be shared equally between the transit agency and other prepaid program partners. Because there would be an increase in the total value loaded onto prepaid cards (to account for off-system usage), the total number and value of reloads is greater than in the closed loop case. These values are shown Figure 4-15.

Open Loop Prepaid Program	Retail Loads	Other Channels (i.e. Vending Machines)	Total	Assumption
CTA Farebox Revenue from Prepaid Cards	~\$80 million	~\$148.5 million	~\$228.5 million	50% of CTA Farebox Revenue in FY07-08; same as closed loop prepaid cards
Off-System Revenue from Prepaid Cards	~\$80 million	~\$148.5 million <sup>101</sup>	~\$228.5 million	50% of CTA Farebox Revenue from Open Loop Prepaid Cards
Sum of CTA Farebox Revenue and Off-System Revenue from Prepaid Cards	~\$160 million	~\$297 million <sup>102</sup>	~\$457 million	
Percent of CTA & Off-System Revenue by Channel	35%	65%	100%	Proportional to CTA revenue data
Annual Number of Retail Loads	~18 million	N/A	N/A	100% Number of Retail Purchases in 2007; Proportional to CTA revenue data
Annual Prepaid Cards Issued	~500,000			Twice Active Chicago Cards/Plus in 2009

Figure 4-15 CTA Open Loop Prepaid Card Assumptions

Figure 4-16 shows annual cost estimates for CTA's open loop card prepaid program. In a similar fashion to the closed loop calculations, costs for the CTA managed program were estimated based on TfL cost figures. The four program manager options with private companies were again estimated using the ranges for transaction, commissions, and card issuance costs. These ranges generally have higher values than those for closed loop cards, which accounts for the added functionality and complexity associated with open loop cards. Revenue from user paid fees for off-system transactions were subtracted from the total cost figures for each option.

Annual Costs (\$m)	Low	Mid	High	Open Loop Assumptions
<b>CTA Managed</b>	\$8.5	\$12.9	\$17.2	Sum of Capital & Operating Costs
<i>Annual Capital Costs</i>	\$2.2	\$3.3	\$4.4	Based on 200-400% TfL Prestige Costs, Pro-rata by 700/4000 Locations; Converted to Dollars; 5 Year Recovery Factor
<i>Annual Operating Costs</i>	\$6.3	\$9.5	\$12.8	Based on 200-400% TfL Prestige Costs, Pro-rata by 700/4000 Locations; Converted to Dollars; 5 Year Recovery Factor; Revenue 1-3% Off-System Transactions
<b>Bill Payment Company</b>	\$12.3	\$52.2	\$104.1	0.5%-2% Transaction Fee; \$5-\$10 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; \$.50-\$5 Flat Reload Fee; Revenue 0.5-1.5% Off-System Transactions
<b>Prepaid Company</b>	\$21.3	\$62.4	\$105.3	0.5%-2.5% Transaction Fee; \$5-\$10 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; \$1-\$5 Flat Reload Fee; Revenue 0.5-1.5% Off-System Transactions
<b>Payment Card Company</b>	\$12.3	\$52.2	\$104.1	0.5%-2% Transaction Fee; \$5-\$10 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; \$.50-\$5 Flat Reload Fee; Revenue 0.5-1.5% Off-System Transactions
<b>Financial Institutions</b>	\$11.0	\$30.0	\$59.2	0.5%-1.5% Transaction Fee; \$4-\$8 Card Issuance Costs; 0% Retail Reload Commissions; \$.50-\$3 Flat Reload Fee; Revenue of 0.5-1.5% Off-System Transactions

Figure 4-16 CTA Open Loop Prepaid Program Annual Cost Estimates

As was previously noted, riders were assumed to pay a per transaction fee for off-system purchases, and these are summarized in the Figure 4-17.

Total Annual Costs to Riders (\$m)	Low	Mid	High	Assumptions
Rider fees for off system transactions	\$2.3	\$4.6	\$6.9	1%-3% Transaction Value Off-System; Half to transit agency; half to program manager

Figure 4-17 CTA Open Loop Prepaid Program Annual Cost Estimates for Riders

<sup>101</sup> Figure not used in prepaid calculations.

<sup>102</sup> Figure not used in prepaid calculations.

### 4.7.3 Chicago Transit Authority Open Loop Prepaid Card Lower Bound

The private sector could choose to bear most of the costs for an open loop transit prepaid card. It is unclear if the private sector would be willing to offer transit agencies a proposition such as this. This calculation can serve as a “lower bound” for transit agency costs for an open loop prepaid program, and Figure 4-18 shows the results of this calculation.

CTA Annual Costs (\$m)	Low	Mid	High	Open Loop Assumptions
<b>Bill Payment</b>	\$2.2	\$5.0	\$9.6	0% Transaction Fee; \$5-\$10 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; \$0 Flat Reload Fee; 0.5-1.5% Revenue from Off-System Transactions
<b>Prepaid Company</b>	\$2.2	\$5.0	\$9.6	0% Transaction Fee; \$5-\$10 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; \$0 Flat Reload Fee; 0.5-1.5% Revenue from Off-System Transactions
<b>Payment Card Industry</b>	\$2.2	\$5.0	\$9.6	0% Transaction Fee; \$5-\$10 Card Issuance Costs; 0.5%-5% Retail Reload Commissions; \$0 Flat Reload Fee; 0.5-1.5% Revenue from Off-System Transactions
<b>Financial Institutions</b>	\$0.9	\$0.8	\$0.6	0% Transaction Fee; \$4-\$8 Card Issuance Costs; 0% Retail Reload Commissions; \$0 Flat Reload Fee; 0.5-1.5% Revenue from Off-System Transactions

Figure 4-18 CTA Open Loop Prepaid Program Lower Bound of Annual Costs

## 4.8 Summary

At the beginning of the chapter, three primary dimensions were proposed for evaluating a transit prepaid program: (1) customer experience, (2) coverage, and (3) costs. Using these three dimensions as a framework, different program manager and card function options were evaluated for each transit agency. The following sections summarize the results, first for Transport for London and then for the Chicago Transit Authority.

### 4.8.1 Transport for London Scenario Comparison

The following chart compares the TfL scenarios discussed in the previous sections.

TfL Scenario (costs in £ millions)	Closed Loop Annual Costs (Figure 4-7)	Open Loop Annual Costs (Figure 4-9)	Open Loop Lower Bound (Figure 4-11)	Degree of Coverage <sup>103</sup>	Customer Experience & Additional Considerations
Transit Agency	£19-37	£26-45	N/A	~4,000 locations	High customer familiarity because same locations as OTS
Bill Payment Company	£8-45	£20-127	£4-32	~1,000-4,000	Used for Congestion Charging; some customer familiarity
Prepaid Company	£36-144	£53-212	£12-43	~4,000	Customer education for new locations needed
Payment Card Company	£11-92	£25-132	£9-38	~1,000-4,000	Customer education for new locations needed
Financial Institution	£14-66	£42-100	£2-5	~100-1,000	Customer education for using ATMs needed; Need for real-time networks

Figure 4-19 TfL Comparison of Prepaid Scenarios

<sup>103</sup> The degree of coverage reflects broad ranges of the number of locations in the greater London area. This varies from company to company, and these figures should not be treated as precise.

All of the TfL **closed loop** options were estimated to have lower annual costs than the respective open loop options, unless the private sector chose to bear most of the costs for the open loop card, as shown in the “lower bound” column in Figure 4-19. For the cost estimates shown in the first two columns of Figure 4-19, TfL should consider the tradeoff of providing customers with additional card functionality (i.e. off-system usage) that appears to come at an added price to both the transit agency and the transit rider. The amount of off-system transactions on open loop cards is highly uncertain. If this number were to increase significantly beyond what was assumed in the models, open loop cards could become more attractive for TfL. Likewise, if TfL were to receive a greater revenue share from off-system transactions (above half of 1-3%), then open loop prepaid card programs could be more attractive. If reload costs for off-system usage were not borne by TfL (i.e. some reloads required user-paid fees), then open loop cards would again become more attractive. Because transit agencies have previously not charged for reloading, this was not considered, but it could be possible.<sup>104</sup>

Regarding the program manager, the **transit agency** program has relatively high costs for the closed loop option. Using the same locations as Oyster Ticket Stops may not benefit from the economies of scale that could potentially reduce costs for the other options that also serve as reload locations for other card programs. On the other hand, this option benefits from increased geographic coverage and high degrees of customer familiarity because riders would not need to change their habits for prepaid top-ups.

**Prepaid card companies**, while offering relatively good geographic coverage, appear to be the most expensive third party provider. If their costs come down, which may be possible given the size and scale of transport products, this may become a more attractive option. Additionally, there would be a change in customer experience, which could require additional customer education to assure that riders know how and where to top-up prepaid cards.

**Bill payment** and **payment card industry** locations appear to have the lowest costs. Capitalizing on their economies of scale may help to bring down cost drivers, but there is a high degree of uncertainty in this, as is reflected by the high upper range of these numbers. On the flip side, many of these companies currently do not have as great geographic coverage as TfL’s Oyster Ticket Stop network; transit agencies may need to consider partnering with more than one of these companies or encouraging them to increase their geographic coverage. Regarding the customer experience, bill payment networks have been utilized for Congestion Charging payments, and transport customers have some familiarity with these locations.

**Financial institutions** costs may be lower than a transit agency managed program, but they could be higher than bill payment or payment card company options. A key concern with this option would be if networks need to be upgraded for real-time transaction processing (such as rolling out cash-scanning ATMs). Additionally, topping up at banks or ATMs would be a more substantial deviation from current customer experience for transit card loading.

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<sup>104</sup>There appear to be straightforward ways to pass reload costs on to customers. For example, customers could have 4 free reloads per month, but beyond that, they could be charged a fee, etc.

In summary, these programs each have different advantages in terms of cost, coverage, and customer experience, and TfL will have to weigh the tradeoffs between ease of customer experience and increased costs. Figure 4-20 shows the tradeoff between increasing coverage (on the x-axis) and increasing annual costs (on the y-axis). The values shown in this figure are the lowest values in the ranges for the closed loop, open loop, and open loop “lower bound” in Figure 4-19. Last, if the lower end of the cost ranges shown in Figure 4-19 are achieved, particularly for the bill payment and payment card company options, then TfL could realize a decrease in overall costs for revenue collection.<sup>105</sup>

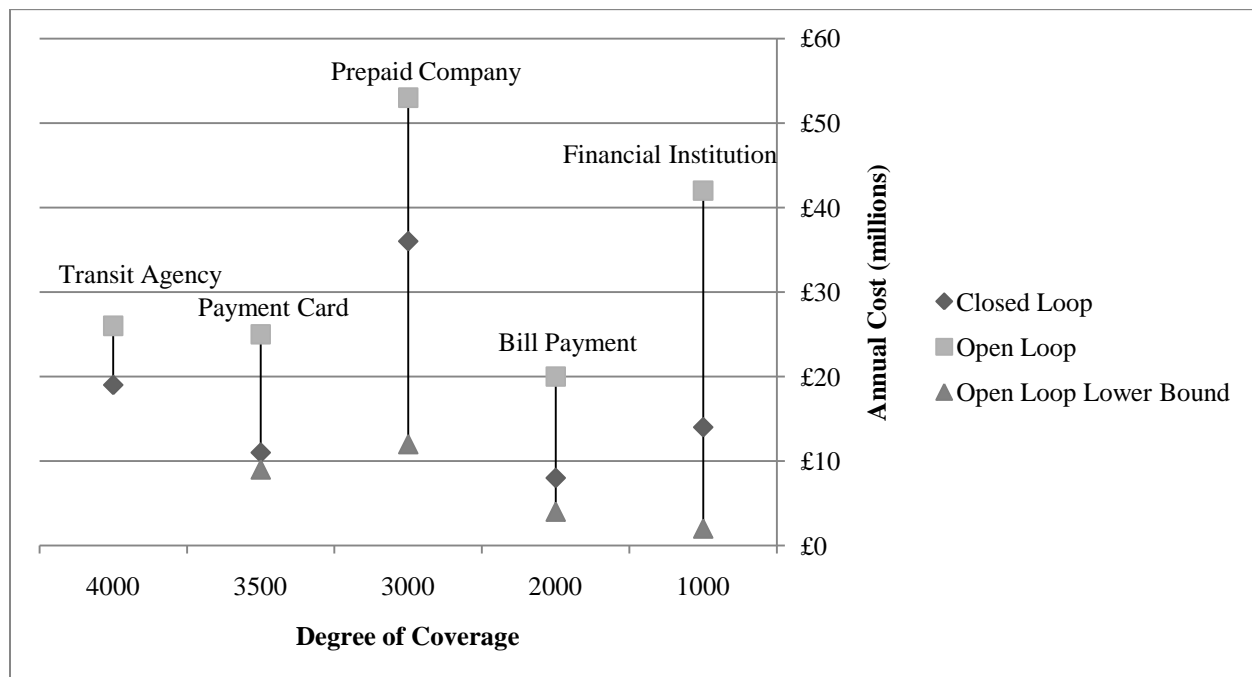


Figure 4-20 TfL Annual Costs versus Geographic Coverage

<sup>105</sup> According to the FY 2007-2008 Cost of Revenue Collection Analysis, direct and indirect costs of revenue collection attributable to Oyster Ticket Stops totaled approximately £36 million, and this did not include any card issuance costs.

#### 4.8.2 Chicago Transit Authority Scenario Comparison

The following chart compares the CTA scenarios discussed in the previous sections.

CTA (costs in \$ millions)	Closed Loop Annual Costs (Figure 4-14)	Open Loop Annual Costs (Figure 4-16)	Open Loop Lower Bound (Figure 4-18)	Degree of Coverage <sup>106</sup>	Customer Experience & Additional Considerations
Transit Agency	\$5.4-12.0	\$8.5-17.2	N/A	~700 locations	High customer familiarity because same locations; Mainly sell magnetic stripe currently
Bill Payment Company	\$3.3-27.3	\$12.3-104.1	\$2.2-9.6	~200-400	Customer education for new locations needed
Prepaid Company	\$8.1-28.5	\$21.3-105.3	\$2.2-9.6	~200-400	Customer education for new locations needed
Payment Card Company	\$3.3-18.3	\$12.3-104.1	\$2.2-9.6	~200-500	Customer education for new locations needed
Financial Institution	\$3.3-31.3	\$11.0-59.2	\$0.6-0.9	~100-300	Need for real-time networks; Customer education for using ATMs needed;

Figure 4-21 CTA Comparison of Prepaid Scenarios

All of the **closed loop** options are estimated to have lower costs than the open loop options, unless the private sector chose to bear most of the risks for the open loop card, as shown in the “lower bound” column in Figure 4-21. Similar to TfL, the CTA will want to consider the tradeoff of providing customers with additional card functionality (i.e. off-system usage) that appears to come at an added price to both the transit agency and the transit rider. Again, it is noted that the amount of off-system transactions on open loop cards and the model for open loop revenue sharing is highly uncertain. If the CTA were to receive a greater revenue share from off-system transactions (above half of 1-3%), then open loop cards could be more attractive. Likewise, if reload costs for off-system usage were passed on to the rider, then open loop cards would again become less costly.

Regarding the program manager, the **transit agency** managed program has relatively high costs for the closed loop option. This option does benefit from high geographic coverage and high degrees of customer familiarity because riders would not need to change their current habits for prepaid top-ups. On the other hand, one key concern would be that many retailers currently vend only magnetic stripe products; the CTA would need to enlist retailer agreement for installation of prepaid equipment.

**Prepaid card companies**, while offering good geographic coverage, again appear to be the most expensive third party provider. If their costs come down, this may be a more attractive option. Additionally, there would be a change in customer experience, which could require additional customer education to assure that riders know how and where to top-up prepaid cards.

<sup>106</sup> The degree of coverage reflects broad ranges of the number of locations in the greater Chicago area. This varies from company to company, and these figures should not be treated as precise.

**Bill payment, payment card industry, and financial institutions** appear to have the potential to offer slightly lower costs than the transit agency managed program, although there is a high degree of uncertainty in these costs, as is reflected by the high upper range of cost estimates shown in Figure 4-21. On the flip side, most of these networks do not have as much geographic coverage throughout the city of Chicago as existing magnetic stripe transit card distribution network. The CTA may want to consider partnering with more than one of these companies or encourage them to increase their geographic coverage. The CTA may also want to keep in mind the changes in customer experience, which could require additional customer education to assure that riders know how and where to top-up prepaid cards. Last, for financial institutions, the ability to process loads at ATM in real-time would be another consideration, which would hinge upon the roll-out of cash-scanning ATMs. This may have longer time to market than the other options.

In summary, these programs each have different advantages in terms of cost, coverage, and customer experience. Figure 4-22 shows the tradeoff between increasing coverage (on the x-axis) and increasing annual costs (on the y-axis). The values shown in this figure are the lowest values in the ranges for the closed loop, open loop, and open loop “lower bound” in Figure 4-21. Last, these figures and estimates are subject to high degree of uncertainty, and these conclusions could change as the CTA enters the procurement process.

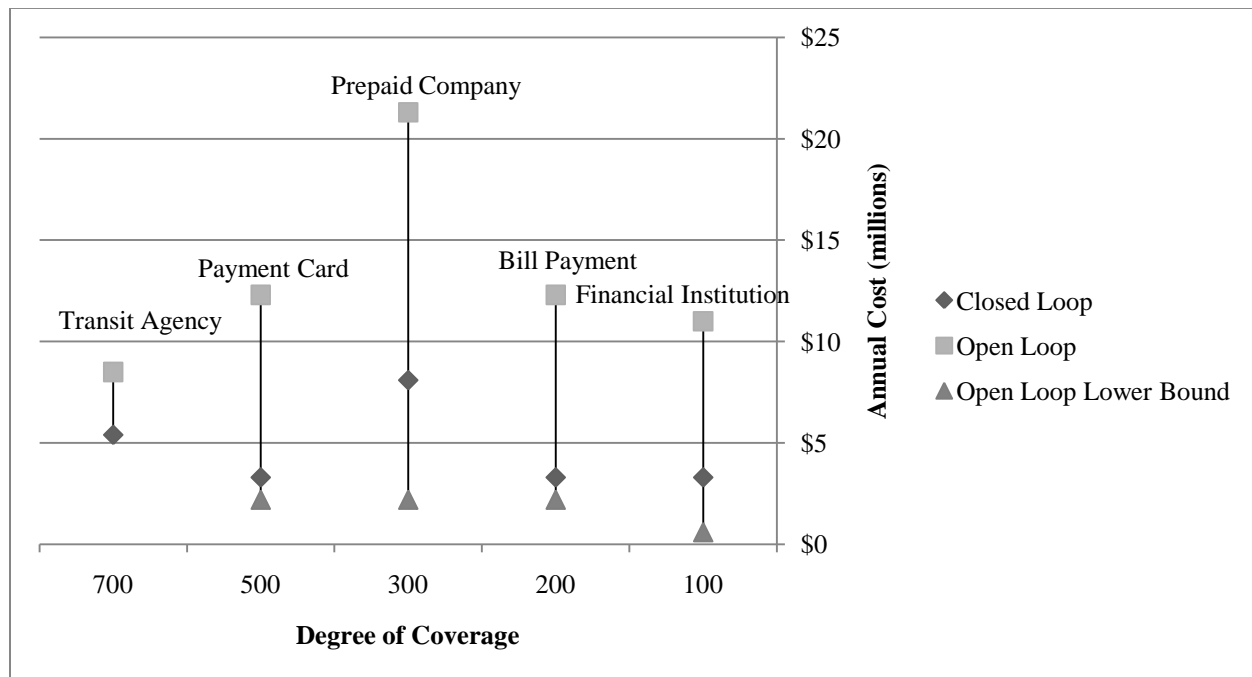


Figure 4-22 CTA Annual Costs versus Geographic Coverage



## 5 Unbanked and Underbanked Transit Riders

The previous three chapters focused on contactless bankcards (CLBC) and prepaid cards from the perspective of the transit agency implementing these new fare collection systems. This and the following chapter focus on the transit rider perspective and demand for these products.

This chapter investigates one group of transit riders who may have no choice but to use prepaid cards in CLBC fare collection systems: the unbanked. This demographic group includes riders who do not have an existing relationship with a financial institution, and lack a debit or credit card. The first part of this chapter highlights some of the reasons for transit agencies to be concerned with this group of constituents. Definitions of key terms related to this socioeconomic group are presented. The literature on the unbanked demographic in the United States and the United Kingdom is briefly reviewed, with a focus on nationwide studies that have recently been conducted. The final sections of this chapter provide a detailed analysis of this demographic in a transit context, utilizing recent survey data available from Transport for London (TfL) and the Chicago Transit Authority (CTA).

### 5.1 Motivation

If inequitable fare policies were implemented in a contactless bankcard system (such as charging customers without bankcards higher fares or fees), unbanked riders could suffer from a significant decrease in access to public transport. Unbanked individuals often come from the least advantaged groups in society, including those with lower income and education levels. Some of these individuals are dependent on public transit systems for mobility, and increasing barriers to their primary mode of transport is unacceptable.

Many transportation agencies have recognized the need to provide equitable transportation services to all groups of society, and they have explicitly enunciated this in their primary objectives and agency mission statements. For example, Transport for London is “committed to providing accessible transport, promoting equal opportunities and good relations between different groups, and eliminating unlawful discrimination,” and believes “transport is one of the most powerful mechanisms for tackling inequality and exclusion (TfL 2010).”

In addition to transit agency initiatives, some national laws also mandate consideration of equality in transport provision. For example, federal law in the United States requires that public transportation agencies consider the implications of new policies on the disadvantaged. In 1994, Executive Order 12898, which stems from Title VI of the Civil Rights Act of 1964, directed all agencies receiving federal funds to ensure that minorities, ethnic groups, and low-income populations are not adversely affected by implementation of federally funded programs. The Department of Transportation expanded upon this mandate in 1997 by issuing the *DOT Order to Address Environmental Justice in Minority Populations and Low-Income Populations*, which requires transit agencies to ensure that new investments deliver equitable levels of service and benefits to minority populations (FHWA 2000).

Providing all groups in society with equitable access to transit service is a key theme in public transport provision and planning. Understanding the division between banked and unbanked

riders could help transit agencies plan CLBC and prepaid card fare collection systems more effectively and ensure that equitable fare options are introduced for all groups of riders.

## 5.2 Definition of Unbanked

The definitions of key terms used in this chapter are:

- **Unbanked:** These are individuals who are currently not served by a bank and are outside of the financial mainstream. The conventional definition is individuals who do not have a basic checking account, savings account, or other type of transactional account at a bank or credit union (Seidman et al. 2005, FDIC 2009).
- **Underbanked:** Individuals who have a limited relationship with financial institutions are often referred to as underbanked. They may have a basic checking or savings account, but do not have other common financial instruments, such as credit or debit cards (FDIC 2009).
- **Alternative Financial Services (AFS):** Alternative financial services operate separately from banks and credit unions, and these include check cashing outlets, money transmitters, payday loan stores, car title lenders, and pawnshops (FDIC Quarterly 2009). Both the unbanked and the underbanked often rely heavily on alternative financial services for their financial needs.
- **Financial Inclusion:** This term refers to the delivery of financial services to all of the population, including disadvantaged and low income groups. This is the opposite of financial exclusion, which leaves people out of basic banking services (Her Majesty's Treasury 2007).

## 5.3 Who is Unbanked?

Because unbanked individuals operate outside of the financial mainstream, until recently, there has been a lack of data related to this demographic. The governments in both the United Kingdom and the United States have made special efforts in recent years to conduct nationwide studies that have enabled greater understanding of the overall size of the unbanked demographic and their socioeconomic characteristics. In this section, the most comprehensive studies of unbanked and underbanked individuals in the United States and the United Kingdom are reviewed to present a broad overview of the demographic and economic characteristics of the unbanked.

## 5.4 Unbanked in the UK

Her Majesty's Treasury has utilized data from the Family Resources Survey, which is a national survey of households sponsored by the Department for Work and Pensions, to estimate the size of the unbanked demographic and their socioeconomic characteristics. The Financial Inclusion Taskforce published their most recent report on this topic in October 2009, and the results are discussed in the following paragraphs.

