Yorcard

Yorcard Research Folder - Phase 1

General Reference & Baselining Folder Contents

RES920 - Page 5
Research & General Reference

RES701 - Page 25
Baselining – Boarding Time Study

RES702 - Page 67
Baselining – Equipment User Survey

This folder is the first in a series of six folders and two reports funded by the Department of Transport, Technology and Standards Division that form the research outputs which complement the Yorcard Smart Ticketing Pilot. All folders in this series of seven, comprise of a number of discrete and stand alone reports. Each report has been written so it can be read in isolation, giving the reader a detailed view of a specific subject matter or be read in conjunction with other reports in the same folder or other folders. Consequently there is a considerable amount of common information across reports, which the reader, if intending to read more than one report may wish to skip. There are five reports and one data book that make up this folder.

This report has been produced by Newcastle University for South Yorkshire Passenger Transport Executive under a contract with the Department for Transport. Any views expressed in this report are not necessarily those of the Department for Transport.

Published April 2010

RES703 - Page 91
Baselining – Consumer Survey

RES704 - Page 123
Baselining – End of Phase Report

RES801 - Page 139
Data Book Phase 1

The complete list of folders are as follows :

Phase 1 General Reference and Baselining

Phase 2 Open system, first observations : Touch On only

Phase 3 Open system, full operational system : Touch On Only

Phase 4 Closed system, Touch On Touch Off

Phase 5 Additional Management data

Phase 6 Citizen Card

Phase 7 Reports:Research Final Report and Best Practice Report

RES920 Research & General Reference V1

Contents

This report has been produced by Newcastle University for South Yorkshire Passenger Transport Executive under a contract with the Department for Transport. Any views expressed in this report are not necessarily those of the Department for Transport.

4.0 Citizen cards & the role of Sheffield City Council

5.0 Partners in the Yorcard project & their roles

6.0 Appendices

Introduction

1.1 Purpose

The purpose of this document is to provide a basis for general reference to support the outputs (reporting) and provide some information required to support the author and reader understanding of the operating environment, and the structure and architecture of the Yorcard Project.

1.2 Scope of this document

This document provides a point of general reference to support Yorcard research reports so that background information does not need to be repeated in reports, thus providing an overview of the research programme and a full Glossary of terms used.

This document includes:

- Information regarding the Yorcard Operating environment regarding the operators/stakeholders involved and the nature of their services.
- An overview of the ticketing and retail environment based on information at the start of the pilot and how this is to be developed over the life of the pilot.
- This document includes reference to the Yorcard system architecture including key operational protocols and scheme delivery.

1.3 Document objectives

The objectives of this document are therefore:

- Support author development of research documentation
- Support reader understanding of research outputs
- Provide a Glossary of terms covering all research documents

Background & introduction to Yorcard

2.1 Introduction

The Yorcard Project is intended to deliver a multi-modal, multi operator public transport smartcard scheme to be trialled in part of the South Yorkshire area during 2008/2009. The scheme is intended to offer certain commercial and concessionary ticket products in 'Smart' format and is built to the ITSO standard. Yorcard Limited has procured all the hardware, software and services required to enable the successful implementation of a Pilot scheme. The Pilot is being mounted on the commercial services of two bus operators in the S10 postcode area west of Sheffield city centre, through the city centre, and onwards to various locations to the east of the city. Tendered schools services serving the S10 area complete the bus part of the pilot. The rail part of the pilot involves Doncaster to Sheffield rail services and intermediate stations. The Yorcard Pilot plans to see the issue of up to 30,000 smartcards for use on these services. The architecture of the Yorcard Pilot is represented at Appendix 1.

2.2 The Yorcard Pilot Objectives

The objectives of the pilot were communicated to DfT in the Pilot and Evaluation Plan in 2005. These objectives were also communicated to the bidders during the procurement phase of the project. The primary objectives of the pilot are to:

- Reduce barriers to the use of public transport;
- Reduce delays and improving reliability;
- Reduce in fraud of all types;
- Enhance the image of public transport;
- Reduce administrative costs;
- Improve sales channels;
- Improve MTC revenue distribution by providing more accurate information on journey lengths to meet legal obligations;
- Prove ITSO compliant equipment and operational protocols in a major scheme;
- Inform business cases; and
- Integrate with Real Time Information.

These objectives formed the basis of the creation of 10 Pilot Success Criteria which outlined a number of methodologies that would be employed to establish, investigate and prove each criterion.

The research resulting from the Yorcard pilot will compliment the above primary objectives and add value in terms of understanding smartcard use in a multi-modal, multi-application environment, the effect this will have on stakeholders and the determined success in terms of the business case. It will define all the variables that are to be measured during the pilot.

The comparison of original variable baselines, such as boarding time, calculated prior to the pilot, with the calculations made during the pilot will provide the evidence required to enhance existing knowledge. Increasing the information and operational experience of smartcards will contribute to the overall objective of improving public transport.

2.3 The Bus Environment

The three bus operators participating in the pilot will now each be taken in turn, and will provide an overview of their operations.

MAS Special Engineering (MASS)
The MASS pilot services operate out of a single depot (North Anston) in Sheffield. The depot consists of approximately 50 vehicles and a similar number of drivers. At the time of writing, MASS only operate dedicated schools services tendered by SYPTE. For the Yorcard Pilot, approximately 7 service operate within the defined Yorcard area and serve the 2 main schools in that area. All vehicles within the depot are equipped with new Electronic Ticket Machines (ETMs) and on-board validators.

Stagecoach Sheffield (Stagecoach)
Stagecoach pilot services operate out of a single depot (Halfway) in Sheffield. The depot consists of 49 vehicles and approximately [90] drivers. The depot operates [3] services in total from this depot of which two, the 52 and 120, are targeted pilot routes. All vehicles within the depot are equipped with new ETMs and on-board validators.

First South Yorkshire (First)
First pilot services operate out of a single depot (Olive Grove) in Sheffield. The depot consists of approximately 310 vehicles and approximately 800 drivers. The depot operates a number of services from this depot of which five, the 40, 41, 42, 51 and 52, are targeted pilot routes. Approximately 86 of the vehicles within the depot are equipped with new ETMs and on-board validators.

Headways of Services for Stagecoach and First

Table 2.3 below outlines the *approximate headways of the pilot services for Stagecoach (S) and First (F).*

Route	Monday to Friday Daytime	Monday to Friday Evening	Saturday Daytime	Sunday Daytime
52(S)	7	10-15	7	No Service
120(S)	10	15-20	10	No Service
40(F)	10	15-20	10	20
41(F)	10	15-20	10	12-15
42(F)	10	15-20	10	No Service
51(F)	10	30	12	20
52(F)	6	12	7-8	15

A map of these primary pilot routes can be seen in figure 2.3 below:

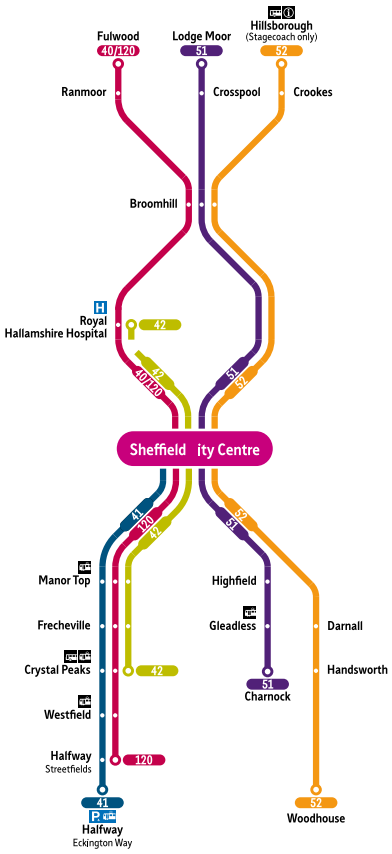


Figure 2.3: Yorcard Primary Pilot Bus Routes *(not to scale). This figure provides an overview of the key commercial routes in the pilot along with the main places served.*