### 5.4.1 Size of the Unbanked Market in the UK

According to the Financial Inclusion Taskforce, the number of adults who are completely unbanked (defined as not having a savings or other transactional account) in the UK has fallen from 2.02 million adults (4%) in 1.39 million households in 2002-2003 to 0.89 million adults (2%) in 0.69 million households in 2007-2008.

The Financial Inclusion Taskforce has also quantified the number of adults who have a saving account but no transactional account, who could be considered underbanked.<sup>107</sup> The size of this group has fallen from 3.57 million adults (8%) in 2.57 million households in 2002-2003 to 1.57 million adults (4%) in 1.28 million households in 2007-2008 (Financial Inclusion Taskforce 2009).

#### 5.4.2 The Unbanked Demographic in the UK

The Financial Inclusion Taskforce further examined the demographics and economic characteristics of the unbanked individuals to look for key trends. They concluded that unbanked households are more likely to have the following characteristics:

- **Lower Incomes:** They are concentrated at lower income levels;
- **Single:** The majority of unbanked households are single;
- **Occupation:** The greatest proportion of unbanked households are either retired or “unoccupied but under National Insurance pension age”;
- **Government Benefits:** Many unbanked households receive some sort of welfare benefits;
- **Housing:** The majority of unbanked individuals are social renters; and
- **Location:** Higher proportions of the unbanked live in Northwest England, Northern Ireland and Scotland.

The taskforce also concluded that unbanked individuals are fairly evenly distributed across age groups, as well as gender (male/female).

#### 5.4.3 Alternative Financial Services in the UK

According to the Financial Inclusion Taskforce, many unbanked individuals utilize a Post Office Card Account (POCA) to fulfill some of their basic financial needs.<sup>108</sup> A POCA is a basic account provided by the Post Office Ltd., and it enables people without a bank account to receive benefits, state pensions, and tax credit payments.<sup>109</sup> The Financial Inclusion Taskforce found that a large number of unbanked individuals had POCAs, and they concluded that either the POCA acts as a stepping stone to banking inclusion, or that holding a POCA contributes to banking exclusion. The Financial Inclusion Taskforce also recognized the popularity of remittance services among migrant workers in the UK, which enables them to transfer money abroad. The popularity of prepaid cards, primarily in other countries, was also acknowledged, and the study noted that this technology could be appealing to consumers who continue to face exclusion from the mainstream (Financial Inclusion Taskforce 2009).

In summary, Her Majesty’s Treasury has been diligently studying the demographics and financial choices of the unbanked to minimize the effects of financial exclusion in the UK.

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<sup>107</sup> The study does not explicitly use the term underbanked.

<sup>108</sup> This finding was confirmed in a regression analysis undertaken by researchers at the Personal Finance Research Centre at the University of Bristol PFRC that assessed the factors that influence adults who are unbanked (Finney and Kempson 2009).

<sup>109</sup> A POCA is not considered a transactional account for the purpose of defining banked vs. unbanked.

## 5.5 Unbanked in the USA

In a national effort to assess financial exclusion, the Federal Deposit Insurance Reform Conforming Amendments Act of 2005 (known as the Reform Act) requested that the Federal Deposit Insurance Corporation (FDIC) make a “fair estimate” of the size and worth of the unbanked market in the USA. In response, the FDIC published their first nationwide survey of unbanked and underbanked households in December 2009. This survey aimed to fill a gap in the availability of comprehensive data on the number of unbanked and underbanked households in the United States, and it included a thorough analysis of the unbanked demographic, their reasons for being unbanked, and their current financial habits (FDIC 2009).

### 5.5.1 Size of the Unbanked Market in the USA

The FDIC defines unbanked individuals as having neither a checking nor a savings account, and they estimated that at least 17 million adults residing in approximately 9 million US households (7.7%) are unbanked. Likewise, another 43 million adults residing in approximately 21 million households (17.9%) are underbanked, meaning that the household has a checking or savings account and relies heavily on alternative financial services (AFS). Last, another 4.1% of households in America, or roughly 5 million households, may be banked or underbanked, but due to data limitations, their status could not be verified. These statistics are shown in the following diagram (Figure 5-1).

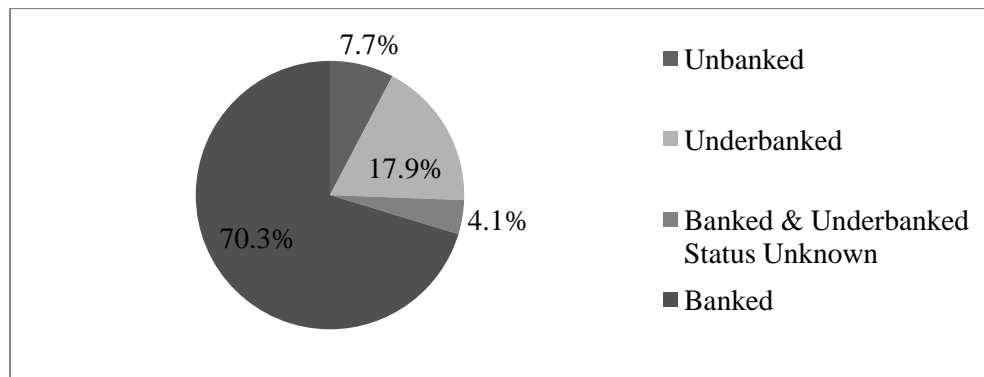


Figure 5-1 Banking Status of US Households  
Source: FDIC 2009

### 5.5.2 The Unbanked Demographic in the USA

The FDIC further examined the demographics and economic characteristics of the 9 million unbanked households. They concluded that the following types of households are more likely to be unbanked than the population taken as a whole:

- **Minorities:** Black, Hispanic, or American Indian/Alaskan households;
- **Noncitizens:** Those where a householder is a foreign-born noncitizen;
- **Language:** Households where Spanish is the only language spoken at home;
- **Single:** Unmarried female or male households;
- **Lower Incomes:** Those with an annual income less than \$30,000;
- **Lower Education:** Those holding less than a high school degree;
- **Lower Ages:** Those under age 45; and
- **Location:** Those who live in the southern region of the USA.

The FDIC also examined the demographics and economic characteristics of 21 million underbanked households. They noted many similar trends between the unbanked and underbanked households, but that the demographic patterns are more pronounced among unbanked households than underbanked households (FDIC 2009). For example, similar to the unbanked, underbanked households have a higher tendency to be minorities, live in Spanish speaking households, and live in single households, but their income levels and education levels tend to be somewhat higher than the unbanked (less than \$50,000 and less than a college degree, respectively).

Last, this comprehensive study had similar results as other surveys of the unbanked and underbanked conducted by various organizations. For example, the literature has generally concluded that financial exclusion occurs in households with lower incomes, lower levels of education, and those with racial/ethnic minorities (see, e.g., Financial Services Authority 2000, Greene 2003 et al., Seidman et al. 2005).

### **5.5.3 Reasons for Being Unbanked in the USA**

In the *2009 National Survey of Unbanked and Underbanked Households*, the FDIC asked unbanked and underbanked households why they never had a bank account, or if they were previously banked, why they closed their bank account. By far the most common reason for not having a bank account was that the household did not have enough money to need an account. Some of the other key reasons are as follows: *they did not/do not see the value of an account; service charges are too high; they do not write enough checks; the minimum balance requirement is too high; they bounced too many checks/had too many overdrafts; they do not trust banks; banks do not feel comfortable or welcoming; there is a language barriers at banks; do not have documents to open accounts; there is no bank near work or home; and they could not manage or balance the account* (FDIC 2009).

The FDIC findings are generally in agreement with the common themes that emerge from the literature related to reasons why households are unbanked in the USA, and these are often issues of language, trust of financial institutions, privacy concerns, availability of financial products, and the cost of financial services (Smart Card Alliance 2008).

### **5.5.4 Alternative Financial Services in the USA**

According to the FDIC, approximately 66% of unbanked households use the following alternative financial services (AFS): non-bank money orders, non-bank check cashing, pawn shops, payday loans, rent-to-own agreements, and refund anticipation loans. Approximately one quarter of unbanked households does not use any AFS, which the FDIC interpreted to mean that they probably rely heavily on cash transactions. Additionally, approximately 12% of unbanked households have used a general purpose prepaid card, and approximately 3.1% have received their income through a payroll card. It was also noted that the underbanked had similar characteristics in terms of meeting their financial needs, with heavy reliance on money orders and check cashing services. Last, the results of this nationwide survey are in alignment with the trends from the literature about the financial habits of unbanked individuals, which generally conclude that unbanked individuals have a strong reliance on AFS and an increasing usage of prepaid cards (see e.g. Greene et al. 2003, CFSI 2009).

## **5.6 Comparison of the Unbanked in the UK and the USA**

Some common themes emerged between the unbanked demographics in the USA and the UK. Both HM Treasury and the FDIC found a higher incidence of unbanked in single households and those with lower incomes. Additionally, certain geographic areas showed a higher incidence of unbanked households: the southern region of the USA and Northwest England, Northern Ireland and Scotland in the UK. Some differences also emerged; for example, in the UK, age was not a determining factor, while younger individuals were more commonly unbanked in the USA.<sup>110</sup>

Another noteworthy difference was that the overall size of the unbanked demographic is much smaller in the UK. During the last decade, the British government has taken explicit steps to reduce the size of the unbanked market, including establishing a shared goal between financial institutions and the Her Majesty's Treasury to halve the number of adults in households with no bank account. As part of this 'shared goal', they have encouraged the establishment of basic bank accounts for the unbanked population, and they have been measuring their progress toward this goal, which has already been very successful in reducing the size of the unbanked population (Financial Inclusion Taskforce 2009).

The US government is beginning to take steps toward understanding the characteristics of the unbanked demographic and responding to their needs. While the American government does not currently have a shared agreement with the financial industry to reduce the size of the unbanked population, as the UK does, the Federal Deposit Insurance Corporation (FDIC) has recently recommended that policymakers consider making such as goal, as well create a national task force to provide oversight and guidance to those who might be involved in this effort (FDIC Survey of Banks' Efforts 2009).

Last, the UK provides a basic account through the Post Office, while unbanked and underbanked Americans appear to rely more heavily on alternative financial services and prepaid cards.

## **5.7 Unbanked Transit Riders**

While the nationwide studies discussed in the previous sections provide insight into the demographic and economic characteristics of unbanked individuals in the USA and the UK, they do not address this group in a transit context. This is particularly relevant since many transit systems, particularly in the USA, have a large number of transit dependent customers, many of whom come from low income groups (Garrett 1999). This market could be larger in a transit context compared to these nationwide studies.

Because unbanked riders were not previously a major concern for transit agencies planning fare collection systems, there has been little research published on this topic. One notable exception was a white paper on the unbanked published by the Smart Card Alliance in 2008. In that report, survey information from the Southwest Ohio Regional Transit Authority (SORTA) in Cincinnati was presented. Cincinnati's 2007 ridership survey revealed that 62% of their adult riders had a debit card (Smart Card Alliance 2008).

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<sup>110</sup> The two reports did not assess all of the same factors, so additional conclusions cannot be drawn. For example, the October 2009 Financial Inclusion Taskforce Report does not discuss levels of education, ethnicity, etc.

METRO was contacted to see if they had any additional information about the unbanked in Cincinnati.<sup>111</sup> 430 Hamilton County residents participated in the survey, and 69% of METRO riders reported having a checking account in the last 12 months. 49% of METRO riders had a credit card during the last 12 months (Rademacher and Hulen 2007). The study results did not explicitly divided riders into “banked” and “unbanked” categories, so it is difficult to compare the results directly to national studies, but it can be broadly concluded that a significant number of transit riders do not currently have credit and/or debit cards, as seen in Figure 5-2.

<b>Financial Instrument</b>	<b>Percentage Of All Riders</b>
Checking Account	69%
Debit Card	62%
Credit Card	49%

Figure 5-2 Financial Instruments used by Cincinnati METRO Riders

Cincinnati’s transit system is different from the other transit agencies discussed in this thesis because it is a bus-only system. The city as a whole has a high percentage of residents living below the poverty line.<sup>112</sup> These results may not be similar to other American transit agencies, and further study of the unbanked in transit is necessary.

The following sections dive into the details of recent surveys conducted by the two major transit agencies discussed in this thesis: Transport for London and the Chicago Transit Authority. Both agencies have commissioned customer research to investigate, among other things, the number of riders who have access to bankcards.<sup>113</sup>

### 5.7.1 Underbanked Riders in London

In the spring of 2009, Transport for London (TfL) commissioned a comprehensive ridership survey to inform decisions related to their Future Ticketing Project. The research included analysis of current ticket and travel choices, preferences for future ticketing, and socioeconomic information. A total of 460 interviews were completed, and the sample was weighted post-survey to be representative of all public transport system users.

On the TfL Future Ticketing Project survey, respondents were asked if they have a credit card, debit card, or prepaid card. The following table shows the answers of the 460 respondents, which sums to more 460 because customers could select all that applied.

<b>Financial Instrument</b>	<b>Respondents (Weighted)</b>	<b>Percentage Of All Riders</b>
Debit Card	377	82%
Credit Card	191	42%
Prepaid Card	28	6%
None of the Above	41	9%

Figure 5-3 Financial Instruments used by TfL Riders

<sup>111</sup> Thanks to Ted Bergh, CFO at METRO, for providing the final 2007 ridership survey report.

<sup>112</sup> In 2007, Cincinnati had some of the highest poverty rates of large American cities according to the US Census Bureau. [http://www.census.gov/Press-Release/www/releases/archives/income\\_wealth/010583.html](http://www.census.gov/Press-Release/www/releases/archives/income_wealth/010583.html)

<sup>113</sup> The results presented in the following paragraphs are from the survey data collected by the two transit agencies (TfL and CTA). The raw data was provided to MIT, and all calculations shown in this document were done by the author.

TfL survey respondents were then classified as underbanked<sup>114</sup> if they had neither a credit, debit, or prepaid card, which was approximately 10% riders (45 of 460 surveyed) as is shown in Figure 5-4. This percentage is greater than the results of the national survey previously cited, which stated that approximately 4% of adults in the UK were underbanked. This difference may be partially attributed to the different definition of underbanked used by TfL, which was lack of credit/debit/prepaid cards, instead of HM Treasury's definition, which are those who have a savings account but not a transactional account.

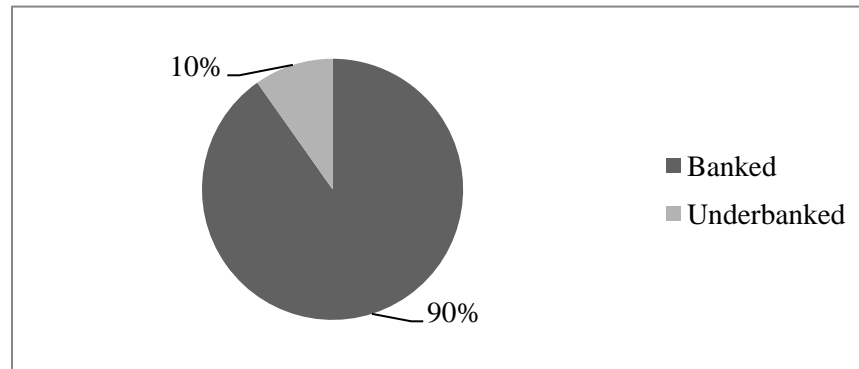


Figure 5-4 Percentage of Underbanked Riders at TfL

Because the total count of underbanked respondents was only 45 of 460 survey respondents, further analysis of the socioeconomic and travel characteristics of the underbanked is not presented in this thesis due to the small sample size.

### 5.7.2 Unbanked Riders in Chicago

In the fall of 2008, the Chicago Transit Authority (CTA) conducted a comprehensive Customer Experience Survey that included questions on ridership, general perceptions of the CTA, fare payment, service attributes, customer loyalty, technology use, and socioeconomic status. This survey was used by the agency to gather insight into changes in travel behavior and to address issues facing the CTA. Northwest Research Group was hired to conduct and analyze the results of the interviews. They collected data by telephone using Random Digit Dial (RDD) sampling as well as computer-assisted telephone interviewing (CATI) technology. This data collection process yielded a total sample size of 2,439 complete interviews, which were stratified by geographic area of residence (downtown, North Side, Northwest, South Side, Southwest Side, West Side, and suburban Chicago) and by the respondent's primary mode (bus or rail). The resulting cell size allowed for statistically reliable results.

On the CTA Customer Experience Survey, respondents were asked what financial instruments they used, and they were allowed to select all that applied. As can be seen in the following table, the majority of riders (68%) have checking accounts, 64% have credit cards, 56% of riders use checks, and 55% use debit cards. 24% of riders use currency exchanges for their financial services, which may be disproportionately popular among CTA riders because many currency

<sup>114</sup> The TfL survey did not ask if respondents had a saving or checking account. HM Treasury's definition of unbanked, which is those without a savings or a transactional account, could not be calculated. The definition used by TfL is more similar to HM Treasury's definition for underbanked individuals, and therefore, the term underbanked is used.



exchanges retail CTA magnetic stripe tickets. Last, a small percentage of riders (3%) did not want to answer the question or did not know the answer.

Financial Instrument	Respondents (Weighted)	Percentage Of All Riders
Checking Account	1,664	68%
Credit Card	1,554	64%
Checks	1,363	56%
Debit Card	1,338	55%
Currency Exchanges	596	24%
Other	36	1%
None	222	9%
No Answer	64	3%

Figure 5-5 Financial Instruments used by CTA Riders

Using the data displayed in Figure 5-5, riders were classified as banked if they had a checking account, checks, credit cards and/or debit cards. Unbanked riders were those without checking accounts, debit cards, credit cards, and checks, as well as those respondents who only use currency exchanges.<sup>115</sup> Of the 2,375 (weighted) respondents who answered the question, 20% were unbanked, which is shown in Figure 5-6. This statistic was significantly greater than the percentage of unbanked individuals in the USA from the nationwide FDIC study, which may be due in part to the CTA definition of unbanked, which did not include a basic savings account.

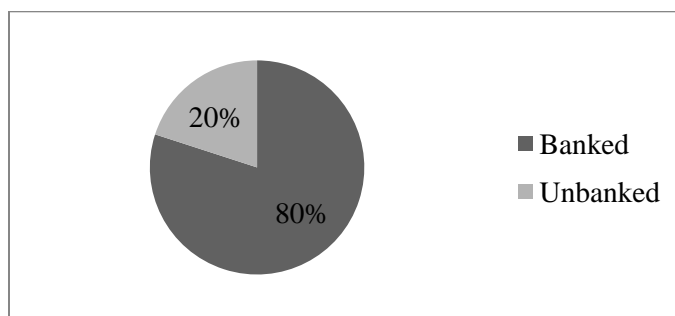


Figure 5-6 Percentage of Unbanked Riders at the CTA

### 5.7.3 Additional Analysis of Unbanked Riders in Chicago

Because of the large sample size of the CTA data for unbanked riders (475 weighted respondents), the results were broken down to compare the socioeconomic, transportation, and fare media characteristics of unbanked and banked riders. Detailed tables showing the results of this analysis are shown in Appendix A. In some cases, unbanked riders had similar demographic and transportation characteristics as banked riders. A few notable exceptions are highlighted in the following paragraphs.

<sup>115</sup> The CTA survey did not ask if respondents had a savings account. The FDIC's definition of unbanked, which is those without a savings or a checking account, could not be calculated. Likewise, the FDIC definition for underbanked, which is those with either a savings or checking account, could not be calculated. The definition used by CTA is somewhere in-between these two definitions because anyone without a checking account was considered unbanked, and therefore, the term unbanked is used.

**Age:** Figure 5-7 shows that unbanked riders were distributed fairly evenly across riders ages 25 to 64. When compared to banked riders, there is a much higher incidence of unbanked riders in the oldest age category (65+), in which 87% of riders are unbanked, and the youngest age group (16-17 years), in which 73% are unbanked.

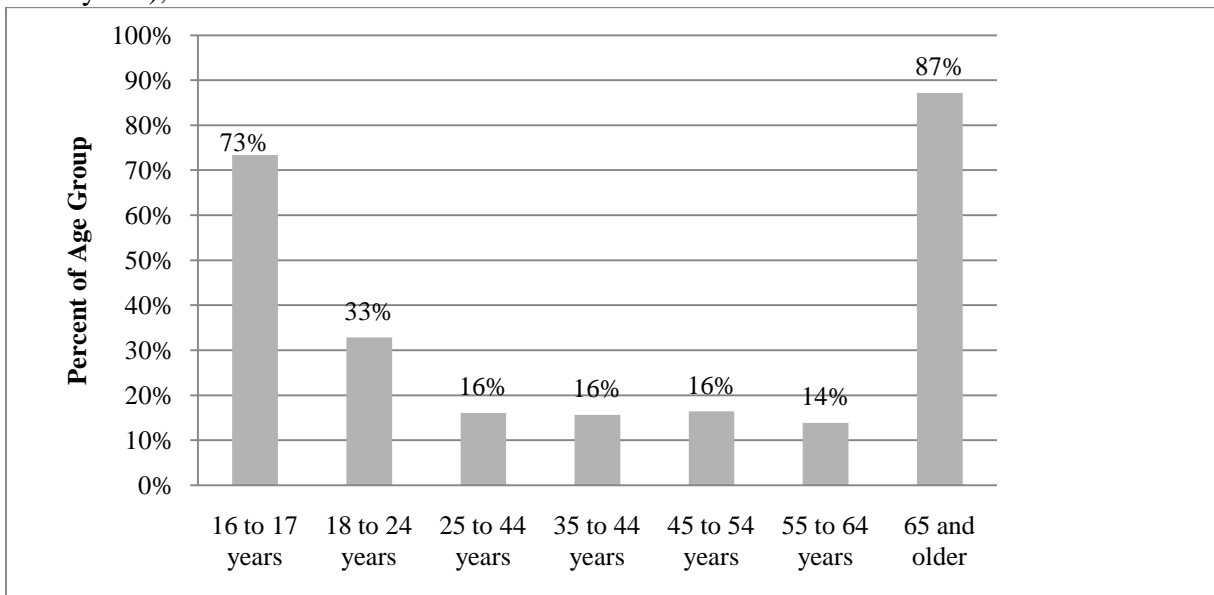


Figure 5-7 Percentage of Unbanked Riders by Age Group at the CTA

**Race:** Figure 5-8 below reveals that minorities comprise a larger share of unbanked riders in Chicago. There was a higher incidence unbanked riders among Hispanics (41%), as well as African American (32%). Only 10% of Caucasian riders were unbanked.

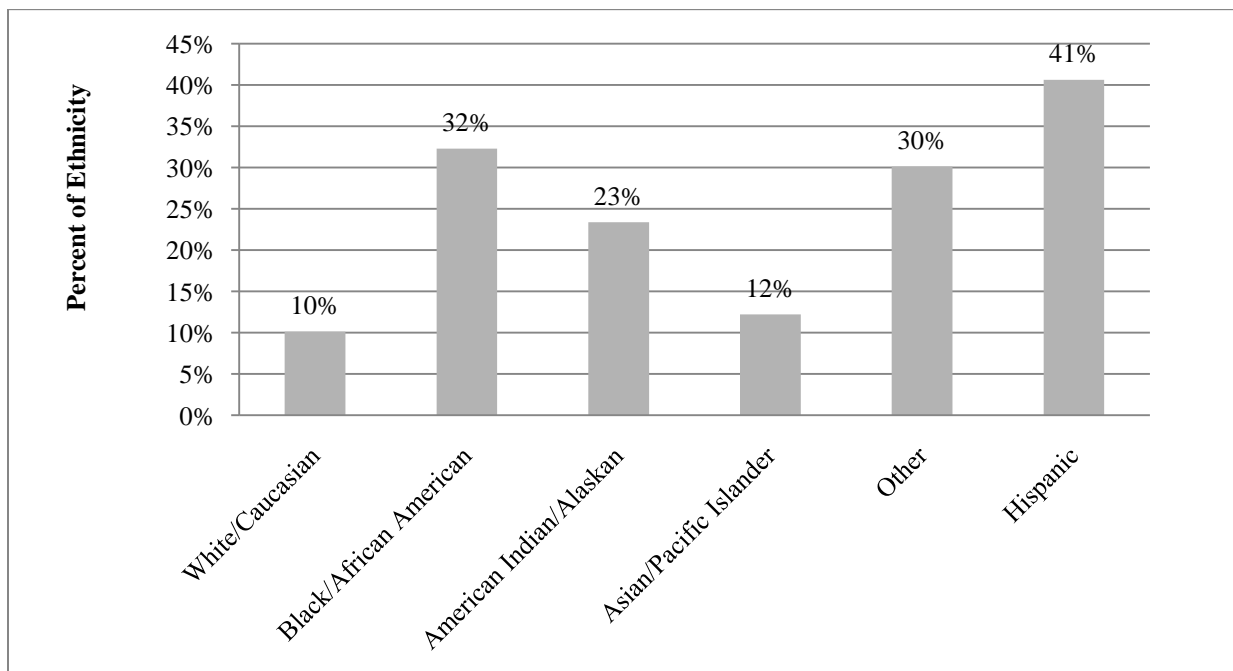


Figure 5-8 Percentage of Unbanked Riders by Ethnicity at the CTA

**Employment Status:** Figure 5-9 shows that the highest incidence of unbanked transit riders occurs for the unemployed (41%) and for students (37%). Only 12% of employed riders are unbanked.