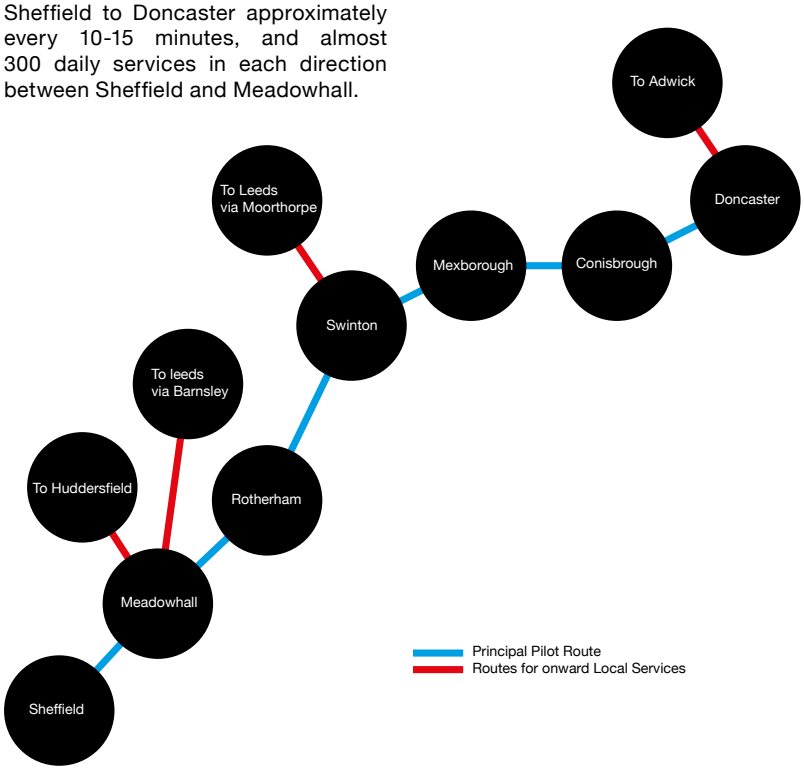
2.4 The Rail Environment

The rail environment consists of seven stations and 4 service operators, plus one other station operator (National Express) who does not operate services along the pilot route. The principal operator is Northern Rail, who operate local services and serve all the pilot stations. The other service operators, Cross Country Trains, East Midlands Trains and TransPennine Express operate long distance services and do not serve all the pilot rail stations.

Most services operate an hourly service Monday to Saturday and 2 hourly service on a Sunday. However, with so many routes involved within the Yorcard pilot there is a service from Sheffield to Doncaster approximately every 10-15 minutes, and almost 300 daily services in each direction between Sheffield and Meadowhall.

A map of the pilot route can be seen in figure 2.4 below:

Figure 2.4: Yorcard Pilot Rail Route *(not to scale). This figure provides an overview of the key local service routes in the pilot along with the places served. The blue line represents the pilot route, whereas the red lines represent other routes for local services that involve the pilot route.*



2.5 The Ticketing and Retail Environment

This section is to be taken in specific categories of; concessionary passes, multi-operator and multi-modal tickets and single operator bus and rail tickets. Each category will provide and overview of the pass and ticket ranges (including usage validities where appropriate) currently offered along with where such tickets can be bought or issued. This section will end by explaining how the introduction of Yorcard will change the baseline position.

Concessionary Passes
Senior and Disabled residnets of South Yorkshire can apply for an English National Concessionary Travel Scheme (ENCTS) pass allowing free travel nationwide on local bus services after 0930 Monday to Friday and all day on weekends and bank holidays. SYPTE extend this concession to use passes from 0900 on bus, train and tram.

Eligible young persons can apply for a MegaTravel or Student pass allowing a 40p flat fare for all journeys at all times of day on most services in South Yorkshire. A Zero Fare pass offers free travel to children who meet distance based criteria for home to school travel.

All concessionary passes are issued on application by SYPTE at their Travel Information Centres.

Multi-Operator and Multi-Modal Tickets
Multi-operator and Multi-Modal tickets are owned by TravelMaster Ltd and administered by SYPTE. There is a large range of tickets available ranging from: single local authority area based tickets through to county wide products; and discounted versions for school children and young persons. Most products encompass bus and train travel and are available in day, week, month, quarter and annual versions.

TravelMaster tickets are generally available at Travel Information Centres and a small number of other selected outlets.