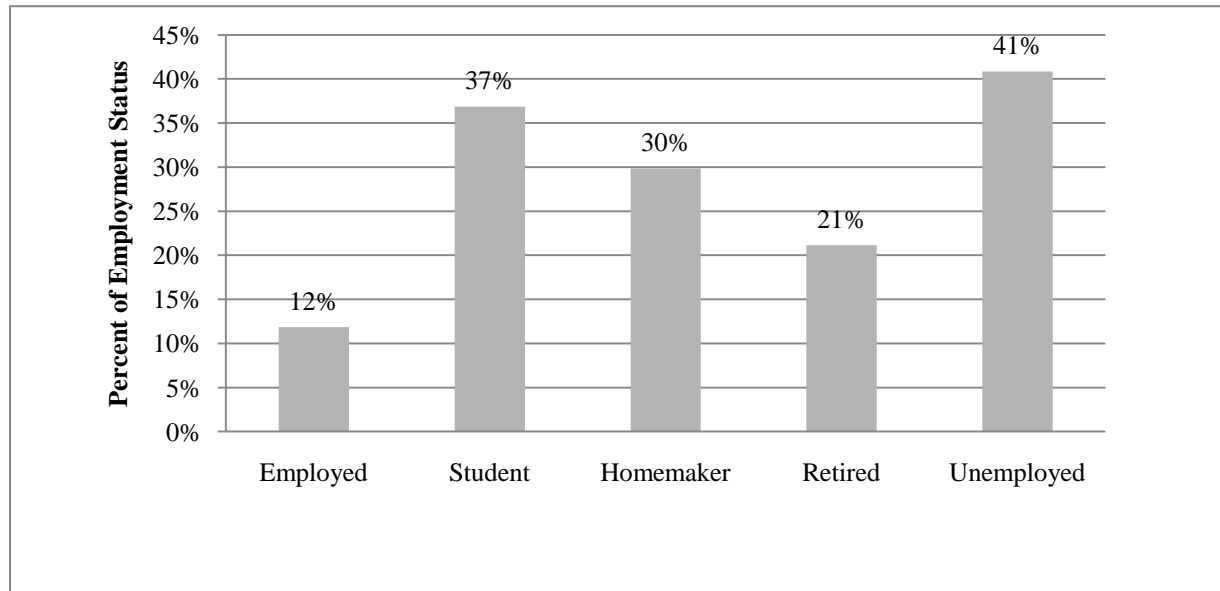


Figure 5-9 Percentage of Unbanked Riders by Employment Status at the CTA

**Education:** Figure 5-10 shows that unbanked riders generally have lower levels of education than banked riders. The majority of riders with less than a high school diploma are unbanked (60%). 39% of those who have a high school diploma or GED are unbanked. Those with bachelors or post bachelor degrees are less likely to be unbanked (8%, 5% respectively).

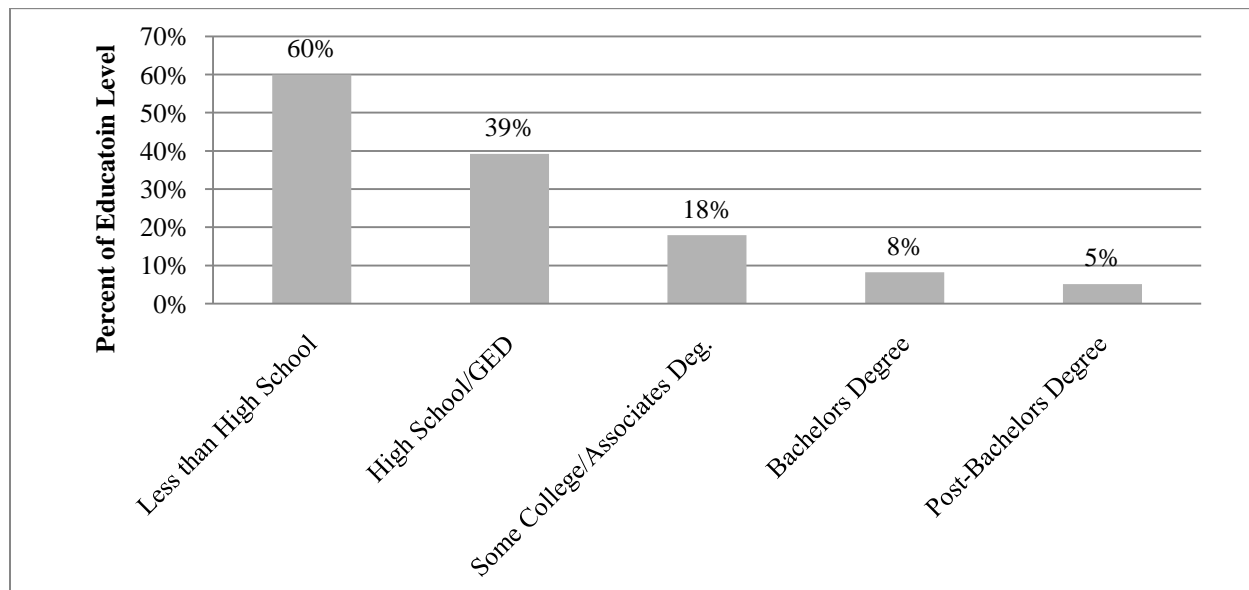


Figure 5-10 Percentage of Unbanked Riders by Education Level at the CTA

**Income:** Income has a clear correlation with banking status, as can be seen in Figure 5-11. 49% of riders who earn less than \$10,000 annually are unbanked. This percent decreases as income increases.

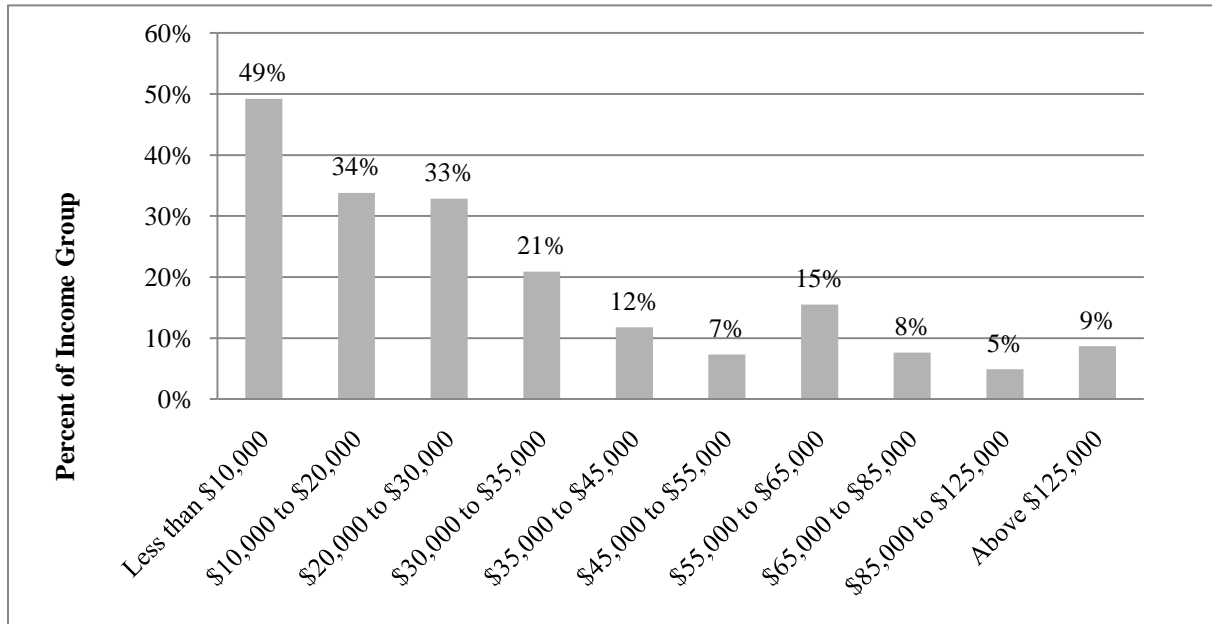


Figure 5-11 Percentage of Unbanked Riders by Income Group at the CTA

**Location:** The location of residence of CTA riders were classified into seven regions defined by zip codes, which is shown in Figure 5-12. The region with the highest percentage of unbanked riders was the downtown (39%), and this was followed by the south (28%) and southwest (25%).

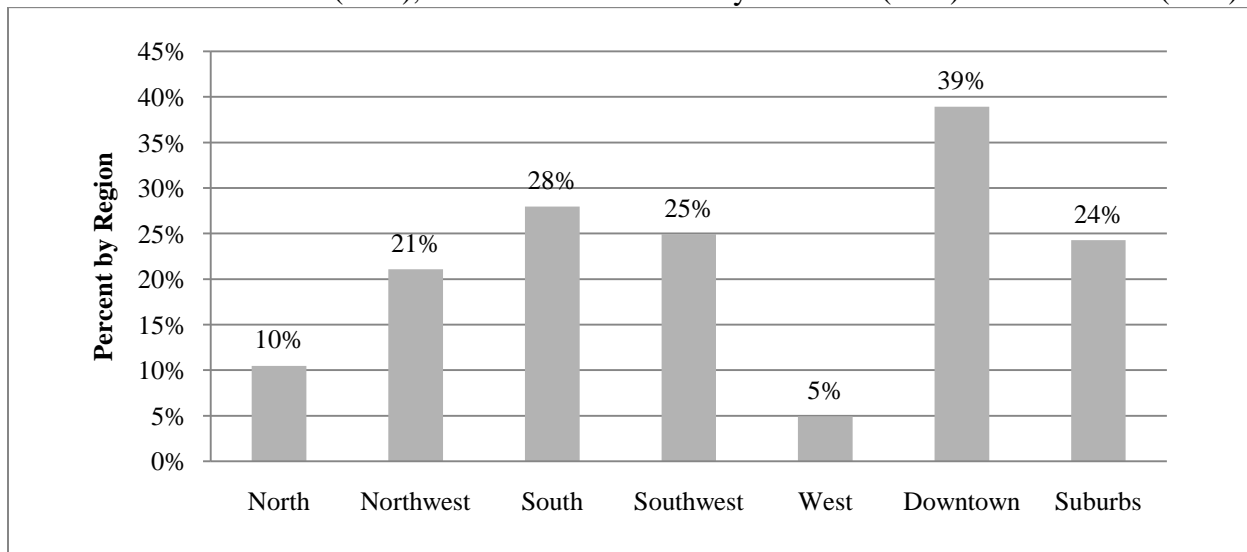


Figure 5-12 Percentage of Unbanked Riders by Residence Location at the CTA

**Mode and Frequency of Travel:** Frequent riders take the bus or train 5 days per week or more, infrequent riders take the bus or train once per week or more, and occasional riders take the bus or train once per month or more. Frequent and infrequent riders were further subdivided into mode (bus or train), depending on which they rode more often. Figure 5-13 shows that most unbanked riders tend to take the bus. 28% of frequent bus riders and 23% of infrequent bus riders are unbanked.

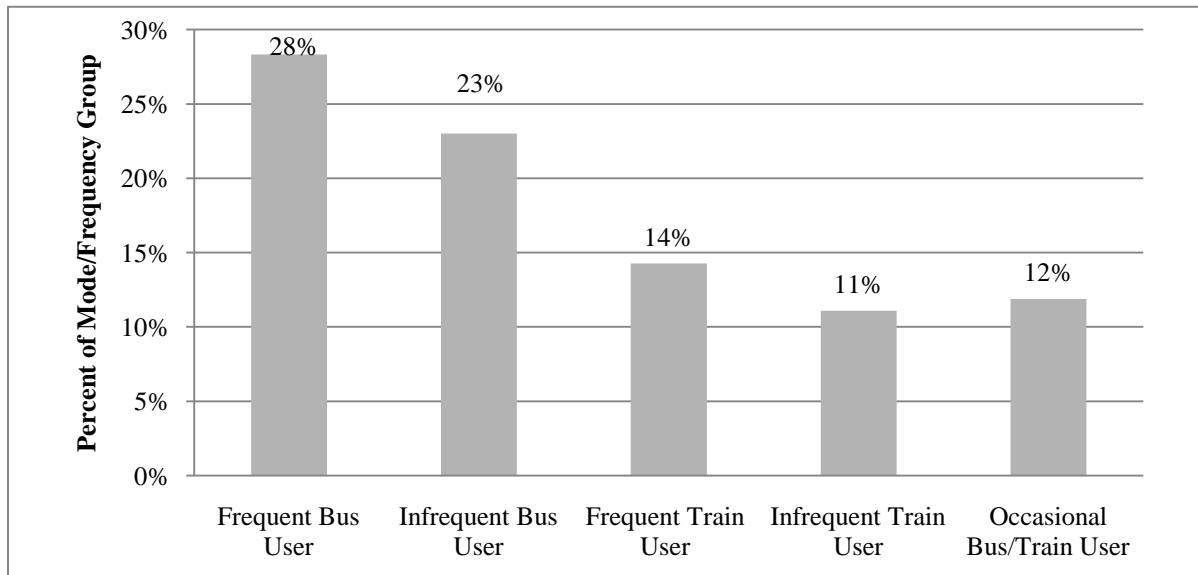


Figure 5-13 Percentage of Unbanked Riders by Mode and Frequency at the CTA

**Reasons for Choosing Transit:** Figure 5-14 shows the reasons why CTA riders choose transit. Many transit riders who can't or don't know how to drive (38%), and many riders who don't have a car (37%) are unbanked. These results suggest that a relatively large percentage of unbanked riders are "captive" to transit and may not have other transportation alternatives.

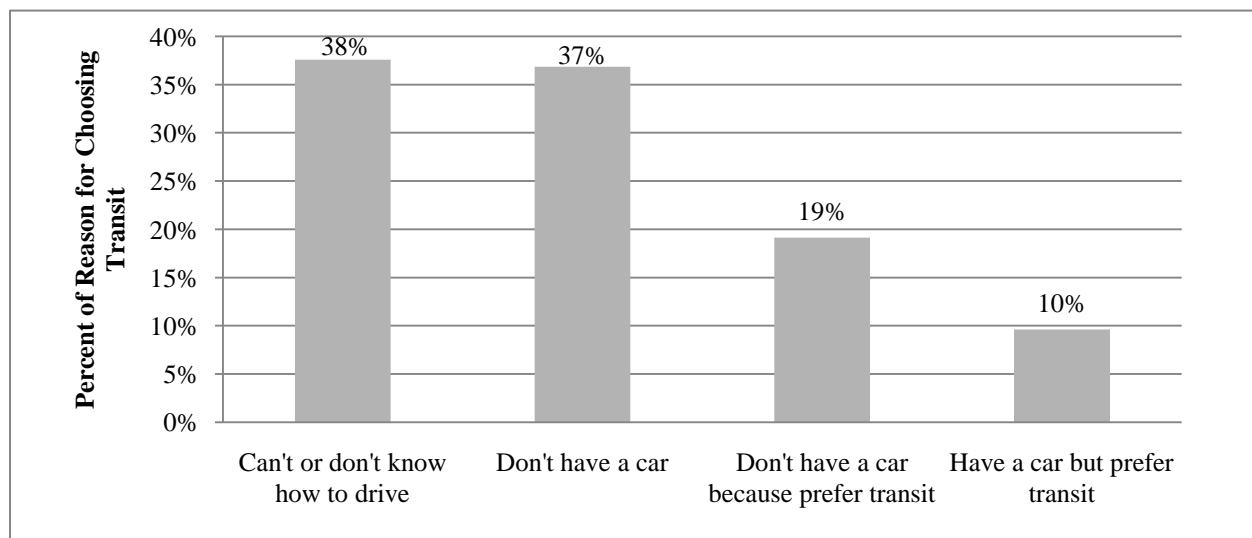


Figure 5-14 Percentage of Unbanked Riders by Reasons for Choosing Transit at the CTA

**Fare Media:** Figure 5-15 compares the fare choices of unbanked and banked riders. A higher percentage of unbanked riders pay with period passes on magnetic stripe tickets (34%). Likewise, more unbanked riders pay with cash (31%). This analysis shows that unbanked riders have a very low utilization of the two smart card options. 10% of Chicago Card users are unbanked and 2% of Chicago Card Plus users (which are linked directly to a credit or debit card) claim to be unbanked.

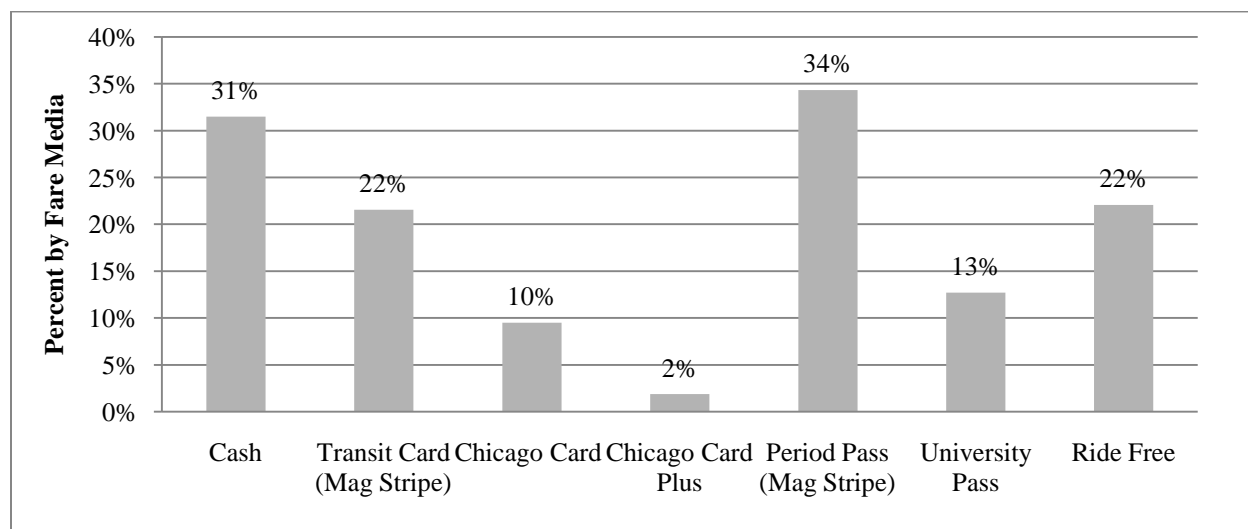


Figure 5-15 Percentage of Unbanked Riders by Fare Media at the CTA

## 5.8 Comparison of CTA and FDIC Studies

Although the definitions of unbanked differ slightly between the nationwide FDIC study and the CTA survey, there are some general trends that emerged for the unbanked in America. Both the CTA and FDIC found a higher incidence of unbanked individuals with lower income levels and lower levels of education. Additionally, the unbanked were more likely to be from ethnic minority groups. Some transit-specific trends appear to be a higher incidence of unbanked riders in older age groups (65+), as well as a dependency on transit for transportation.

## 5.9 Comparison of Transit Agencies

The results from Cincinnati, Chicago, and London can be used to compare the financial characteristics of transit riders in major metropolitan areas. It is not possible to directly compare the number of unbanked riders between cities because of survey limitations. Ideally, one would like to compare the percentage of all transit riders who not have any preexisting relationship with financial institutions including basic checking or savings accounts<sup>116</sup> because these riders would be the least likely to be able to participate in a CLBC fare collection system. Instead, the percentage of riders with credit and debit cards is compared between agencies. Figure 5-16 shows that TfL has the highest percentage of riders with debit cards (82%), and the CTA has the highest percentage of riders with credit cards (64%). These statistics do not reveal information about contactless functionality.

<sup>116</sup> None of the three transit agency surveys asked about savings accounts. The Chicago and Cincinnati surveys did ask about checking accounts, but the London survey did not. For this reason, only debit and credit cards are compared.

<b>Percentage of Riders with Bankcards</b>	<b>Cincinnati METRO</b>	<b>Chicago Transit Authority<sup>117</sup></b>	<b>Transport for London</b>
Debit Cards	62%	55%	82%
Credit Cards	49%	64%	42%

Figure 5-16 Comparison of Riders with Bankcards at Three Transit Agencies

## 5.10 Summary

The first part of this chapter highlighted reasons for transit agencies to be concerned with unbanked riders. This motivated a broad discussion of unbanked individuals in the United States and United Kingdom, including review of recent nationwide studies. These studies revealed that the government of the UK has recently undertaken a special initiative to increase financial inclusion, which has helped to reduce the size of the unbanked market, although those that remain in this demographic often come from disadvantaged groups. Likewise, the United States government has recently begun to analyze financial inclusion, and the latest FDIC study has shown a higher propensity of unbanked individuals in the United States than the United Kingdom, with many of these individuals coming from the least advantaged groups in society.

The unbanked market was then analyzed in a transit context utilizing recent survey data collected by three transit agencies: Transport for London, Cincinnati METRO, and the Chicago Transit Authority. This data revealed that each agency has a sizable population without credit or debit cards. Additional analysis was undertaken to examine the demographics of unbanked transit riders in Chicago because of the large amount of survey data available. The results were generally in alignment with nationwide studies demonstrating that, for example, unbanked individuals often have lower levels of education and are from minority racial groups. These results confirm that transit agencies may need to give special consideration to the unbanked demographic as they move toward CLBC and prepaid fare collection systems to ensure equitable options for all groups of transit riders.

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<sup>117</sup> Respondents who chose not to answer this question in the CTA Customer Experience Survey accounted for approximately 3% of riders, and therefore, the actual percentage of riders with credit/debit cards could be slightly higher.

## 6 Transit Rider Attitudes toward CLBC Fare Collection Systems

Chapter 5 focused on unbanked and underbanked riders, who may have to use prepaid cards in contactless bankcard (CLBC) fare collection systems because they lack a credit or debit card. In addition, there may be other groups of riders who have a bankcard but prefer to use either prepaid cards or other forms of fare media. This could be for many reasons, such as being able to manage funds better, general concerns with the banking or credit card industries, or a hesitancy to use new technologies (such as RFID). Transit rider attitudes toward CLBCs and prepaid cards should be investigated to assess demand for these new products.

In order to investigate transit rider preferences for future fare media, this chapter is broken down into four sections. The first section presents the modeling framework that will be used. The next two sections present quantitative analysis of survey data from the Chicago Transit Authority (CTA) and Transport for London (TfL), respectively. The final section is a comparison of the two transit agencies.

### 6.1 Modeling Framework

Stated preference data can be utilized to assess rider attitudes toward new fare media options. Ideally, one would like to have the following information from ridership surveys:

- **Fare Media Choice Set:** Riders would be asked if they prefer contactless bankcards, open loop prepaid cards, closed loop prepaid cards, paper tickets, or other forms of fare media.
- **Attributes of Alternatives:** In order for survey participants to make a fully informed assessment of future fare media, they would need to know the accompanying fare policy, available fare products, etc.
- **Characteristics of the Decision-maker:** In order to understand how survey participants choose alternatives, it would be best to know characteristics of the rider such as socioeconomic information, attitudes toward new technologies, etc.

If all of this information were available, then one could rigorously assess the fare media choices of riders. Due to time and money constraints of surveying riders, all of this information is not available, but both the CTA and TfL have conducted surveys to begin an assessment of ridership preferences. The data that is available from these agencies is used in the following sections in a two-step process to assess rider attitudes to future media.

1. **Statistical Analysis:** Statistical analysis quantifies the size and demographics of different ridership groups based on future fare media preference.
2. **Discrete Choice Modeling:** This builds upon fare media choices of riders to further investigate trends between segments of riders using discrete choice modeling (i.e. logit).

Last, there is little or no relevant literature related to this modeling context. To the best of the author's knowledge, statistical analysis of transit rider attitudes toward contactless bankcards has not been published. Moreover, discrete choice modeling has generally not been used in a fare media choice context. Prior work related to transit fare choice is generally a function of the fare policy, not fare media (see, e.g. Hong 2006, Zureiqat 2008).



## 6.2 Transport for London

Transport for London commissioned a comprehensive ridership survey in the spring of 2009 to gain a better understanding of customer attitudes towards future fare media options. MVA Consultancy was hired to conduct and analyze the results of the survey. A total of 460 interviews were completed, and the sample was weighted post-survey to be representative of all public transport system users. Survey questions pertained to ticket choices, travel behavior, socioeconomic information, and financial characteristics. This data source was also used to quantify the number of unbanked riders in London in Chapter 5.<sup>118</sup>

### 6.2.1 TfL Rider Attitudes toward CLBC Fare Collection Systems

Survey respondents were provided with fare media information using show cards and a short video. They were reminded how they can currently pay for travel in London, and they were given a description of contactless bankcard technology. Then, they were then presented with three future fare media options that were described in the following manner:

1. **a TfL card**, which is a contactless, closed loop prepaid card that can only be used for travel on public transport in London and is similar to the Oyster card;
2. **a contactless bankcard**, which allows for either Pay As You Go travel or period passes for transport payment and can be used to purchase everyday items at shops; and
3. **a paper ticket**, which will be more expensive than the TfL and the contactless bankcard.

Notably, open loop prepaid cards were not assessed in this survey. Additionally, the paper ticket option includes magnetic stripe tickets, but the language was simplified for the purpose of the survey. Moreover, the specific fare policies associated with each alternative were not presented, but participants were told that paper tickets would be more expensive.

The preferences of the 460 respondents are shown in Figure 6-1. The majority (55%) stated that they preferred the TfL closed loop prepaid card, and 31% stated that they preferred to use CLBCs for transit payment.

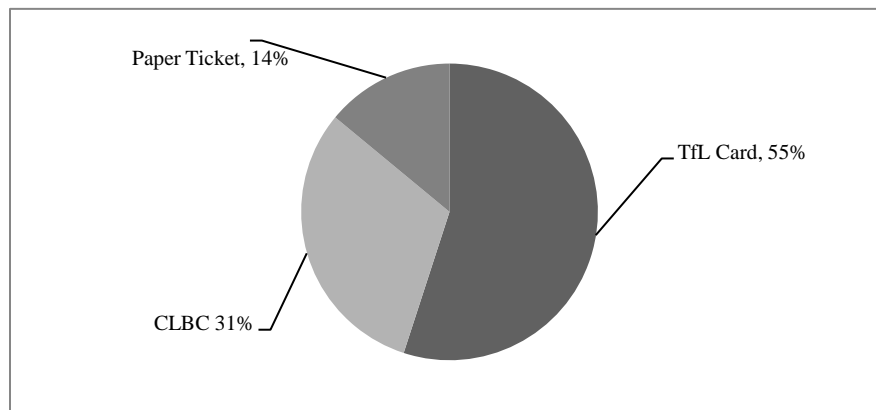


Figure 6-1 TfL Future Fare Media Choice

<sup>118</sup> The results presented in the following paragraphs are from survey data collected by MVA consultancy, but all calculations were done by the author.

## 6.2.2 TfL Statistical Analysis

Fare media choice was then broken down to investigate the socioeconomic characteristics, transportation choices, and current fare choices of riders. The following subsections highlight trends among riders, and additional statistics can be found in Appendix B.

**Age:** As is shown in Figure 6-2, the future fare media choice of riders had some variation with age. The youngest age group (age 18 to 24) had the greatest percentage of riders who preferred CLBCs (41%). On the other hand, the two oldest age groups (age 55 to 59 years; over age 60) had the highest percentage of riders who chose paper tickets (33% and 32%, respectively). Last, there was little variation between the middle age groups (Ages 25 to 34; 35 to 44; Age 45 to 54), who generally preferred TfL prepaid cards.

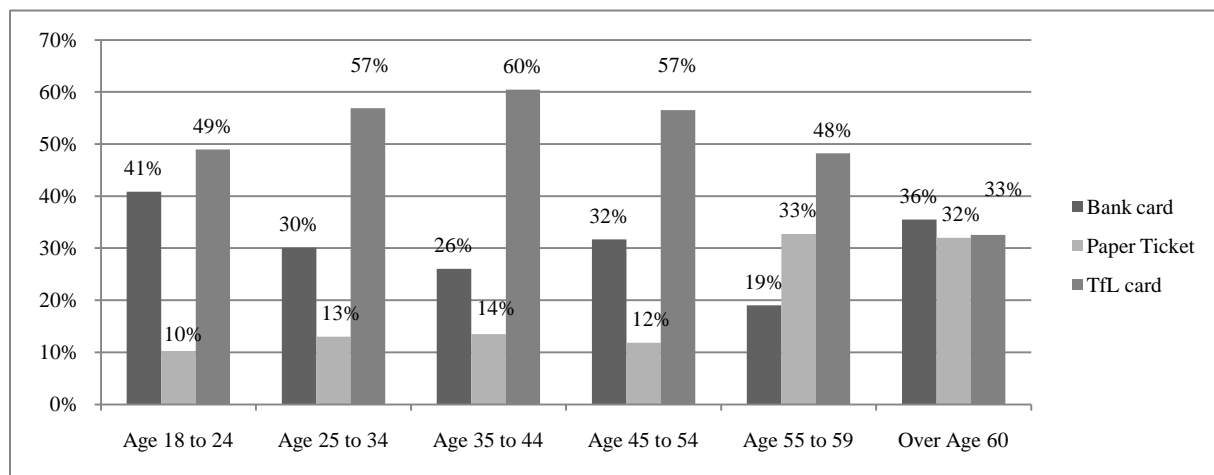


Figure 6-2 Comparison of Preferred TfL Fare Media by Age

**Employment Status:** Figure 6-3 shows future fare media preference by employment status. Retired persons evenly chose paper tickets (50%) and TfL cards (50%), but, as can be seen in Appendix B, the sample size of retired persons was very small (only 4 participants). Other than students, who showed a slightly higher tendency to choose CLBCs, most groups generally displayed similar preferences for fare media.

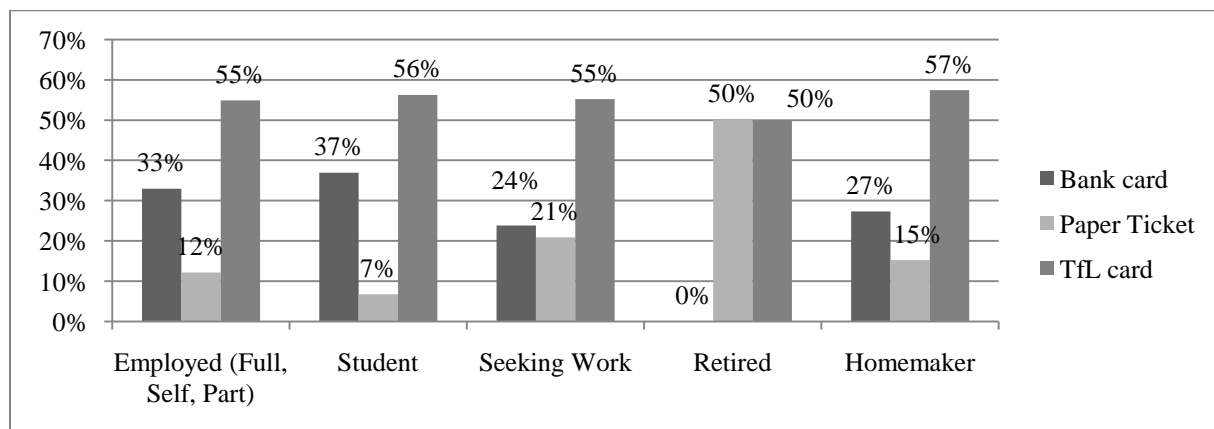


Figure 6-3 Comparison of Preferred TfL Fare Media by Employment Status

**Income:** Figure 6-4 shows future fare media preference by annual income. The two highest income groups had a greater tendency to prefer bankcards, but it is noted that the £75,000 income group only included 5 survey participants. Other trends were not systematic.

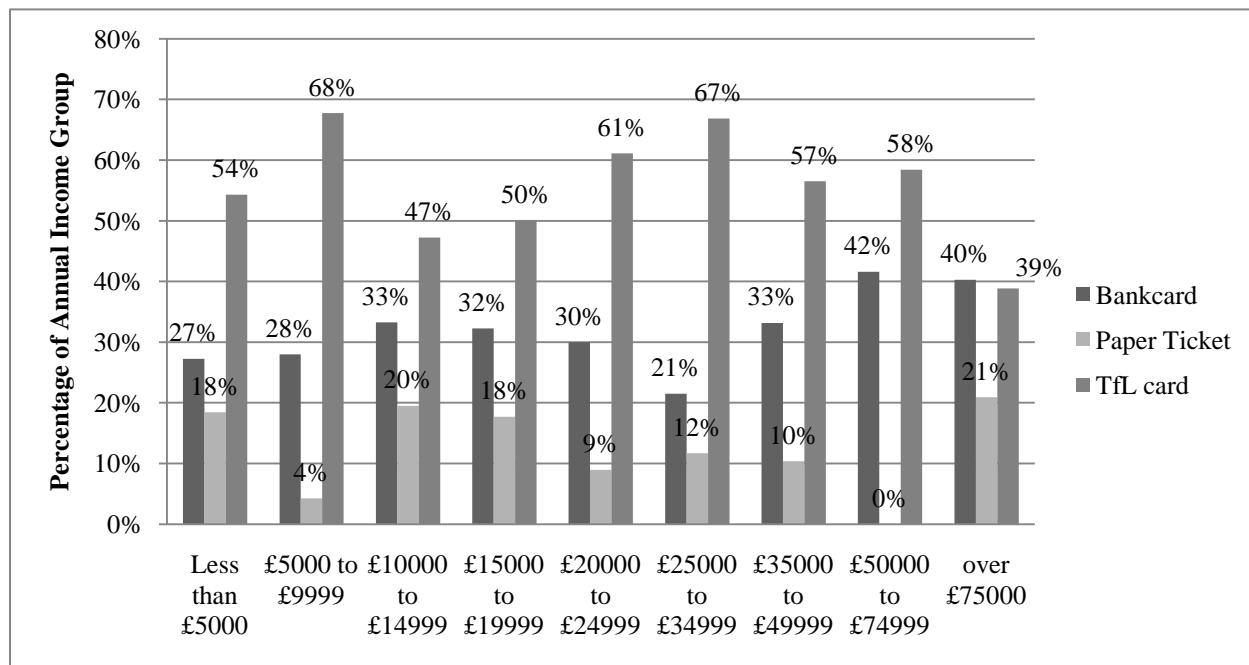


Figure 6-4 Comparison of Preferred TfL Fare Media by Annual Income

**Banked:** If a respondent had a credit, debit or prepaid card, they were considered to be banked, and if they had none, they were categorized as underbanked. One might hypothesize that the underbanked would never select payment with a bankcard, but, as can be seen in Figure 6-5 below, 20% preferred CLBCs. A greater percentage of banked individuals (32%) preferred bankcards.

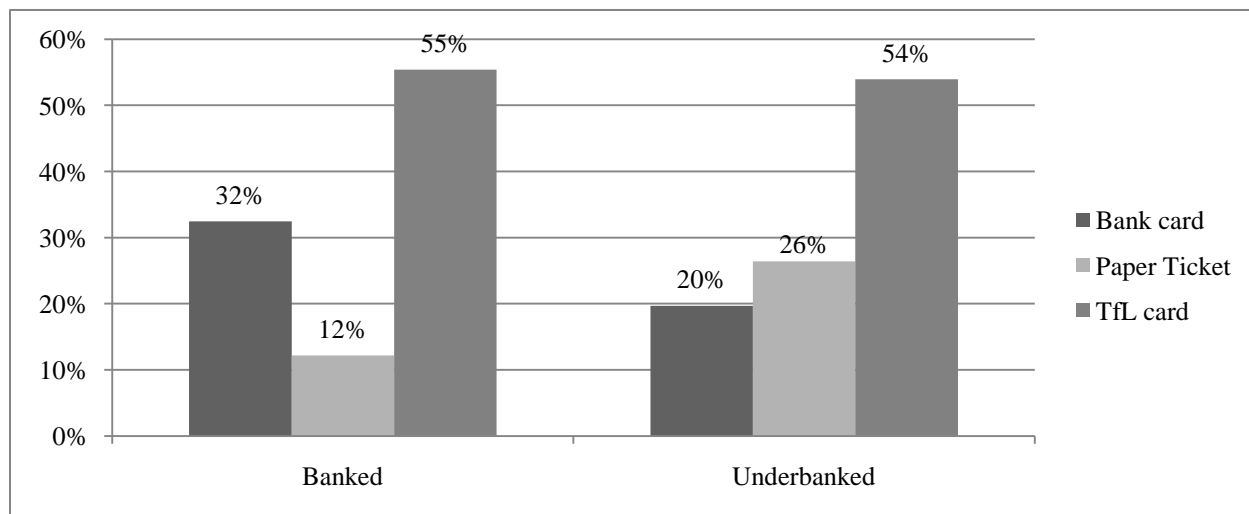


Figure 6-5 Comparison of Preferred TfL Fare Media by Banked/Unbanked

**Mode:** Figure 6-6 shows fare media preference by primary mode. Notably, National Rail riders had a high preference for bankcards (37%), were most likely to choose paper tickets (24%), and had the lowest preference for TfL prepaid cards (39%). This survey was conducted in 2009, and at that time, the Oyster card was not largely available on National Rail.

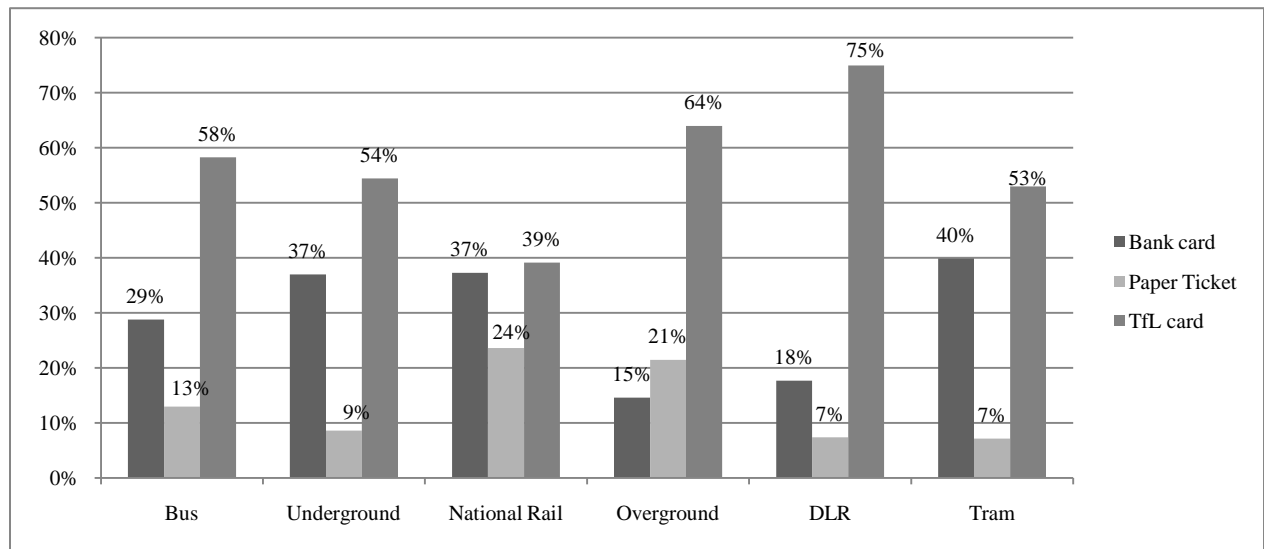


Figure 6-6 Comparison of Preferred TfL Fare Media by Main Mode

**Journey Purpose:** Figure 6-7 shows fare media choice by journey purpose. Riders who were traveling for company business (such as meetings) had the strongest tendency to choose bankcards (55%), but, as is shown in Appendix B, the sample size was only 7 participants.

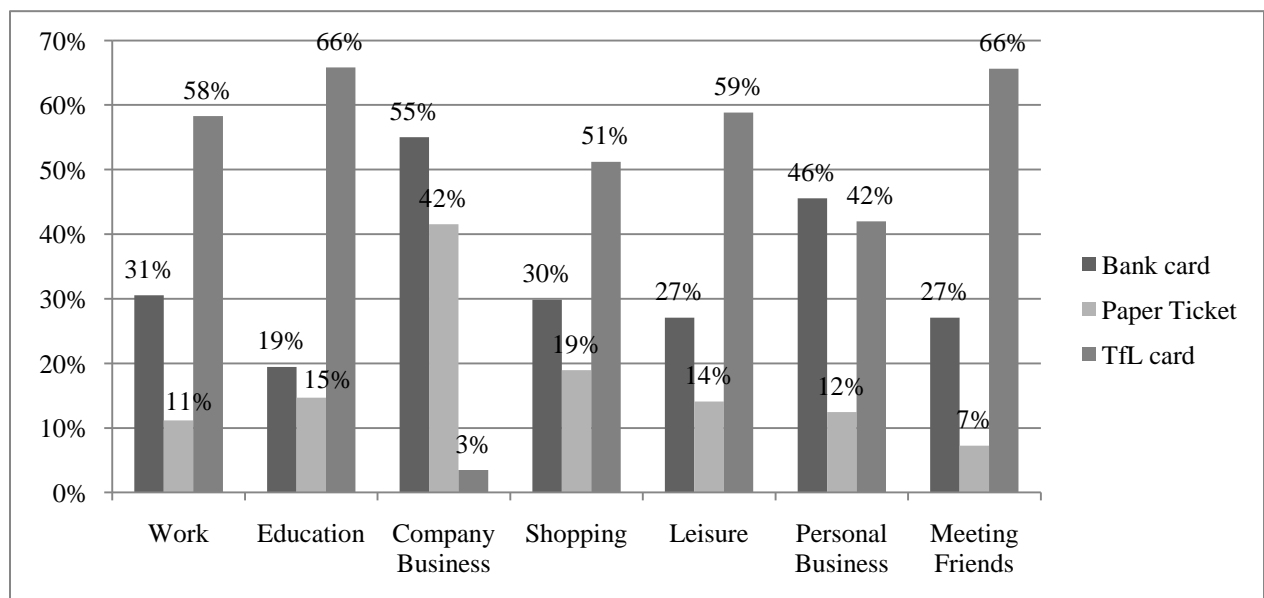


Figure 6-7 Comparison of Preferred TfL Fare Media by Trip Purpose

**Ticket Type:** Figure 6-8 shows future fare media choice by current ticket selection. 30% of riders who used paper tickets, which included paper singles, paper returns, one day paper tickets, or seven day paper tickets, wished to continue to use paper tickets. Other groups appear to have similar preferences.

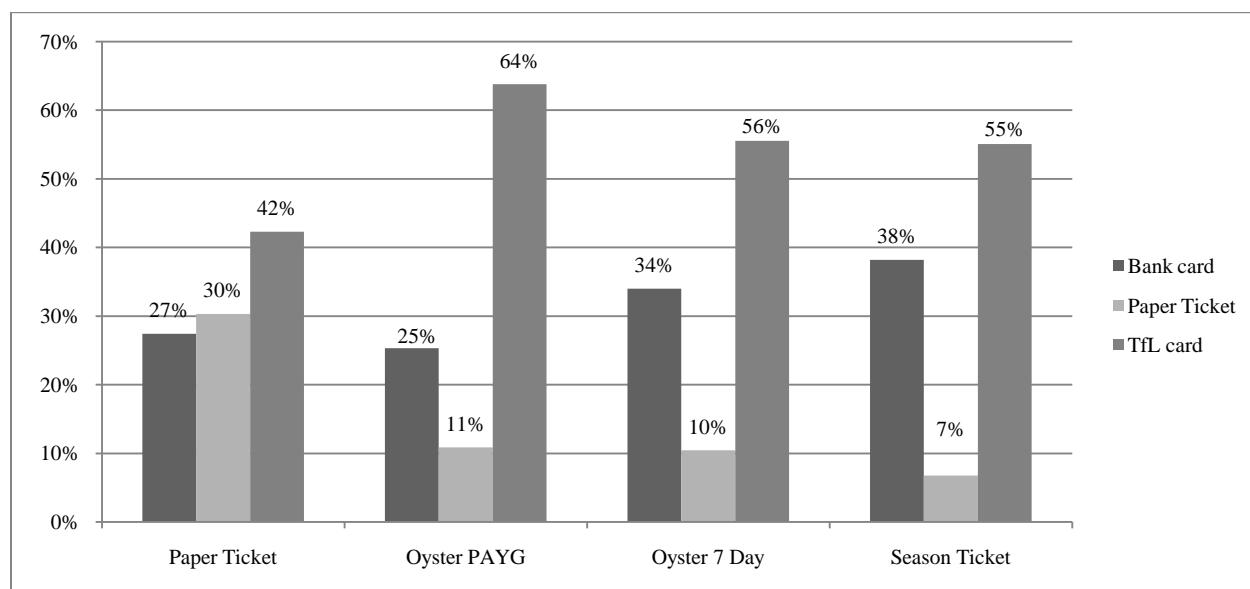


Figure 6-8 Comparison of Preferred TfL Fare Media by Current Ticket Type

**Paying for Ticket:** Figure 6-9 shows future fare media choice broken down by how riders currently pay for tickets. Respondents who purchased their ticket with a debit card displayed the strongest preference for CLBCs (43%) and the least preference for paper tickets (5%).

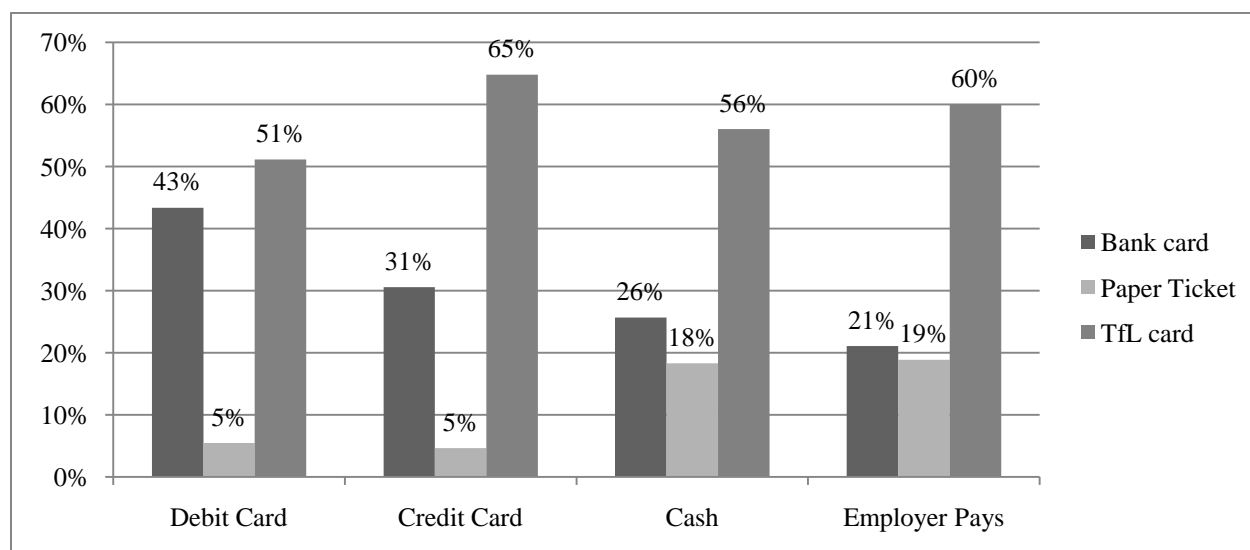


Figure 6-9 Comparison of Preferred Future Fare Media by Current Payment Medium

**Ticket Channel:** Figure 6-10 examines future fare media choice by the channel through which tickets are currently purchased. It is noted that Travel Information Centres, online purchases, Auto Top Up, and bus stop purchases had small sample sizes, as is shown in Appendix B. Tube Ticket Offices and Oyster Ticket Stops are the most popular channels to purchase tickets, and these had similar trends.