Single Operator Tickets (Bus)
Stagecoach and First offer a very simple range of tickets based around single fares, day and weekly tickets. Most are available on bus, but certain longer period tickets may be able to be purchased on-line or at Travel Information Centres.

Retail Outlets
The pilot area has the following Travel Information Centres:
- Sheffield, Arundel Gate
- Sheffield, Interchange
- Sheffield, Cambridge Street (due to close late in 2008)
- Rotherham
- Meadowhall
- Doncaster, Interchange

Plus smaller Travel Information Centres at Swinton and Mexborough. At the time of writing, only the TICs in Sheffield will be equipped to undertake smartcard ticketing.

For rail, there are staffed stations or vending machines at:
- Sheffield
- Meadowhall
- Rotherham
- Doncaster

Mexborough is a staffed station, but is not staffed all of the time. However, all seven pilot stations will be equipped to sell certain smartcard tickets.

In addition to the methods of retail above, certain products will be eligible for auto-top up and auto-renew in a smartcard environment. Those smart enabled products that are available to use outside the nominated pilot services would require a paper counterpart to travel on routes outside of the pilot area.

2.6 The Customer Support Environment

The customer support environment within the Yorcard area is based on two channels; the TICs and Traveline. Traveline offers a telephone help service between the hours of 0700 and 2200 seven days per week, and the TICs offer a face-to-face service generally during normal office hours Monday to Saturday. Traveline will be equipped to help smartcard holders with enquiries and, as previously mentioned, TICs in Sheffield will also be able to help with smartcard sales and queries.

The Yorcard research contract

3.1 Overview

A research contract has been entered into with the South Yorkshire Passenger Transport Executive (SYPTE) and the Department for Transport (DfT) Transport Technology and Standards Division. The tender document is entitled "Trial of a Multi-Mode 'Citizen Services' Smartcard". There are 7 phases to the research contract that will be undertaken during pre and post implementation of the Yorcard Project. As an overview:

- Phases 1 and 2 define a baseline that allow changes to be tracked in phases 3 and 4.
- Phase 3 collects and reports on data from the open system, or touch on only mode, on bus.
- Phase 4 collects and reports on data from the closed system, or touch on/touch off mode, on bus.
- Phase 5 relates to secondary data, particularly sales and usage.
- Phase 6 relates to the integration of transport and 'citizen services'.
- Phase 7 is the final report and business case evaluation.

3.2 Research Tender Objectives

The DfT have specified a number of objectives in the specification for the work namely:

- All elements of the pilot scheme shall be fully compliant to the prevailing ITSO documentation.
- Conduct a robust analysis of (1) bus boarding times, (2) Systems performance and (3) passenger reaction to address the concerns of all key stakeholders involved in the rollout of smartcard technologies within a deregulated transport industry. This should provide a comparison of existing performance measures prior to the introduction of smartcards to the pilot area.
- The research shall assess the Customer Experience and the Operator and PTE expectations and provide recommendations for rollout. Included within this analysis shall be a study of the business case for deployment of similar regional schemes.
- To understand the value of new innovative ticketing products to the key stakeholders
- To understand the value of using Citizen cards as an alternative to transport only smartcards.
- To ensure that all deliverables are clear, concise, accurate, thorough, of a high technical quality and well written.
- The research shall complement the Yorcard pilot timetable.

The research has been structured to meet these objectives and is broken down into a number of phases to account for the changing pilot environment. The outputs of the tender are detailed in section 3.3 below.

3.3 Research Tender Outputs

The document map defining the inputs and outputs to the research contract are described in figure 3.3 below. When delivering outputs, it is essential that there is an evaluation regarding the Yorcard pilot objectives and the objectives of the DfT research contract. In addition, there needs to be an analysis of how Yorcard can influence the results in the future in terms of meeting the objectives. The deliverables of the research contract are:

Baselining Phase 1:
Boarding Time Study Report
Equipment User Survey Report
Bus and Rail User Survey Report
Phase 1 Report

Baselining Phase 2:
Boarding Time Study Report
Equipment User Survey Report
Phase 2 Report

Open System Phase 3:
Boarding Time Study Report
Equipment User Survey Report
Bus and Rail User Survey Report
Phase 3 Report