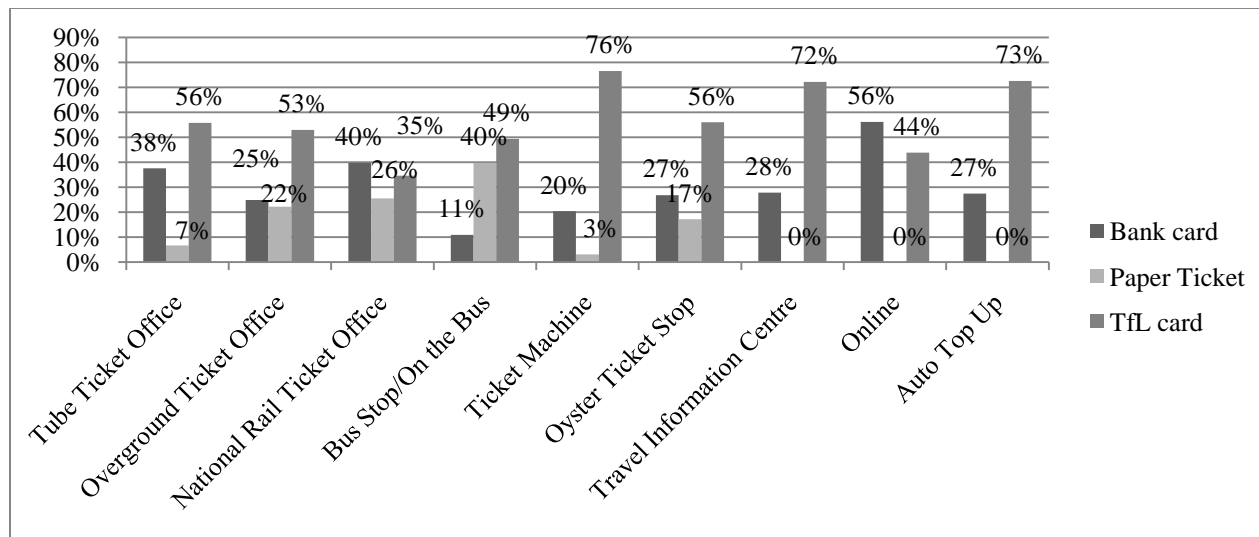


Figure 6-10 Comparison of Preferred TfL Fare Media by Ticket Channel

**Social Grade:** Social grade classification based on the occupation of the primary earner is commonly used in the UK for customer research.<sup>119</sup> Figure 6-11 shows future fare media choice by social grade. CLBCs were preferred by the majority of Class A respondents (57%). Classes B, C1, C2, and D showed similar preferences, with approximately one third of respondents preferring CLBCs. Class E riders exhibited a higher tendency to choose paper tickets (26%).

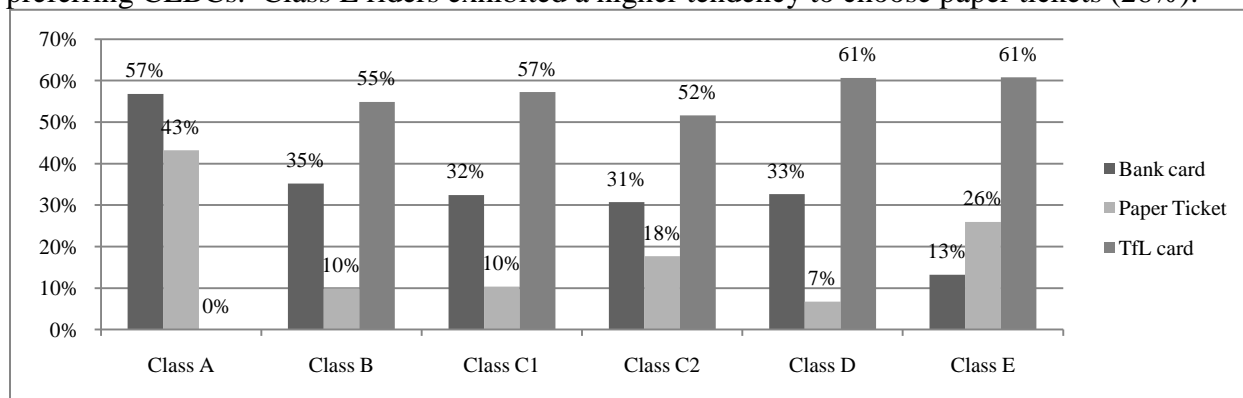


Figure 6-11 Comparison of Preferred TfL Fare Media by Social Grade

<sup>119</sup> A is upper middle class, with a higher managerial, administrative or professional position;  
 B is middle class with an intermediate managerial, administrative or professional job;  
 C1 is lower middle class, with supervisory or clerical, junior managerial, administrative or professional jobs;  
 D is working class, with semi or unskilled manual workers; and  
 E is the lowest level of subsistence, with dependence on the state for payments or those with casual employment or without a regular income.

### 6.2.3 TfL Discrete Choice Model for Fare Media

The following section builds up the previous analysis by applying a discrete choice model to future fare media choice. Logistic regression (i.e. logit) is a statistical technique that can be used to identify the extent to which individual socioeconomic characteristics relate to a decision-maker's choice. Because there were three distinct future fare media choices (Figure 6-12), multinomial logit was selected.

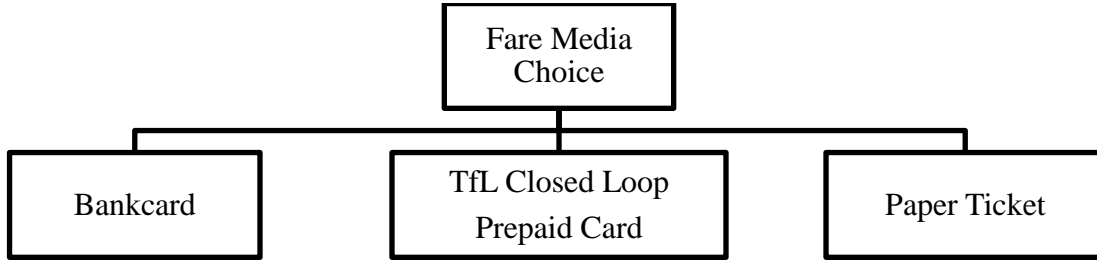


Figure 6-12 TfL Fare Media Choice Set

### 6.2.4 TfL Multinomial Logit Model Specification

The theory underlying multinomial logit (MNL) rests on the assumption that a consumer will choose the alternative that has the maximum utility. The probability that a decision-maker will choose each alternative (bankcard, TfL closed loop prepaid card, paper ticket) can be written in the following manner:

$$Probability(TfL\ card) = \frac{e^{V_{TfLcard}}}{e^{V_{Bankcard}} + e^{V_{TfLcard}} + e^{V_{PaperTicket}}}$$

$$Probability(Bankcard) = \frac{e^{V_{Bankcard}}}{e^{V_{Bankcard}} + e^{V_{TfLcard}} + e^{V_{PaperTicket}}}$$

$$Probability(Paper\ Ticket) = \frac{e^{V_{PaperTicket}}}{e^{V_{Bankcard}} + e^{V_{TfLcard}} + e^{V_{PaperTicket}}}$$

**Where:**

$V_{Bankcard}$  = systematic utility of choosing a bankcard,

$V_{TfLcard}$  = systematic utility of choosing a TfL closed loop prepaid card, and

$V_{PaperTicket}$  = systematic utility of choosing a paper ticket.

The systematic utility of each alternative is a function of the explanatory (independent) variables, which are characteristics of the decision-maker. These variables include socioeconomic, transportation, and ticketing characteristics, and they are defined in Figure 6-13.

	Variable	Definition
Socioeconomic Characteristics	Male	A dummy variable for gender defined to be one if the respondent was male.
	Age	Dummy variables were used for respondent age groups, which were subdivided 18-24, 25-34, 45-54, 55-59 and 60+.
	Location	A dummy variable was defined to be one if the respondent lived within the city of London.
	Ethnicity	Dummy variables were used for white/Caucasian respondents and minorities.
	Employment Status	Dummy variables were used for employment categories: employed, student, unemployed, retired, homemaker, or other.
	Banked	A dummy variable was defined to be one if the respondent had either a credit, debit, or prepaid card.
	Social Grade	Dummy variables were used for each social grade: A, B, C1, C2, D, and E.
	Income	Dummy variables for annual income groups £10,000 & less, £10,000-50,000, and £50,000 & greater.
	Household Size	A continuous variable represented the total number of individuals in the household.
Travel Characteristics	Journey Purpose	Dummy variables were used for journey purpose: Work/Education Commuting/Business, Leisure or Personal Business.
	Mode	Dummy variables were used for each primary mode: Bus, Underground, National Rail, Overground, DLR and Tram.
Ticketing Characteristics	Ticket Type	Dummy variables for current ticket type were divided into Paper Tickets, Oyster Pay-as-you-go, Weekly Passes on Oyster, and Season Tickets (monthly and longer).
	Ticket Purchase Location	Dummy variables were used for where tickets are currently purchased: Tube Ticket Offices, Overground Ticket Offices, National Rail Ticket Office, Bus stop/Onboard, Ticket Machines, Travel Information Centres, Oyster Ticket Stops, Online, Auto Top up and Other.
	Paying for Ticket	Dummy variables represented how tickets are currently purchased: using a debit card, using a credit card, using cash, by an employer, or other.

Figure 6-13 Definition of TfL Variables



After assessing many specifications using these independent variables, which included testing for nested structures, the following simple systematic utility functions were selected as having the most explanatory power over fare media choice in the MNL model.

$$V_{Bankcard} = \beta_0 + \beta_1 (Male) + \beta_2 (Banked) + \beta_3 (Age\ 18\ to\ 24) + \beta_4 (Debit) + \beta_5 (Class\ A)$$

$$V_{TfLcard} = \beta_1 (Male)$$

$$V_{Paper} = \beta_6 + \beta_7 (Paper\ Ticket) + \beta_8 (National\ Rail)$$

**Where:**

*Male* is a dummy variable for male respondents;

*Banked* is a dummy variable for respondents who have at least one credit, debit or prepaid card;

*Age 18 to 24* is a dummy variable for respondents who fall between the ages of 18 and 24;

*Debit* is a dummy variable for respondents who pay or reload current tickets using a debit card;

*Class A* is a dummy variable for respondents from households in social grade ranking A, which is for higher managerial, administrative or professional positions;

*Paper Ticket* is a dummy variable for respondents who currently use a paper ticket; and

*National Rail* is a dummy variable for respondents whose primary mode is National Rail.

As can be seen above, the bankcard equation and the paper ticket equation have alternative specific constants ( $\beta_0$  and  $\beta_6$ , respectively). The TfL closed loop prepaid card is considered to be the base case. The resulting coefficient estimates are given below. T-statistics are shown in parenthesis below each variable.

$$V_{Bankcard} = -1.59 + 0.674(Male) + 0.648(Banked) + 0.634(Age\ 18\ to\ 24) + 0.734(Debit) + 1.33(Class\ A)$$

(-3.90)                      (2.20)                      (1.55)                      (2.76)                      (3.32)                      (1.76)

$$V_{TfLcard} = 0.674 (Male) \quad (2.20)$$

$$V_{Paper} = -1.73 + 1.44 (Paper\ Ticket) + 0.664 (National\ Rail)$$

(4.79)
(1.90)

The overall statistics of the model are presented in the following figure.

Number of observations:	452
Init log-likelihood:	-494.739
Final log-likelihood:	-402.024
Likelihood ratio test:	185.431
Rho-square:	0.187
Adjusted rho-square:	0.169

Figure 6-14 TfL Choice Model Statistics

### 6.2.5 TfL Model Conclusions

Conclusions about the TfL choice model can be summarized in the following manner.

- **Goodness of Fit:** The overall goodness of fit of the model is somewhat low by a number of measures. For example, rho-squared is measured on a scale of zero to one, where zero indicates no fit and one indicates perfect fit. A rho-squared of 0.187 suggests that the independent variables have a weak, but still statistically significant, relationship with fare media choice.
- **Alternative Specific Constants:** The alternative specific constants for the bankcard and paper ticket alternatives ( $\beta_0$  and  $\beta_6$ ) were -1.59 and -1.79, respectively. The negative signs indicate that, all else being equal, the TfL card is the preferred alternative. Additionally, the relatively large magnitude of these two constants compared to the other coefficients indicates that there is a high level of unexplained preference between alternatives.
- **Male:** Gender was a statistically significant variable, and the positive coefficient (0.674) in both the bankcard and TfL card equations indicates that men may have a higher preference for the two contactless alternatives than women.
- **Banked:** Riders who already have credit, debit or prepaid cards had a positive preference for using bankcards as fare media, as is indicated by the coefficient (0.648) in the bankcard equation. It is noted that it was unknown if the respondent's card was contactless. Last, the t-statistic was only 1.55, and this variable does not have as great statistical significance as the other variables.
- **Age:** Riders age 18 to 24 showed a preference for contactless bankcards, as indicated by the positive coefficient (0.634) in the systematic utility equation for the bankcard alternative.
- **Debit:** Riders who already use debit cards to purchase tickets or reload Oyster cards also had a tendency to prefer bankcards, as is indicated by the coefficient of 0.734 in the bankcard equation.
- **Class A:** Riders from Class A households showed a preference for bankcards, which is shown by the large, positive coefficient of 1.33 in the bankcard equation.
- **Paper Ticket:** The positive coefficient of 1.4 in the paper ticket equation indicates that riders who currently use paper tickets exhibit a tendency to prefer paper tickets.
- **National Rail:** Respondents who primarily use National Rail exhibited a tendency to prefer paper tickets, as is noted by the positive coefficient of 0.664 in the paper ticket equation. Again, it is noted that this survey was conducted in 2009, which was before the Oyster card was expanded to most National Rail services.

## 6.3 The Chicago Transit Authority

As the Chicago Transit Authority moves toward implementation of a CLBC fare collection system, they have also investigated customer attitudes toward payment with CLBCs. In the fall of 2008, the CTA conducted a comprehensive Customer Experience Survey that included questions on ridership, general perceptions of the CTA, fare payment, service attributes, customer loyalty, technology use, and socioeconomic status. Northwest Research Group was hired to conduct and analyze the results of the interviews. Data was collected by telephone using

Random Digit Dial (RDD) sampling and computer-assisted telephone interviewing (CATI) technology. This process yielded a total of 2,439 complete interviews, which were stratified by geographic area of residence (downtown, North Side, Northwest, South Side, Southwest Side, West Side, and suburban Chicago) and by the respondent's primary mode (bus or rail). The resulting cell size allowed for statistically reliable results. This data source was also used in Chapter 5 to quantify the number of unbanked riders at the CTA.<sup>120</sup>

### 6.3.1 CTA Rider Attitudes toward CLBC Fare Collection Systems

In the telephone interview, riders were asked to rank how likely they would be to use contactless bankcards for transit payments in comparison to continuing to use the current fare media (Chicago card, magnetic stripe card, or cash) in the following manner:

- (1) *Very unlikely to use a contactless bankcard;*
- (2) *Somewhat unlikely to use a contactless bankcard;*
- (3) *Neither likely nor unlikely to use a contactless bankcard;*
- (4) *Somewhat likely to use a contactless bankcard; or*
- (5) *Very likely to use a contactless bankcard.*

Notably, neither open or closed loop prepaid cards were assessed in this survey. Additionally, the specific fare policies associated with each alternative were not presented.

Results are shown in Figure 6-15. A total of 2,363 people answered this question, which, after weighting, accounted for a sample size of 2,356 riders. The majority of CTA riders were very unlikely to use a contactless bankcard (48%), and another 15% were somewhat unlikely. Only 20% of riders were very likely to use a CLBC, and another 17% were somewhat likely.

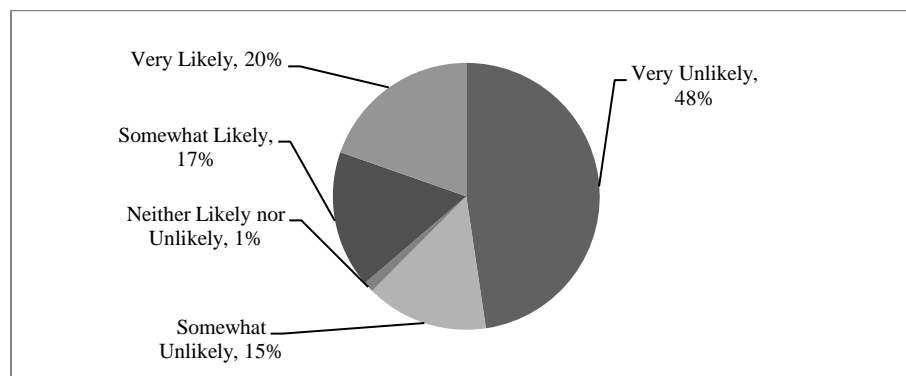


Figure 6-15 CTA Rider Likelihood of Using Contactless Bankcards

### 6.3.2 CTA Statistical Analysis

Fare media preferences were then broken down to investigate the transportation choices, socioeconomic characteristics, and current fare choices of riders. The following sections highlight trends among riders, and additional results can be found in the Appendix C.

<sup>120</sup> The results presented in the following paragraphs are from survey data collected by Northwest Research Group, but all calculations were done by the author using the raw data.

**Age:** Figure 6-16 shows the likelihood of riders choosing CLBCs by age group. Notably, 64% of riders over age 65 were very unlikely to use CLBCs. Younger age groups showed similar preferences for fare media.

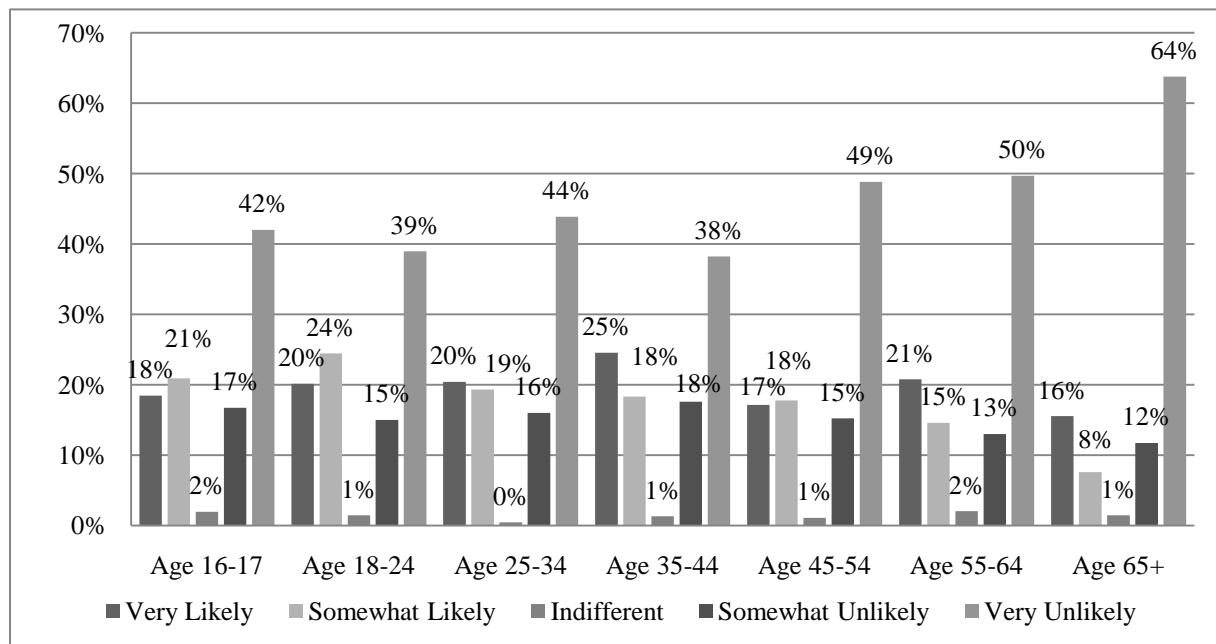


Figure 6-16 CTA Rider Likelihood of Using Contactless Bankcards by Age Group

**Employment Status:** Figure 6-17 shows the likelihood of choosing contactless bankcard by employment status. The majority of retired riders were very unlikely to use CLBCs (60%). Similar preferences were exhibited by the other employment groups.

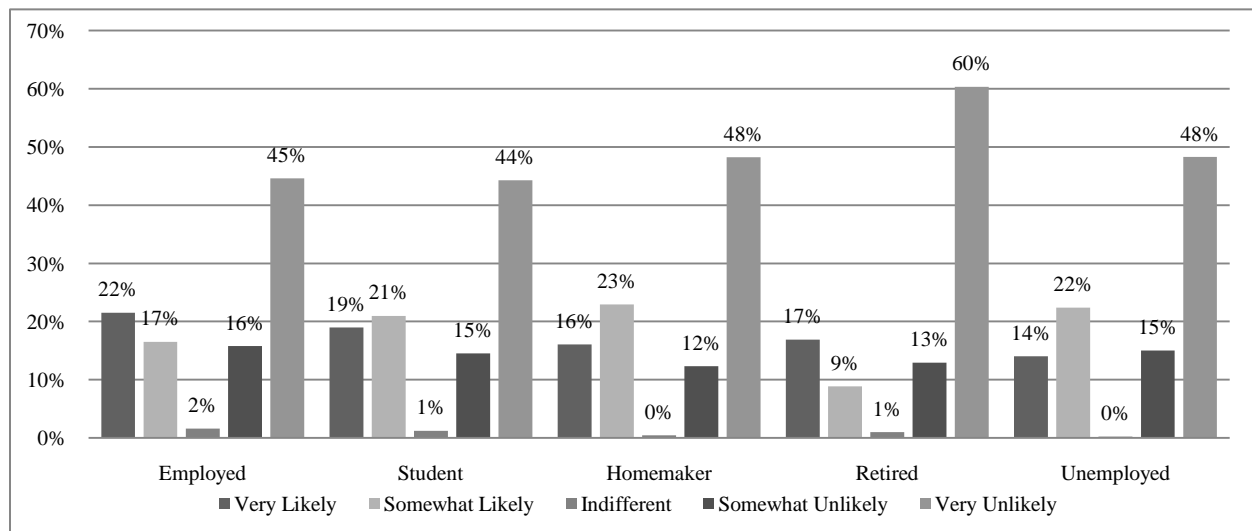


Figure 6-17 CTA Rider Likelihood of Using Contactless Bankcards by Employment Status

**Income:** Figure 6-18 shows the likelihood of choosing contactless bankcard by annual income. Most income groups showed similar preferences for fare media, but higher income groups were slightly more likely to prefer CLBCs.

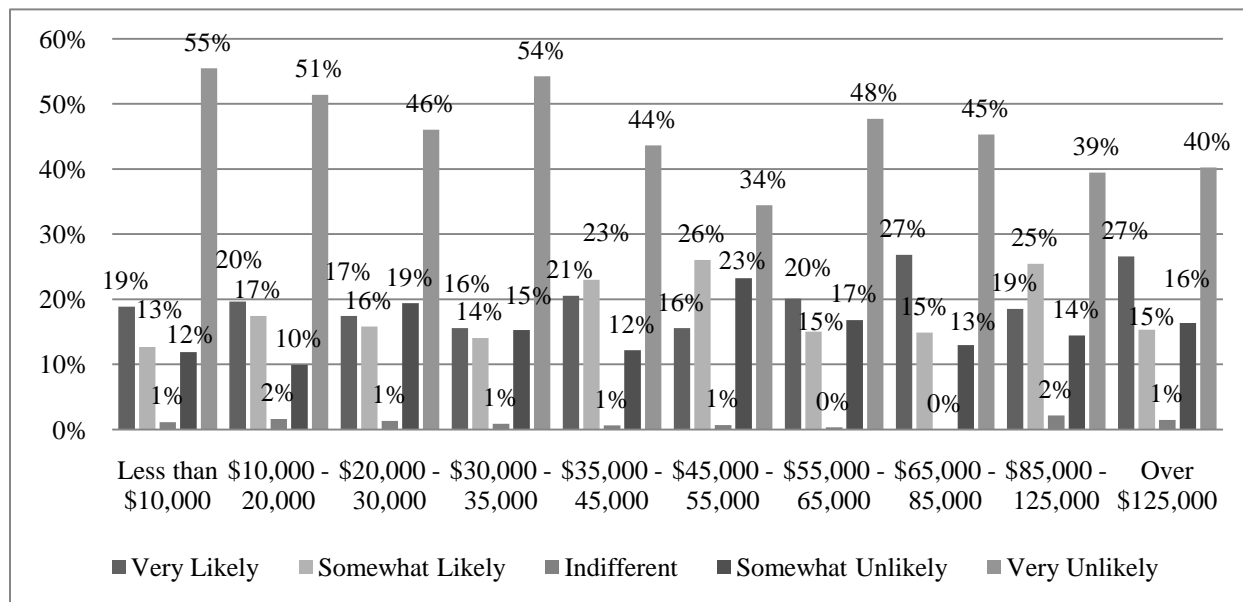


Figure 6-18 CTA Rider Likelihood of Using Contactless Bankcards by Annual Income

**Mode and Frequency:** Figure 6-19 shows likelihood of using contactless bankcards by mode and frequency. Frequent travelers ride the CTA five days per week or more, infrequent riders once per week or more, and occasional riders once per month or more. Frequent and infrequent riders were subdivided by mode (bus or train) that they rode more often. The majority of frequent and infrequent bus riders were very unlikely to use CLBCs (50% and 53%, respectively). On the other hand, 25% of infrequent train riders and 24% of occasional riders were very likely to use CLBCs.

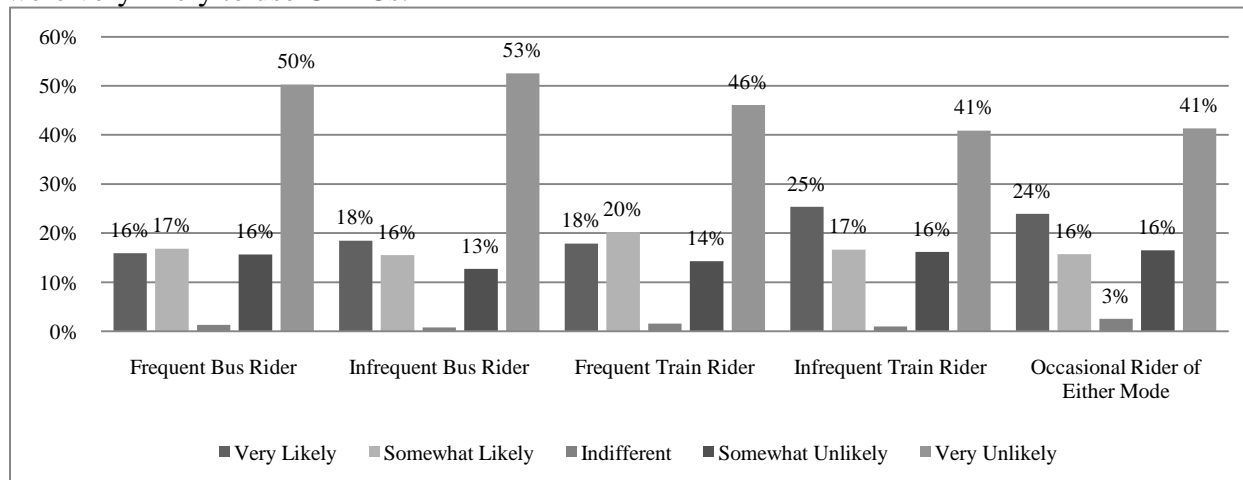


Figure 6-19 CTA Rider Likelihood of Using Contactless Bankcards by Mode and Frequency

**Journey Purpose:** Figure 6-20 shows likelihood of using CLBCs by journey purpose of the rider's most frequent trip. Those travelling for leisure, personal business, to the airport and for business-related work were slightly more likely to choose CLBCs (very likely for 25%, 24%, 23% and 23% of respondents, respectively).

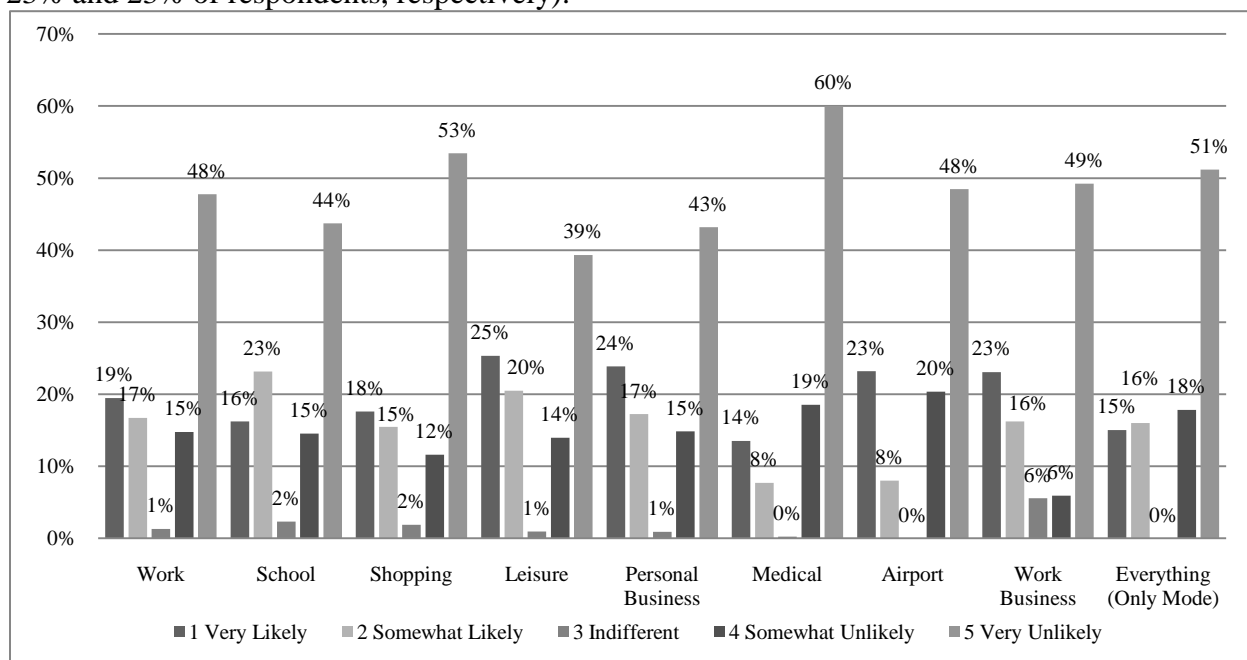


Figure 6-20 CTA Rider Likelihood of Using Contactless Bankcards by Journey Purpose

**Banked:** If a respondent had either a credit card, debit card or checking account, they were considered to be banked; otherwise, they were categorized as unbanked (see Chapter 5). Figure 6-21 shows that 21% of banked riders were very likely to use CLBCs, while 16% of unbanked riders were very likely to use CLBCs.

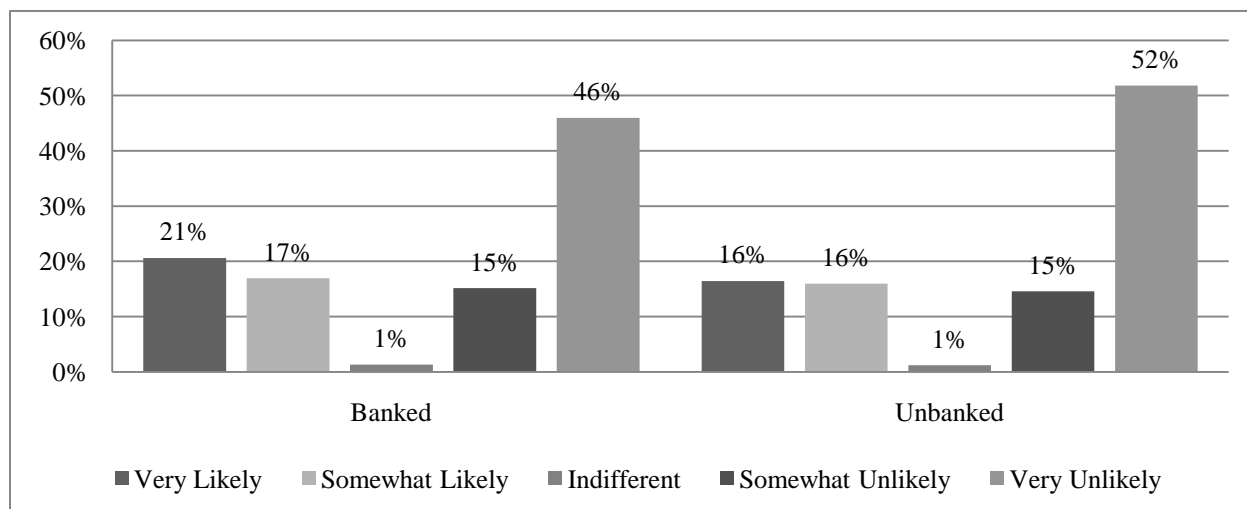


Figure 6-21 CTA Rider Likelihood of Using Contactless Bankcards by Banked/Unbanked

**Ticket Type:** Figure 6-22 displays likelihood of using CLBCs by current ticket type. The majority of CTA riders who participate in reduced or free fare programs (students, disabled, seniors or military personnel) were very unlikely to choose CLBCs (60%). Other groups showed similar preferences for fare media.

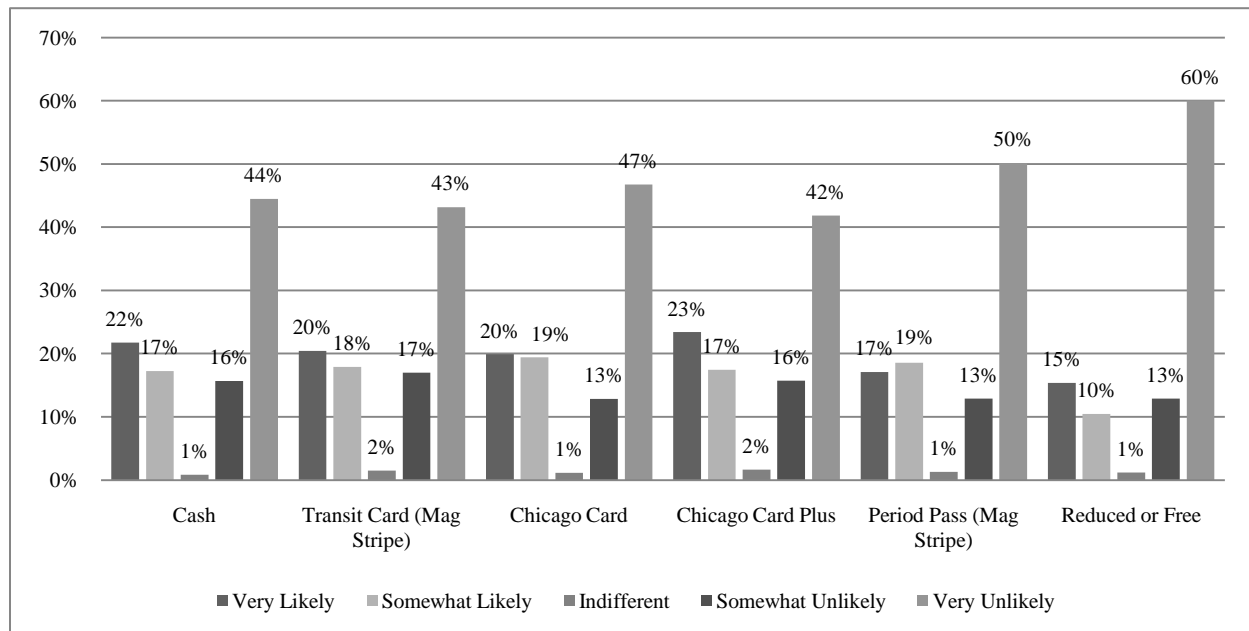


Figure 6-22 CTA Rider Likelihood of Using Contactless Bankcards by Current Fare Media

**Use of Cash:** Figure 6-23 displays the likelihood of using CLBCs for transit fare media compared to the frequency of cash usage for making payments (such as in retail). The majority of riders who always use cash for payments were very unlikely to use CLBCs for transit fare payment (55%). Other groups had similar preferences.

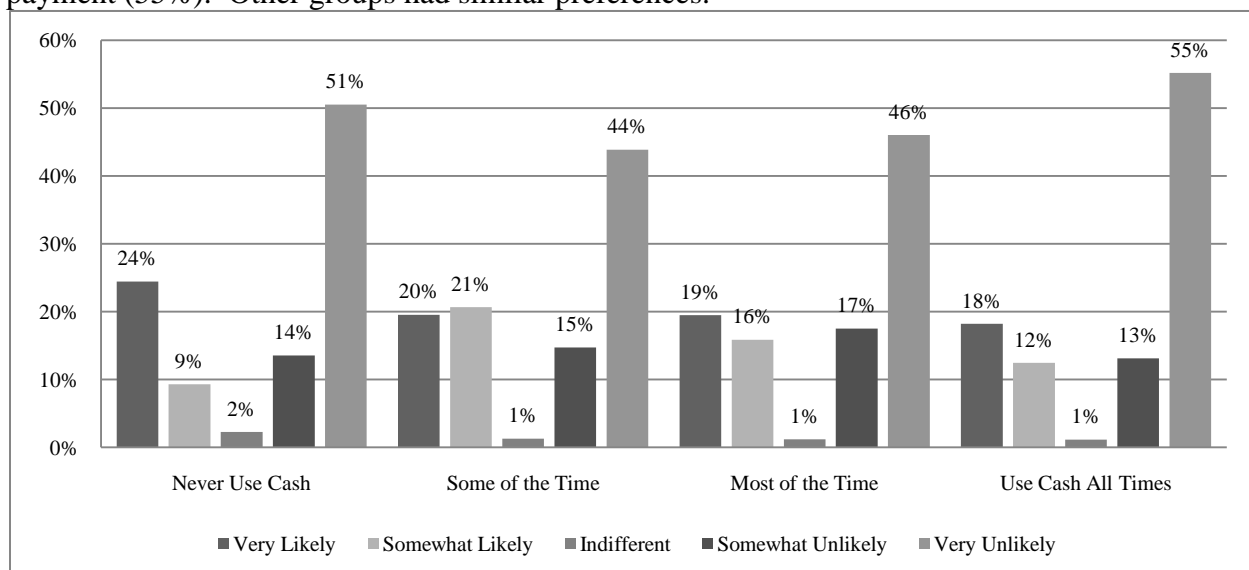


Figure 6-23 CTA Rider Likelihood of Using Contactless Bankcards by Frequency of Cash Use

**Awareness of Contactless:** CTA riders were asked if they had ever heard of or read anything about contactless payment cards, which were described as bank or credit cards that can being waved in front of a terminal as well as swiped through traditional card readers. Figure 6-24 reveals that 21% of riders who were aware of CLBCs were very likely to use them for transit fare payment.

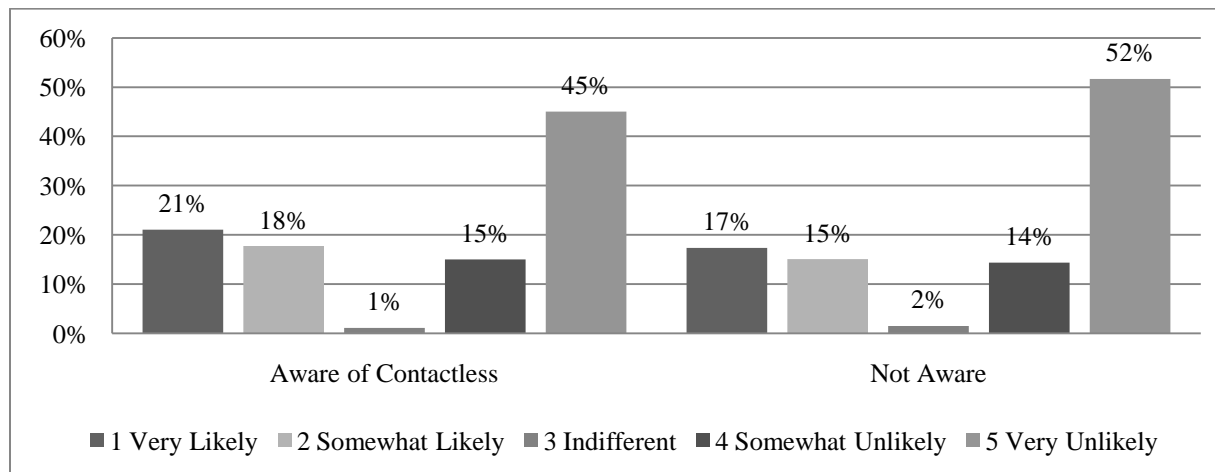


Figure 6-24 CTA Rider Likelihood of Using Contactless Bankcards by Contactless Awareness

### 6.3.3 CTA Discrete Choice Model for Fare Media

A discrete choice model for fare media choice was used to build upon the analysis of CTA data. Based on the fare media survey question, the choice set was defined to be bankcard and current fare media, as is shown in Figure 6-25. Respondents who stated that they were “very likely” or “somewhat likely” to choose CLBCs were assumed to have chosen the bankcard alternative. Likewise, those who were “very unlikely” or “somewhat unlikely” to use CLBCs were combined to select current fare media.<sup>121</sup> Because there were two choices, binary logit was utilized.

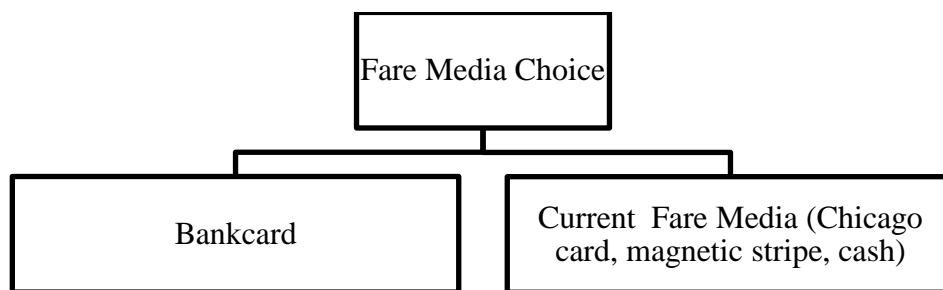


Figure 6-25 CTA Fare Media Choice Set

### 6.3.4 CTA Binary Logit Model Specification

The theory underlying binary logit rests on the assumption that a consumer will choose the alternative that has the maximum utility. The probability that a decision-maker will choose each alternative (bankcard or current fare media) can be written in the following manner:

<sup>121</sup> It is noted that respondents who were “neither likely nor unlikely” between CLBCs and current fare media were excluded from the choice model. This represented less than 1% of survey participants.



$$Probability (Bankcard) = \frac{e^{V_{Bankcard}}}{e^{V_{Bankcard}} + e^{V_{Fare Media}}}$$

$$Probability (Fare Media) = \frac{e^{V_{Fare Media}}}{e^{V_{Bankcard}} + e^{V_{Fare Media}}}$$

**Where:**

$V_{Bankcard}$  = systematic utility of choosing a bankcard, and

$V_{Fare Media}$  = systematic utility of choosing current fare media.

The systematic utility of each alternative is a function of the explanatory (independent) variables, which are characteristics of the decision-maker. These variables include socioeconomic, transportation, and ticketing characteristics, and they are defined in Figure 6-26.

	Variable	Definition
Socioeconomic Characteristics	Male	A dummy variable for gender was defined to be one if the respondent was male.
	Age	Dummy variables were used for respondent ages groups, which were subdivided 16-17, 18-24, 25-34, 45-54, 55-64 and 65+.
	Location	Dummy variables were used for regions where the respondents live in Chicago: North, Northwest, South, Southwest, West, Downtown and Suburbs.
	Ethnicity	Dummy variables were used for white/Caucasian respondents and minorities.
	Employment Status	Dummy variables were used for employment categories: employed, student, unemployed, retired, homemaker, or other.
	Income	Dummy variables for annual income groups were: \$20,000 & less, \$20,000-55,000, \$55,000-85,000, and \$85,000 & greater.
	Household Size	A continuous variable represented the total number of individuals in the household.
Financial Characteristics	Banked	A dummy variable was defined to be one if the respondent had either a credit card, debit card or checking account.
	Frequency of Cash Payment	Dummy variables were used based on the frequency with which the respondent uses cash for retail payments: never, sometimes, most of the time, and all of the time.
	Awareness of Contactless Bankcards	A dummy variable was defined to be one if the respondent had heard of contactless bankcards.
Travel Characteristics	Frequency of Travel	Dummy variables were defined for frequent riders (at least five rides per week), infrequent riders (at least one ride per week), and occasional riders (at least one ride per month).
	Journey Purpose	Dummy variables were used for journey purpose: Work/Education Commuting/Business, Leisure/Personal Business/Medical/Airport, and Only Mode of Travel.
	Mode	Dummy variables were used for primary mode: Bus, Rail or Both.
Ticketing Characteristics	Ticket Type	Dummy variables for current type were divided into cash, transit card (magnetic stripe), Chicago card, Chicago card plus, period pass, and reduced/free fares.

Figure 6-26 Definition of CTA Variables

After assessing many specifications using these independent variables, the following simple systematic utility functions were selected as having the most explanatory power over fare media choice in the binary logit model.

$$V_{Bankcard} = \beta_0 + \beta_1(Young) + \beta_2(HH\ Size) + \beta_3(Train) + \beta_4(Banked * Aware\ of\ Contactless)$$

$$V_{Fare\ Media} = \beta_5(Age\ 65) + \beta_6(Work\ Trip) + \beta_7(All\ Cash\ Payments)$$

**Where:**

*Young* is a dummy variable for respondents who are under age 45;

*HH Size* is the size of the respondent's household, ranging up to 14 people;

*Train* is a dummy variable for respondents whose primary mode is train;

*Banked* is a dummy variable for respondents who have a credit, debit card, or checking account;

*Aware of Contactless* is a dummy variable for respondents who are aware of CLBCs;

*Age 65* is a dummy variable for respondents who are over 65 years of age;

*Work Trip* is a dummy variable for respondents who primary journey purpose is commuting to work or school or work-related trips; and

*All Cash Payments* is a dummy variable for respondents who stated that they always use cash to pay for things (including retail purchases).

As can be seen above, the bankcard equation has an alternative specific constant ( $\beta_0$ ). The current fare media choice is considered to be the base case. The resulting coefficient estimates are given below, and T-statistics are shown in parenthesis below each variable.

$$V_{Bankcard} = -0.774 + 0.292(Young) + 0.0863(HH\ Size) + 0.247(Train) + 0.224(Banked * Aware\ of\ Contactless)$$

(-5.92)            (2.88)            (2.98)            (2.03)            (2.36)

$$V_{Fare\ Media} = 0.516(Age\ 65) + 0.238(Work\ Trip) + 0.378(All\ Cash\ Payments)$$

(3.36)            (2.46)            (3.23)

The overall statistics of the model are presented in the following figure.