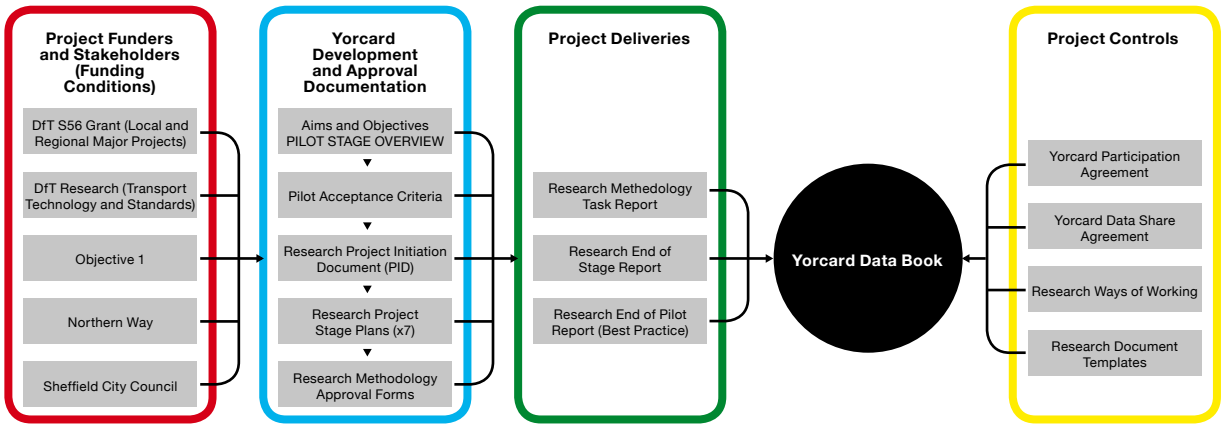
Closed System Phase 4:
Boarding Time Study Report
Equipment User Survey Report
Bus and Rail User Survey Report
Citizen Card Research Report
Phase 4 Report

Management Information Phase 5:
Monthly Management Information Reports including Network Data Reports
Quarterly Updates of the Yorcard Data Book

Citizen Card Integration Phase 6:
Smartcard User Survey Report
Desk Exercises
Organisational Opinions/ Structured Interviews
Laboratory Trial
Phase 6 Report

Final Report Phase 7
Best Practice Final Report (including business case analysis)

Figure 3.3: Yorcard Document Data Flows. *This figure outlines the influences and controls in place that assist in the production of the Yorcard Research deliverables and in particular the Yorcard Data Book. Boxes in the red section show the project funders (plus Sheffield City Council), where there may be conditions attached to the provision of funding (or project assistance in the case of Sheffield City Council) based on certain data being provided. Boxes in the blue section outline the documents that the Yorcard partners have developed to enable the data collection methodologies to be robust. Boxes in the green section summarise the 3 main subject deliverables to be provided to the DfT for the research tender. And finally, boxes in the yellow section highlight the contractual controls and agreed working processes that enable data to be presented in a format that meets the funders conditions but protects commercially sensitive data.*



3.4 What the Research Programme will deliver

It has been mentioned that the research project has some specified deliverables in terms of reports and their content. The research programme will collect data, in some cases, at many intervals over the life of the pilot and track how measurements are changing. In reality, the research programme is designed to help shape the development of the Yorcard project into the vision of becoming a region wide scheme. The research programme is not designed to provide all the answers to enable a wider roll out of the scheme, but would look to provide the following in particular:

- What ticketing regime provides the best solution for minimising bus boarding times in relation to on-on and on-off regimes, the on bus processes and the ticket products offered.
- The customer reaction to smartcard ticketing.
- The elements of smartcard ticketing that would encourage increased patronage or modal shift.
- What the reaction is from the equipment users in terms of ease of operating the new equipment.
- Give robustness to business case inputs. Where in the past numbers have been estimates, the research may now give some actual figures or enable more accurate forecasting.
- Allow a number of models of scenarios for future development to be built.
- Help provide guidance on merging transport smartcards with local authority 'citizen' smartcards.
- How certain business processes may be improved during the transition from paper based ticketing to smartcard ticketing.