Number of observations:	2,211
Init log-likelihood:	-1,539.648
Final log-likelihood:	-1,432.250
Likelihood ratio test:	214.796
Rho-square:	0.070
Adjusted rho-square:	0.065

Figure 6-27 CTA Choice Model Statistics

### 6.3.5 CTA Model Conclusions

Conclusions about the CTA choice model can be summarized in the following manner:

- **Goodness of Fit:** The overall goodness of fit of the model is very low by a number of measures. For example, a rho-squared of 0.070 suggests that the independent variables have very limited relationship with fare media choice. Possible reasons for this are discussed in the next section.

- **Alternative Specific Constant:** The alternative specific constant for bankcard (-0.774) indicates that, all else being equal, current fare media is the preferred alternative. Additionally, the relatively high magnitude of this constant compared to the other coefficients indicates that there is a high level of unexplained preference between alternatives.
- **Young Age:** Riders under 45 years of age showed a preference for contactless bankcards, as indicated by the positive coefficient of 0.292 in the bankcard equation.
- **Age 65:** Riders over age 65 showed a preference for current fare media, as indicated by the positive coefficient (0.516) in the current fare media equation.
- **Household Size:** Household size was a statistically significant variable, and the positive coefficient (0.0863) suggests that respondents from larger households may prefer CLBCs. This coefficient is small in magnitude compared to the other coefficients, which can partially be attributed to the fact that household size is a continuous variable that is larger in magnitude than the other dummy variables.
- **Train:** Respondents who primarily use the train exhibited a tendency to prefer contactless bankcards, as is noted by the positive coefficient of 0.247.
- **Banked \* Aware of Contactless:** This was an interaction term for riders who had heard of contactless bankcards and also had a credit card, debit card, or checking account. The positive coefficient of 0.224 indicates that these riders have a positive preference for using bankcards as fare media.
- **Work Trip:** Riders who primarily use the CTA for commuting to work or school or for business related trips showed a preference for current fare media, as is shown by the coefficient of 0.238.
- **All Cash Payments:** Riders who always use cash for payments were inclined to choose current fare media, as is shown by the positive coefficient of 0.378 in the fare media equation.

### 6.3.6 CTA Model Areas for Improvement

As was noted in the previous section, the overall goodness of fit of the binary logit model was very low. It may be difficult to improve overall fit of the model if the data is biased. When analyzing stated preference data, there are many possible factors that could cause biases in the data. These include:

- indifference of survey participants to the experimental task;
- a policy response bias;
- a justification bias to substantiate their current behavior;
- an omission of situational constraints when choosing an alternative;
- an incomplete description of alternatives; or
- a cognitive incongruity with actual behavior (Ben-Akiva 2009).

In the case of the CTA stated preference data, two of these factors are likely to have caused biases in the survey results. First, there could have been an incomplete description of

alternatives. 36% of survey participants had never heard of contactless bankcards (see Appendix C). Furthermore, telephoned survey participants were only offered a short description of contactless bankcards fare collection systems, which was described as “a system that allows you to pay your fare on buses and at train turnstiles by holding your credit or bank card up to a secure reader.” This can be contrasted with the TfL Future Ticketing Project survey, in which a short video was utilized to explain the fare media alternatives to survey participants. The second factor that could have biased the results was an indifference of survey participants to the experimental task. The CTA Customer Experience survey had over 70 questions; although not all questions were asked to every participant, they were asked many questions and could have become indifferent to answering before the fare media question was presented.

## 6.4 Comparison of London and Chicago

The results of the statistical analyses and discrete choice models for the CTA and TfL can be compared to investigate overarching themes and trends of rider preferences for future fare media. Figure 6-28 compares the survey results of the two agencies, with an emphasis on the discrete choice modeling results. This is followed by a discussion of general conclusions about ridership preferences for future fare media in CLBC fare collection systems.

	Transport for London (2009 Survey Data)	Chicago Transit Authority (2008 Survey Data)
<b>Rider Preference for Future Fare Media</b>		
<i>Overall Percentage</i>	- 33% of riders prefer CLBCs; - 55% of riders prefer TfL prepaid cards; and - 14% of riders prefer paper tickets.	- 36% of riders prefer CLBCs; - 1% are neutral; and - 62% of riders prefer current fare media. <sup>122</sup>
<b>Influencing Factors</b>		
<i>Age</i>	- Younger riders (ages 18-24) prefer CLBCs.	- Younger riders (under 45 years) prefer CLBCs. - Older riders (65+) prefer current fare media.
<i>Household</i>	- Riders from Class A households have a stronger tendency to choose CLBCs.	- Riders from larger households have a stronger tendency to choose CLBCs.
<i>Banked</i>	- Riders with credit, debit or prepaid cards tend to prefer CLBCs.	- Riders with credit, debit cards or checking accounts tend to prefer CLBCs.
<i>Mode</i>	- National Rail riders prefer paper tickets.	- Train users prefer CLBCs.
<i>Tickets &amp; Payments</i>	- Riders who currently use debit cards to purchase tickets have a tendency to choose CLBCs. - Paper ticket users have a tendency to continue to prefer paper tickets.	- Riders who are aware of contactless bankcards have a tendency to choose CLBCs. - Riders who always use cash for retail payments prefer current fare media.
<i>Other</i>	- Male riders have a tendency to prefer either TfL or bankcards, in comparison to paper tickets.	- Riders who use the CTA for commuting and work-related trips prefer CLBCs.
<b>Strength of Trends</b>		
<i>Goodness of Fit</i>	- The overall goodness of fit suggests a statistically significant relationship.	- Little goodness of fit, which may indicate biases in the data such as limited respondent understanding of alternatives.

Figure 6-28 Comparison of TfL and CTA Rider Attitudes toward Contactless Bankcards

<sup>122</sup> Rounded to the nearest whole percent.

### **1. Overall preference for contactless bankcards is similar for both agencies.**

As can be seen in Figure 6-28, 33% of TfL riders and 36% of CTA riders prefer CLBCs. Sizable segments of riders beyond the underbanked and unbanked, which were 10% of TfL riders and 20% of CTA riders, respectively, prefer not to use CLBCs.

### **2. Alternative forms of fare media are necessary to complement contactless bankcards.**

The majority of TfL riders (69%) preferred prepaid cards or paper tickets, and most CTA riders (62%) prefer existing fare media. These statistics demonstrate that, particularly in the initial years of contactless bankcard fare collection systems, the majority of riders may prefer not to use CLBCs. Alternative forms fare media such as prepaid cards are necessary.

### **3. Factors influencing fare media choice include age, payment characteristics, and mode.**

The statistical analysis and discrete choice models revealed that trends for fare media preference are not very strong, which is indicated, for example, by low goodness of fit in the discrete choice models. However, a few key factors did emerge that appear to influence the choice of fare media by different ridership groups, as was shown in Figure 6-28. These include the following socioeconomic and travel characteristics.

- **Age:** Younger riders showed a preference for CLBCs at both agencies. In general, younger generations have demonstrated trends of increased utilization of credit and debit cards (see, e.g. Sallie Mae's *How Undergraduate Students Use Credit Cards* 2009). Moreover, younger age groups may be more inclined to adopt new technologies (see, e.g. Beal 1957, Rogers 1962, others). On the other hand, older riders showed a preference for existing fare media at the CTA. Because the CTA (and TfL) have concession schemes for older riders, it may have been unclear to survey respondents if contactless bankcards would or could be used for free travel. Moreover, even if these riders were paying full fares, older generations are generally less likely to adopt new technologies (see, e.g. Beal 1957, Rogers 1962).
- **Availability and Familiarity of Bankcards:** Riders at both transit agencies who are currently banked had a tendency to prefer CLBCs. Given that most of these riders already have credit or debit cards, they may be more inclined to use them for transit payments for reasons of convenience. Moreover, at the CTA, those who were already aware of contactless bankcards had a tendency to prefer CLBCs.
- **Payment Choices:** Current payment choices in retail and transit influenced fare media selection at both transit agencies. At the CTA, riders who stated that they always used cash for retail payments had a tendency to prefer current fare media, which may indicate that they are hesitant to change from their current preferred payment choice. On the other hand, TfL riders who currently use debit cards to purchase transit tickets showed a preference for CLBCs, again indicating that riders may want to continue with their preferred payment instrument.
- **Mode:** Different modes exhibited transit agency-specific fare media trends. CTA train riders had a tendency to prefer CLBCs. On the other hand, TfL National Rail riders had a preference for paper tickets. This is presumably because National Rail largely did not have contactless technology when the survey was administered, and customers were more familiar with paper tickets. These results could be different now that the Oyster card has been expanded to regional rail.

## 6.5 Comparison with Consumer Adoption of Other Technologies

After assessing the attitudes of transit riders to new fare media choices, one may wonder if these results are generally in alignment with attitudes toward new technologies or if these are transit-specific trends. Because RFID technology is relatively new and that payment applications are not yet widespread (see Chapter 2), consumers could view it in a similar fashion to other new and emerging technologies.

Sociology models have been developed to help understand the acceptance of new technologies by different consumer groups (Beal & Bohlen 1957, Rogers 1962). One well-known model that has been applied in many fields, including agriculture, medicine, and IT, divides consumers into five groups based on time of adoption. These categorizations are based on trends in the socioeconomic and social characteristics of consumers, which can be summarized in the following manner.

- **Innovators** represent a small number of people who are willing to adopt a new technology first. They are often young, willing to take risks, from higher social classes, and have close contact to scientific sources or other innovators.
- **Early adopters** fall into the second fastest adoption category, and they tend to have a high degree of leadership among the other categories. Additionally, they are typically younger in age, have more advanced education, have a higher social status, and have more financial lucidity.
- **The early majority** adopts a new technology significantly after the innovators and early adopters. They tend to be slightly above average in age and education level, have average social status, and are less technically focused.
- **The late majority** generally approach new technologies with skepticism. They often have more limited financial resources, less education, and are older. They only adopt a new technology after the majority of society has already adopted it.
- **Laggards** are the last to adopt an innovation. They are typically averse to change and are more focused on traditions. They generally have lower social status, lower financial resources, and are the oldest of all adopters (Beal & Bohlen 1957, Rogers 1962).

The factors influencing fare media choice at the CTA and TfL seem to be in agreement with the categorizations in the technology adoption model presented above. Riders who preferred CLBCs were generally from younger age groups, and they tended to be banked. Likewise, Class A riders in London preferred CLBCs. These characteristics may be indicative of innovators and early adopters, who are often young, willing to take risks, and from higher social classes. On the other hand, those who preferred traditional fare media were older in age. They tended to favor current payment mechanisms (such as cash for retail payments), which may indicate that they approach new payment technologies with skepticism. These groups may make up the late majority or laggards in CLBC adoption, if they ever adopt the technology.

Additionally, the sociology model presented in the previous paragraph suggests that consumer adoption of new technologies increases over time, and this growth takes on a normal distribution, as is shown in Figure 6-29. The horizontal axis represents the time at which a new technology is adopted and the vertical axis indicates the percentage of people who have adopted the technology. The dashed line running along the figure is the adoption curve, which is the

cumulative percentage of people who have adopted the new technology. When the adoption curve is presented by a simple distribution curve instead of a cumulative distribution, it has a normal bell-shape, as is shown by the solid curve.

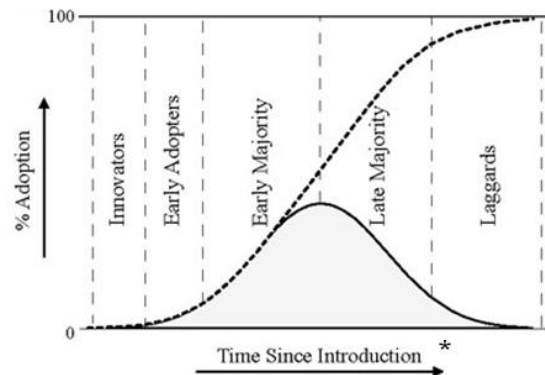


Figure 6-29 Technology Adoption Process<sup>123</sup>

Will this growth curve apply to contactless bankcard adoption in transit fare collection systems? While this question cannot be answered until these systems are implemented, adoption rates of other forms of transit fare media can be investigated. Data was obtained related to the utilization of Oyster cards by TfL riders, and it appears to have followed a similar trajectory to the normally distributed technology adoption curve. Figure 6-30 shows the take-up of Oyster cards between 2002 and 2008, and these rates are anticipated to increase as Oyster card is expanded to National Rail. The adoption of smart cards in London appears to be in general alignment with the framework for consumer adoption of other new technologies, and it may also be relevant for the adoption of contactless bankcards by transit riders.

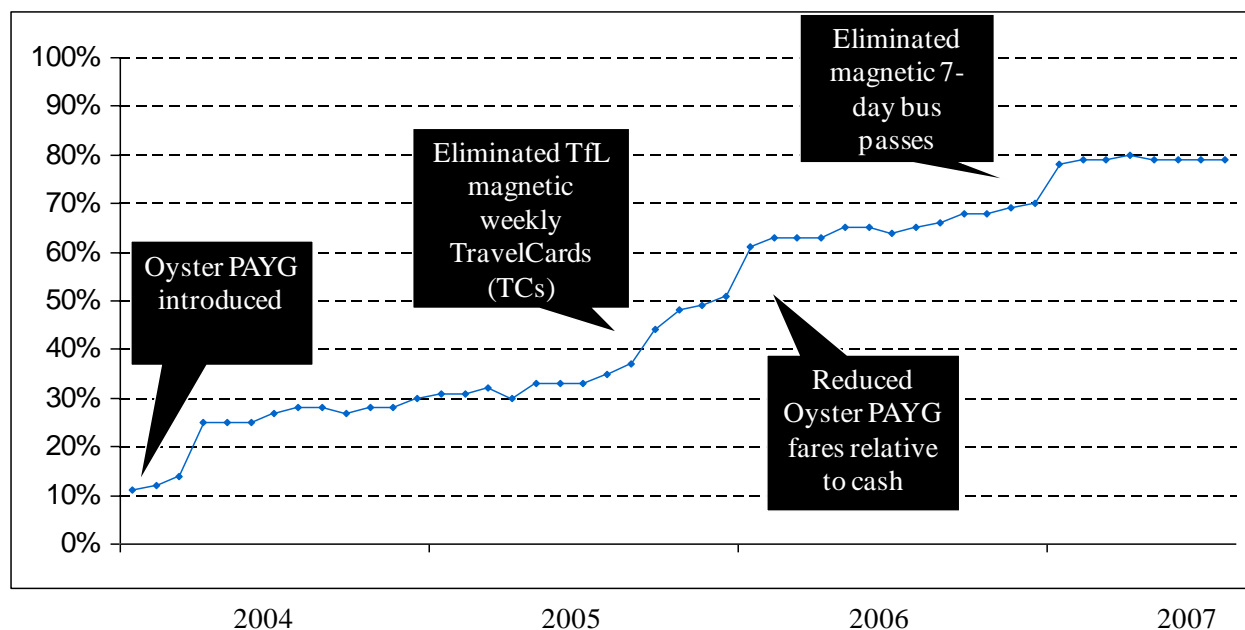


Figure 6-30 TfL Percentage of Journeys on the Oyster card<sup>124</sup>

<sup>123</sup> Image Source: medscape.com

<sup>124</sup> Graph provided by Lauren Sager Weinstein, TfL Fares & Ticketing Directorate.

## **6.6 Summary**

This chapter provided analysis of CTA and TfL customer research data, which was broken down into statistical analysis and discrete choice modeling. Survey data revealed that the majority of riders at the CTA and TfL may prefer prepaid cards, paper tickets, or other forms of existing fare media over contactless bankcards for fare payment. While trends for fare media preference were not very strong, a few key factors did emerge that appear to influence the choice of fare media by different ridership groups, particularly regarding age of riders and use of financial instruments. These trends appear to be in alignment with standard sociology models for technology adoption by consumer groups, which indicate that new technologies gradually gain acceptance over time.



## **7 Conclusions**

This chapter summarizes the findings of this thesis, and it is divided into three sections. First, the evaluation of prepaid card options for Transport for London (TfL) and the Chicago Transit Authority (CTA) is summarized. This is followed by a synthesis of the customer research related to riders who cannot or will not use contactless bankcards (CLBCs). Last, areas for future research and additional analysis are presented.

### **7.1 Evaluation of Prepaid Cards in CLBC Fare Collection Systems**

Because a large segment of the ridership at the CTA and TfL does not have access to or prefers not to use CLBCs, it is necessary for these transit agencies to provide alternative fare media for these riders. Contactless prepaid cards were presented as a possible option, and this appears to be a flexible solution that is capable of meeting the business needs of transit agencies planning CLBC fare collection systems.

Research into the prepaid card market revealed that two of the primary decisions for transit agencies implementing prepaid cards in CLBC fare collection systems are card function and program manager. These options were evaluated based on (1) cost, (2) coverage, and (3) customer experience. This analysis showed that bill payment companies and payment card companies have the potential to offer relatively low cost prepaid solutions for both the CTA and TfL. These companies already have a fairly large number of locations in both cities, although not as many as current transit card distribution networks. Prepaid card companies, while offering relatively good geographic coverage, appear to be a relatively expensive third party provider for both the CTA and TfL. If their costs come down, which may be possible given the size and scale of transit agencies, this may become a more attractive option. Prepaid programs managed by financial institutions may be feasible in the longer term in Chicago and London, but this hinges on the introduction of cash scanning ATMs that will enable real-time reloading for prepaid users. Last, transit agency managed programs appear to have somewhat higher costs, but this provides customers with a similar experience to current smart card systems and has significant geographic coverage in both London and Chicago.

Regarding card function, based on current estimates of costs, closed loop cards appear to have lower costs for both the CTA and TfL. Transit agencies will want to consider the tradeoff of providing customers with additional card functionality (i.e. off-system usage) that appears to come at an added price to both the transit agency and the transit rider. Last, there exists the possibility that payments industry participants (i.e. the program manager) may want to bear the majority of costs for an open loop program. If this were the case, open loop cards may be a more attractive option for transit agencies, but this is subject to negotiation in the procurement process.

### **7.2 Summary of Transit Rider Attitudes toward CLBCs**

Analysis of TfL and CTA customer research revealed that there is a sizable population of riders who may not have or may not want to utilize contactless bankcards for fare payment. Survey data revealed that the majority of riders at the CTA and TfL prefer prepaid cards, paper tickets, or other forms of existing fare media over CLBCs for fare payment.

Statistical analysis revealed that 10% of TfL riders do not have debit, credit or prepaid cards. At the CTA, 20% of CTA riders do not have basic checking accounts, debit or credit cards. Additional analysis of CTA data revealed that these riders, when compared to transit riders as a whole, tend to have lower levels of education and are from lower socioeconomic groups. These results are in alignment with British and American nationwide studies of the unbanked market, which generally show that these are often people from the least advantaged groups in society (FDIC 2009, Financial Inclusion Taskforce 2009).

Stated preference data for TfL also revealed that 55% of riders prefer a closed loop prepaid card, 31% prefer CLBCs, and 14% prefer paper tickets (i.e. magnetic stripe) for transit payment. Similarly, only 36% of CTA riders said that they were “very likely” or “somewhat likely” to choose CLBCs over current fare media.<sup>125</sup> Until CLBCs become more widespread (particularly in retail applications) and customer awareness of this new technology increases, there may be a large share of transit riders who prefer other forms of fare media. This is consistent with the experience of existing smart cards in London, which had limited market share when first introduced, but increased over time.

Discrete choice modeling of the stated preference data for TfL and the CTA revealed that trends of fare media preference between different groups of riders were not very strong, but a few key factors did emerge. Older riders (ages 65+) showed a preference for current fare media, while younger riders more frequently chose CLBCs. On the other hand, banked riders were more likely to choose CLBCs. The factors influencing choice of CLBCs at the CTA and TfL seem to be in agreement with categorizations in standard sociology models describing consumer adoption of new technologies.

In summary, this research has demonstrated that there may be many groups of riders who do not utilize contactless bankcards for fare payment, particularly in the early years of CLBC systems. To meet the needs of these riders, contactless prepaid cards appear to be a feasible option to complement contactless bankcards.

### 7.3 Future Research

There are other areas related to the introduction of contactless bankcards and the case studies presented in this thesis that would be interesting research topics. These areas for future research are outlined in the following paragraphs.

1. **Cell Phones as Fare Media**: Chapter 2 assumed that transit agencies are moving to CLBC fare collection systems because this appears to be the current pathway chosen by many of the major North American and European transit agencies for the immediate future of fare collection systems (MIT Transit Bankcard Workshop Discussion 2009). Many of these agencies view CLBC fare collection systems as a stepping stone to using Near Field Communications (NFC) technology on cell phones, such as was stated in the Chicago Transit Authority’s recent Request for Proposals for an open fare collection system (CTA 2009). It

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<sup>125</sup> Current fare media includes cash, magnetic stripe cards, or contactless smart cards.

would be useful to investigate how transit rider attitudes for prepaid cards and CLBCs are different from cell phones.

2. **The Unbanked in Other Modes of Transportation:** Chapter 5 investigated the demographics of the unbanked based on transit agency customer research. This topic is also relevant for other transportation agencies, including authorities operating toll roads that want to convert to completely electronic tolling systems (Wilson 2004). They face similar issues in providing for customers without bankcards, and comparisons could be drawn between unbanked drivers and unbanked transit riders.
3. **Transit Agencies without Smart Cards:** Chapter 6 focused on consumer attitudes toward contactless bankcards and prepaid cards using survey data from two transit agencies that are both transitioning from proprietary smart card systems to CLBC fare collection systems. Because these transit agencies already utilize RFID technology in the form of smart cards, rider attitudes toward contactless bankcards may be different from those converting from magnetic stripe or paper tickets directly to CLBCs. Research into consumer attitudes toward CLBCs at transit agencies with only magnetic stripe or paper tickets, such as New York City, could yield different results.
4. **Discrete Choice Models:** In Chapter 6, fare media choice models were estimated using standard discrete modeling techniques for London and Chicago stated preference (SP) data from riders. Revealed preference (RP) for current fare media choice is known for smart cards and paper tickets. RP data could potentially be linked to the SP data in the discrete choice models to better incorporate situational constraints on riders.

The additional topics outlined in the previous paragraphs would be excellent topics for future research.

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## Appendix A: CTA Banked and Unbanked Ridership Statistics

	Banked		Unbanked		All Riders	
Characteristics Weighted Sample Size 2,439	Count (Weighted)	% of Banked (Column)	Count (Weighted)	% of Unbanked (Column)	Count (Weighted)	% of All Riders (Column)
All Respondents	1,900	100%	475	100%	2,439	100%
<b>Gender</b>						
Male	798	42%	192	40%	1,011	41%
Female	1,102	58%	283	60%	1,428	59%
<b>Disabled</b>						
Disabled	139	7%	63	13%	204	8%
None	1,756	92%	409	86%	2,223	91%
No Answer	4	0%	2	0%	12	0%
<b>Age</b>						
16 to 17 years	21	1%	59	12%	81	3%
18 to 24 years	141	7%	69	15%	211	9%
25 to 44 years	328	17%	63	13%	394	16%
35 to 44 years	367	19%	68	14%	446	18%
45 to 54 years	381	20%	75	16%	467	19%
55 to 64 years	337	18%	54	11%	403	17%
65 and older	12	1%	85	18%	412	17%
No Answer	310	16%	2	0%	26	1%
<b>Ethnicity*</b>						
White/Caucasian	1,153	61%	130	27%	1,319	54%
Black/African American	526	28%	250	53%	787	32%
American Indian/Alaskan Native	30	2%	9	2%	41	2%
Asian/Pacific Islander	91	5%	13	3%	104	4%
Other	38	2%	16	3%	56	2%
Hispanic	103	5%	71	15%	176	7%
Don't know	4	0%	3	1%	7	0%
Refused	33	2%	7	2%	52	2%
<b>Employment Status*</b>						
Employed	1,311	69%	176	37%	1,519	62%
Student	188	10%	110	23%	303	12%
Homemaker	77	4%	33	7%	112	5%
Retired	318	17%	85	18%	424	17%
Unemployed	148	8%	102	22%	254	10%
Other	14	1%	14	3%	29	1%
Don't know	0	0%	0	0%	0	0%
No Answer	1	0%	5	1%	13	1%
<b>Education</b>						
Less than High School	99	5%	148	31%	247	10%
High School Diploma/GED	196	10%	126	27%	330	14%
Some College/Associates Degree	524	28%	115	24%	650	27%
Bachelors Degree	530	28%	47	10%	591	24%
Post-Bachelors Degree	541	28%	29	6%	591	24%
No Answer	10	1%	10	2%	29	1%

Figure A-0-1 Characteristics of Banked and Unbanked CTA Riders<sup>126</sup>

<sup>126</sup> All summary statistics rounded to the nearest whole number.

\*Respondents could select more than one answer.

	Banked		Unbanked		All Riders	
Characteristics Weighted Sample Size 2,439	Count (Weighted)	% of Banked (Column)	Count (Weighted)	% of Unbanked (Column)	Count (Weighted)	% of All Riders (Column)
All Respondents	1,900	100%	475	100%	2,439	100%
<b>Annual Income</b>						
Less than \$10,000	90	5%	87	18%	178	7%
\$10,000 to \$20,000	121	6%	61	13%	183	8%
\$20,000 to \$30,000	126	7%	62	13%	189	8%
\$30,000 to \$35,000	80	4%	21	4%	101	4%
\$35,000 to \$45,000	133	7%	18	4%	151	6%
\$45,000 to \$55,000	122	6%	10	2%	131	5%
\$55,000 to \$65,000	144	8%	26	6%	171	7%
\$65,000 to \$85,000	212	11%	17	4%	233	10%
\$85,000 to \$125,000	234	12%	12	3%	247	10%
Above \$125,000	246	13%	23	5%	271	11%
Refused but less than \$30,000	19	1%	18	4%	38	2%
Refused but above \$30,000	16	1%	6	1%	23	1%
Refused but between \$30-55,000	13	1%	5	1%	18	1%
Refused but above \$55,000	27	1%	1	0%	29	1%
Completely Refused	317	17%	107	23%	476	20%
<b>Region</b>						
North	598	31%	70	15%	683	28%
Northwest	223	12%	60	13%	293	12%
South	398	21%	155	33%	569	23%
Southwest	131	7%	43	9%	178	7%
West	195	10%	10	2%	292	12%
Downtown	75	4%	48	10%	88	4%
Suburbs	279	15%	89	19%	336	14%
<b>Do you have a cell phone?</b>						
Yes	1,550	82%	234	49%	1,827	75%
No	348	18%	241	51%	609	25%
No Answer	1	0%	0	0%	4	0%
<b>How often do you use cash to make purchases?</b>						
Never use cash	174	9%	26	6%	207	8%
Some of the time	1005	53%	95	20%	1121	46%
Most of the time	462	24%	102	22%	572	23%
All of the time	251	13%	244	51%	502	21%
No Answer	7	0%	7	1%	38	2%
<b>Have you heard of contactless payment technology?</b>						
Yes	1,256	66%	204	43%	1,490	61%
No	633	33%	265	56%	921	38%
No Answer	11	1%	6	1%	27	1%
<b>How likely are you to use a contactless credit/debit card for transit?</b>						
Very Unlikely	848	45%	236	50%	1,123	46%
Somewhat Unlikely	279	15%	66	14%	349	14%
Neither Likely nor Unlikely	25	1%	5	1%	30	1%
Somewhat Likely	313	16%	73	15%	392	16%
Very Likely	380	20%	75	16%	463	19%
No Answer	53	3%	20	4%	83	3%

Figure A-0-2 Characteristics of Banked and Unbanked CTA Riders<sup>127</sup>

<sup>127</sup> All summary statistics rounded to the nearest whole number.

	Banked		Unbanked		All Riders	
Characteristics	Count (Weighted)	% of Banked (Column)	Count (Weighted)	% of Unbanked (Column)	Count (Weighted)	% of All Riders (Column)
Weighted Sample Size 2,439						
All Respondents	1,900	100%	475	100%	2,439	100%
<b>Mode and Frequency of Travel</b>						
Frequent Bus User (5 days/week or more)	476	25%	188	40%	682	28%
Infrequent Bus User (Once/week or more)	561	30%	168	35%	741	30%
Frequent Train User (5 days/week or more)	216	11%	36	8%	260	11%
Infrequent Train User (Once/week or more)	369	19%	46	10%	433	18%
Occasional Bus or Train (Once/month or more)	278	15%	37	8%	323	13%
<b>Primary Trip Purpose</b>						
Work	905	48%	138	29%	1,073	44%
School/Class	120	6%	90	19%	215	9%
Shopping/Store	168	9%	50	11%	231	9%
Leisure/Pleasure/Social	216	11%	36	8%	261	11%
Personal Business	239	13%	68	14%	311	13%
Doctor/Dentist/Medical	137	7%	71	15%	209	9%
Airport	20	1%	1	0%	22	1%
Work-related Business	32	2%	3	1%	36	1%
Everyone (Only means of transport)	28	1%	13	3%	43	2%
Other	31	2%	3	1%	35	1%
No Answer	3	0%	0	0%	3	0%
<b>Reason for Choosing Transit</b>						
Can't or don't know how to drive	133	7%	80	17%	223	9%
Don't have a car	355	19%	207	44%	575	24%
Don't have a car because prefer transit	238	13%	56	12%	301	12%
Have a car but prefer transit	1,156	61%	123	26%	1,310	54%
No answer	17	1%	9	2%	29	1%
<b>What fare media do you use?</b>						
Cash	272	14%	125	26%	405	17%
Transit Card (Magnetic Stripe)	413	22%	114	24%	538	22%
Chicago Card	281	15%	29	6%	317	13%
Chicago Card Plus	380	20%	7	2%	397	16%
Pass (Daily, weekly, monthly, etc.)	200	11%	105	22%	312	13%
University Pass	48	3%	7	1%	57	2%
Disability - Ride Free	31	2%	16	3%	46	2%
Senior - Ride Free	250	13%	64	13%	331	14%
Military - Ride Free	5	0%	2	0%	7	0%
Other	10	1%	6	1%	18	1%
No Answer	9	0%	2	0%	11	0%

Figure A-0-3 Characteristics of Banked and Unbanked CTA Riders<sup>128</sup>

<sup>128</sup> All summary statistics rounded to the nearest whole number.

## Appendix B: TfL Future Fare Media Choice Statistics

	Prefer Bankcard		Prefer Paper Card		Prefer TfL Card		All Riders	
Characteristics Sample Size 460	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column
All Respondents	144	100%	62	100%	254	100%	460	100%
<b>Gender</b>								
Male	74	52%	22	35%	114	45%	211	46%
Female	69	48%	40	65%	140	55%	249	54%
<b>Age</b>								
18 to 24 years	38	26%	9	15%	46	18%	93	20%
25 to 44 years	34	24%	15	24%	64	25%	113	25%
35 to 44 years	25	18%	13	21%	58	23%	97	21%
45 to 54 years	40	28%	15	24%	71	28%	126	27%
55 to 59 years	5	4%	9	15%	14	5%	28	6%
60 and older	1	1%	1	2%	1	0%	3	1%
<b>Ethnicity</b>								
White/Caucasian	97	68%	40	64%	160	63%	297	65%
Indian/Chinese/Asian	9	6%	3	5%	23	9%	36	8%
Black/African/Caribbean	30	21%	18	28%	64	25%	111	24%
Other	6	4%	2	3%	6	3%	14	3%
Refused	2	1%	0	0%	0	0%	2	0%
<b>Employment Status</b>								
Employed (Full time, Part, Self)	115	80%	43	68%	192	76%	350	76%
Student	10	7%	2	3%	15	6%	27	6%
Seeking Work	13	9%	11	18%	29	11%	53	11%
Retired	0	0%	2	3%	2	1%	4	1%
Homemaker	6	4%	3	5%	12	5%	20	4%
Other	0	0%	2	3%	4	2%	6	1%
<b>Social Grade</b>								
Class A	4	3%	3	5%	0	0%	7	2%
Class B	42	29%	12	19%	66	26%	120	26%
Class C1	54	37%	17	27%	95	37%	166	36%
Class C2	18	13%	11	17%	31	12%	60	13%
Class D	15	10%	3	5%	27	11%	45	10%
Class E	7	5%	14	22%	32	13%	53	11%
Refused	4	2%	3	5%	3	1%	10	2%
<b>Annual Income*</b>								
Less than £5000	6	4%	4	6%	11	4%	21	5%
£5000 to £9999	4	3%	1	1%	9	3%	13	3%
£10000 to £14999	10	7%	6	10%	15	6%	31	7%
£15000 to £19999	10	7%	5	9%	15	6%	30	7%
£20000 to £24999	6	4%	2	3%	13	5%	21	5%
£25000 to £34999	10	7%	5	8%	30	12%	45	10%
£35000 to £49999	15	10%	5	7%	25	10%	44	10%
£50000 to £74999	13	9%	0	0%	18	7%	31	7%
over £75000	5	4%	3	4%	5	2%	13	3%
Refused/ Don't Know	65	46%	32	52%	113	44%	211	46%

Figure B-0-1 Future Fare Media Preferences of TfL Riders <sup>129</sup>

<sup>129</sup> All summary statistics rounded to the nearest whole number.

\*Not all survey participants were asked this question.

	Prefer Bankcard		Prefer Paper Card		Prefer TfL Card		All Riders	
Characteristics Sample Size 460	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column
All Respondents	144	100%	62	100%	254	100%	460	100%
<b>Region</b>								
Live in London	127	88%	60	97%	245	96%	432	94%
Live outside London in the UK	17	12%	2	3%	9	4%	28	6%
<b>Do you have a credit/debit card?</b>								
Banked	135	94%	51	81%	230	90%	415	90%
Unbanked	9	6%	12	19%	24	10%	45	10%
<b>Main Mode</b>								
Bus	65	45%	29	47%	132	52%	226	49%
Underground	38	27%	9	14%	56	22%	104	23%
National Rail	28	19%	18	28%	29	11%	75	16%
Overground	3	2%	4	6%	11	4%	18	4%
DLR	4	3%	2	3%	18	7%	24	5%
Tram	6	4%	1	2%	7	3%	14	3%
<b>Primary Trip Purpose</b>								
Work	71	49%	26	42%	135	53%	232	51%
Education	4	3%	3	5%	13	5%	19	4%
Company Business	4	3%	3	5%	0	0%	7	2%
Shopping	22	15%	14	23%	38	15%	75	16%
Leisure	12	8%	6	10%	25	10%	43	9%
Personal Business	18	13%	5	8%	17	7%	40	9%
Meeting Friends	8	5%	2	3%	18	7%	28	6%
Other	5	4%	3	5%	7	3%	16	3%
<b>Current Ticket Choice</b>								
Paper Ticket	25	18%	28	45%	39	15%	92	20%
Oyster PAYG	35	24%	15	24%	87	34%	137	30%
Oyster 7 Day	38	26%	12	19%	62	24%	111	24%
Season Ticket	46	32%	8	13%	66	26%	121	26%
<b>Current Location to Purchase Tickets</b>								
Tube Ticket Office	56	39%	10	16%	82	32%	148	32%
Overground Ticket Office	4	3%	4	6%	9	4%	18	4%
National Rail Ticket Office	15	10%	9	15%	13	5%	37	8%
Bus Stop/On the Bus	1	1%	4	7%	5	2%	11	2%
Ticket Machine	4	2%	1	1%	13	5%	17	4%
Oyster Ticket Stop	54	37%	34	55%	112	44%	200	44%
Travel Information Centre	1	1%	0	0%	2	1%	3	1%
Online	6	4%	0	0%	5	2%	11	2%
Auto Top Up	1	1%	0	0%	3	1%	4	1%
Other	2	1%	0	0%	9	3%	11	2%
<b>Payment Method for Current Ticket</b>								
Debit Card	61	42%	8	12%	72	28%	140	30%
Credit Card	8	6%	1	2%	18	7%	28	6%
Cash	65	45%	46	74%	142	56%	253	55%
Employer Pays	8	6%	7	11%	23	9%	38	8%
Other	2	1%	0	0%	0	0%	2	0%

Figure B-0-2 Future Fare Media Preferences of TfL Riders<sup>130</sup>

<sup>130</sup> All summary statistics rounded to the nearest whole number.

## Appendix C: CTA Future Fare Media Choice Statistics

	Very Likely		Somewhat Likely		Indifferent		Somewhat Unlikely		Very Unlikely		All Riders	
Characteristics Weighted Sample Size 2,356	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column
All Respondents	463	100%	392	100%	30	100%	349	100%	1123	100%	2356	100%
<b>Gender</b>												
Male	197	43%	167	43%	12	41%	220	63%	657	59%	972	41%
Female	265	57%	225	57%	18	59%	126	36%	454	40%	1384	59%
<b>Disabled</b>												
Disabled	33	7%	27	7%	5	15%	34	10%	97	9%	197	8%
None	426	92%	364	93%	26	85%	315	90%	1023	91%	2153	91%
No answer	3	1%	1	0%	0	0%	0	0%	3	0%	6	0%
<b>Age</b>												
16 to 17 years	15	3%	17	4%	2	5%	13	4%	34	3%	80	3%
18 to 24 years	42	9%	51	13%	3	10%	31	9%	81	7%	209	9%
25 to 44 years	79	17%	75	19%	2	6%	62	18%	170	15%	389	16%
35 to 44 years	108	23%	81	21%	6	19%	77	22%	168	15%	440	19%
45 to 54 years	78	17%	81	21%	5	16%	69	20%	223	20%	456	19%
55 to 64 years	80	17%	56	14%	8	26%	50	14%	192	17%	387	16%
65 and older	59	13%	29	7%	5	18%	44	13%	242	22%	379	16%
No Answer	1	0%	2	1%	0	0%	1	0%	12	1%	17	1%
<b>Ethnicity*</b>												
White/Caucasian	267	58%	210	54%	16	53%	184	53%	597	53%	1274	54%
Black/African American	134	29%	125	32%	11	36%	114	33%	382	34%	766	33%
American Indian/Alaskan Native	8	2%	5	1%	0	0%	9	3%	18	2%	41	2%
Asian/Pacific Islander	17	4%	23	6%	1	5%	14	4%	46	4%	102	4%
Other	9	2%	12	3%	1	2%	6	2%	25	2%	54	2%
Hispanic	33	7%	31	8%	3	8%	35	10%	68	6%	170	7%
Don't know/No Answer	10	2%	8	2%	0	0%	6	2%	29	3%	52	2%
<b>Employment Status*</b>												
Employed	318	69%	244	62%	23	78%	233	67%	659	59%	1478	63%
Student	57	12%	63	16%	4	12%	44	12%	133	12%	300	13%
Homemaker	18	4%	25	6%	0	2%	13	4%	53	5%	110	5%
Retired	67	14%	35	9%	4	13%	51	15%	238	21%	394	17%
Unemployed	35	8%	56	14%	1	2%	37	11%	120	11%	249	11%
Other	6	1%	3	1%	0	0%	4	1%	14	1%	28	1%
Don't know/No Answer	1	0%	1	0%	0	0%	0	0%	6	0%	7	0%

Figure C-0-1 Likelihood of Using Contactless Bankcards by CTA Riders<sup>131</sup>

<sup>131</sup> All summary statistics rounded to the nearest whole number. \*Respondents could select more than one answer.

	Very Likely		Somewhat Likely		Indifferent		Somewhat Unlikely		Very Unlikely		All Riders	
Characteristics Weighted Sample Size 2,356	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column
All Respondents	463	100%	392	100%	30	100%	349	100%	1123	100%	2356	100%
<b>Education</b>												
Less than High School	36	8%	47	12%	2	7%	42	12%	110	10%	238	10%
High School Diploma/GED	50	11%	52	13%	4	13%	39	11%	173	15%	318	14%
Some College/Associates Degree	127	27%	94	24%	7	24%	91	26%	313	28%	632	27%
Bachelors Degree	120	26%	98	25%	7	24%	88	25%	263	23%	576	24%
Post-Bachelors Degree	125	27%	100	26%	10	32%	88	25%	246	22%	568	24%
No answer	5	1%	1	0%	0	0%	1	0%	17	2%	24	1%
<b>Annual Income</b>												
Less than \$10,000	32	7%	22	6%	2	7%	20	6%	95	8%	172	7%
\$10,000 to \$20,000	35	7%	31	8%	3	9%	17	5%	90	8%	176	7%
\$20,000 to \$30,000	33	7%	30	8%	2	8%	36	10%	86	8%	188	8%
\$30,000 to \$35,000	15	3%	14	3%	1	3%	15	4%	53	5%	97	4%
\$35,000 to \$45,000	30	6%	33	9%	1	3%	18	5%	64	6%	146	6%
\$45,000 to \$55,000	20	4%	33	8%	1	3%	29	8%	43	4%	126	5%
\$55,000 to \$65,000	34	7%	25	6%	1	2%	28	8%	81	7%	169	7%
\$65,000 to \$85,000	62	13%	34	9%	0	0%	30	9%	104	9%	230	10%
\$85,000 to \$125,000	44	10%	60	15%	5	17%	34	10%	94	8%	237	10%
Above \$125,000	70	15%	40	10%	4	13%	43	12%	105	9%	262	11%
Refused but less than \$30,000	4	1%	7	2%	0	0%	6	2%	19	2%	36	2%
Refused but above \$30,000	3	1%	3	1%	0	0%	5	1%	13	1%	23	1%
Refused but between \$30-55,000	2	0%	3	1%	0	1%	3	1%	10	1%	18	1%
Refused but above \$55,000	4	1%	1	0%	1	2%	7	2%	15	1%	28	1%
No answer	77	17%	55	14%	10	32%	56	16%	251	22%	449	19%
<b>Region</b>												
North	148	32%	103	26%	2	6%	111	32%	303	27%	666	28%
Northwest	49	11%	51	13%	4	12%	42	12%	134	12%	280	12%
South	97	21%	87	22%	7	24%	70	20%	281	25%	542	23%
Southwest	30	6%	32	8%	2	7%	22	6%	89	8%	174	7%
West	55	12%	51	13%	5	16%	56	16%	117	10%	284	12%
Downtown	17	4%	13	3%	1	5%	11	3%	43	4%	85	4%
Suburbs	67	14%	55	14%	9	31%	37	11%	156	14%	324	14%

Figure C-0-2 Likelihood of Using Contactless Bankcards by CTA Riders<sup>132</sup>

<sup>132</sup> All summary statistics rounded to the nearest whole number.



	Very Likely		Somewhat Likely		Indifferent		Somewhat Unlikely		Very Unlikely		All Riders	
Characteristics Weighted Sample Size 2,356	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column
All Respondents	463	100%	392	100%	30	100%	349	100%	1123	100%	2356	100%
<b>Do you have a cell phone?</b>												
Yes	362	78%	316	81%	22	73%	265	76%	812	72%	1777	75%
No	99	21%	74	19%	8	27%	84	24%	310	28%	576	24%
No answer	1	0%	2	0%	0	0%	0	0%	1	0%	4	0%
<b>How often do you use cash to make purchases?</b>												
Never use cash	50	11%	19	5%	5	15%	27	8%	102	9%	203	9%
Some of the time	211	46%	224	57%	14	45%	159	46%	475	42%	1083	46%
Most of the time	107	23%	87	22%	6	21%	97	28%	254	23%	551	23%
All of the time	88	19%	60	15%	5	18%	64	18%	268	24%	485	21%
No answer	6	1%	2	0%	0	0%	2	1%	23	2%	33	1%
<b>Have you heard of contactless payment technology?</b>												
Yes	308	66%	259	66%	17	55%	220	63%	657	59%	1460	62%
No	153	33%	133	34%	13	45%	126	36%	454	40%	880	37%
No answer	2	1%	0	0%	0	0%	3	1%	11	1%	17	1%
<b>Banked or Unbanked</b>												
Banked	380	82%	313	80%	25	82%	279	80%	848	76%	1846	78%
Unbanked	75	16%	73	19%	5	18%	66	19%	236	21%	455	19%
Refused	7	2%	6	2%	0	0%	3	1%	38	3%	55	2%
<b>Mode and Frequency of Travel</b>												
Frequent Bus User (5 days/week or more)	105	23%	111	28%	9	29%	103	29%	331	29%	658	28%
Infrequent Bus User (Once/week or more)	131	28%	110	28%	5	18%	90	26%	372	33%	708	30%
Frequent Train User (5 days/week or more)	46	10%	52	13%	4	13%	37	10%	118	11%	256	11%
Infrequent Train User (Once/week or more)	107	23%	70	18%	4	14%	68	19%	172	15%	421	18%
Occasional Bus or Train (Once/month or more)	75	16%	49	13%	8	26%	52	15%	129	12%	313	13%

Figure C-0-3 Likelihood of Using Contactless Bankcards by CTA Riders<sup>133</sup>

<sup>133</sup> All summary statistics rounded to the nearest whole number.

	Very Likely		Somewhat Likely		Indifferent		Somewhat Unlikely		Very Unlikely		All Riders	
Characteristics Weighted Sample Size 2,356	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column	Count (Weighted)	% of Column
All Respondents	463	100%	392	100%	30	100%	349	100%	1123	100%	2356	100%
<b>Primary Trip Purpose</b>												
Work	203	44%	174	44%	14	45%	154	44%	497	44%	1040	44%
School/Class	34	7%	49	13%	5	16%	31	9%	93	8%	212	9%
Shopping/Store	39	8%	34	9%	4	14%	25	7%	117	10%	219	9%
Leisure/Pleasure/Social	64	14%	51	13%	2	8%	35	10%	99	9%	251	11%
Personal Business	72	16%	52	13%	3	9%	45	13%	130	12%	302	13%
Doctor/Dentist/Medical	27	6%	15	4%	0	1%	37	11%	120	11%	200	8%
Airport	5	1%	2	0%	0	0%	4	1%	10	1%	22	1%
Work-related Business	8	2%	6	1%	2	6%	2	1%	17	2%	35	1%
Everyone (Only means of transport)	6	1%	6	2%	0	0%	7	2%	20	2%	38	2%
Other	6	1%	1	0%	0	0%	9	3%	18	2%	34	1%
No answer	0	0%	2	0%	0	0%	0	0%	2	0%	3	0%
<b>Reason for Choosing Transit</b>												
Can't or don't know how to drive	28	6%	39	10%	2	8%	32	9%	106	9%	207	9%
Don't have a car	113	24%	81	21%	6	21%	75	21%	283	25%	559	24%
Don't have a car because prefer transit	52	11%	50	13%	5	15%	35	10%	147	13%	289	12%
Have a car but prefer transit	265	57%	218	56%	17	56%	202	58%	573	51%	1274	54%
No answer	6	1%	3	1%	0	0%	5	2%	12	1%	27	1%
<b>What fare media do you use?</b>												
Cash	85	18%	68	17%	3	11%	61	18%	174	16%	392	17%
Transit Card (Mag Stripe)	108	23%	94	24%	8	27%	89	26%	227	20%	527	22%
Chicago Card	62	14%	61	16%	4	12%	40	12%	147	13%	314	13%
Chicago Card Plus	90	19%	67	17%	6	21%	60	17%	161	14%	384	16%
Period Pass (Mag Stripe)	53	11%	57	15%	4	13%	40	11%	155	14%	309	13%
University Pass	11	2%	11	3%	0	0%	8	2%	26	2%	56	2%
Disability - Ride Free	11	2%	4	1%	0	0%	5	2%	21	2%	41	2%
Senior - Ride Free	40	9%	28	7%	5	16%	38	11%	189	17%	301	13%
Military - Ride Free	0	0%	0	0%	0	0%	0	0%	5	0%	5	0%
Other	1	0%	1	0%	0	0%	4	1%	10	1%	16	1%
No answer	2	0%	1	0%	0	0%	1	0%	7	1%	11	0%

Figure C-0-4 Likelihood of Using Contactless Bankcards by CTA Riders<sup>134</sup>

<sup>134</sup> All summary statistics rounded to the nearest whole number.