The research programme is unlikely to provide information relating to:

- The level of fraud, unless able to be identified using patronage or sales data.

Citizen cards & the role of Sheffield City Council

4.1 Background

SCC is the primary local authority in whose area the Pilot is taking place, others being Rotherham and Doncaster through which the Pilot railway route passes. It currently provides a smartcard system for certain citizen services including library and leisure applications. There were approximately 175,000 e-voting smartcards in circulation within the local authority area, and now there are approximately 86,000 smartcards being used for library and leisure services. The SCC service is managed by the European Centre of Excellence for the Automatic Identification and Data Capture Technologies (AIDC) .

The long term vision of SCC is to expand the applications currently held on smartcards with a transport application where possible with every resident of Sheffield having a smart citizen card in the future to access all local authority services.

To enable customers to obtain a smartcard, they must first fill in an application form, showing proof of eligibility including residency of Sheffield. The application form is checked at the point of service and then sent to AIDC offices for production. A smartcard is then posted to the applicant. The smartcard used for leisure services is also a photo ID card.

Systems are in place at AIDC to produce both the Library applications and Leisure/Library. The Card Management System (CMS) is web based, enabling other designated sites to access a customer record from their service only. Data can only be viewed by the relevant Service.

AIDC offers first line customer support, in line with Customer Service Standards, to the relevant Council Services, leisure facilities participating in the Slice scheme and customers, dealing with enquiries relating to the card. All calls are logged and reports fed back to the relevant service.

4.2 The Library Environment

There are 38 libraries (including mobile and schools) that are equipped with smartcard technology. The equipment consists of serial readers and USB readers connected to PCs. The smartcard enables registered users to borrow books from the library.

The card is encrypted with the customer number, which links back to the CMS. The library service has direct access to view a customer record.

4.3 The Leisure Environment

There are 28 leisure facilities, including:

- 9 and 18 hole golf courses
- a ski village
- a roller skating centre
- the larger sport centres

that are equipped with hand held readers. There are approximately 8,500 leisure card holders in Sheffield (Slice Card), and some of these smartcards also include the library application. There are certain eligibility requirements to be able to obtain a Slice Card including senior citizens, some categories of children, students and the disabled.

At the point of service, the Slice Card is handed to the receptionist. The receptionist uses the hand held device to read the smartcard which is encrypted with card number, type of eligibility, expiry date. The back office collects card usage data which is downloaded from the hand held devices. There are some reciprocal arrangements with neighbouring local authorities that enables transferable discounts at selected leisure facilities and is used as a 'flash card'. Unlike library cards, leisure cards have the customer photograph printed on the face of the smartcard.

Readers are downloaded at AIDC and sent back to the facility where the reader came from. Data downloaded can be used for marketing purposes by the facility.

Reports are also available which chart how many cards have been sold, how the customer found out about the Slice scheme, demographics etc.

Partners in the Yorcard project & their roles

5.1 Yorcard Project Partners

A number of partner organisations have various roles in respect of the delivery of the Yorcard Pilot and in relation to the Data Book. These are listed below in alphabetical sequence along with their role(s):

- Department for Transport (Regional and Local Major Projects Division)
  a. Project funder – capital equipment and development
- Department for Transport (Transport Technology and Standards Division)
  a. Project funder for certain research elements
- Newcastle University
  a. Data Reviewer
- Northern Way
  a. Project funder
- Objective 1
  a. Project funder
- Participating Bus Operators
  a. Participation in the Pilot
  b. Data owners
  c. Commercial product owners
  d. Co-owners of Data Book
- Participating Train Operating Companies
  a. Operators of certain franchised railway services in the Pilot period
  b. Commercial product owners
  c. Railway station operators
  d. Data Owners
  e. Co-owners of Data Book
- Scheidt and Bachmann
  a. Primary supplier
- Sheffield City Council
  a. Supporting authority for the provision of Citizen Card research
- South Yorkshire Passenger Transport Executive (SYPTE)
  a. Yorcard Project sponsor and lead authority
  b. Owner of concessionary products
  c. Owner and manager of Travel Information Centres for smartcard retailing
  d. Operator of certain railway stations
  e. Data owners
  f. Co-owner of Data Book
- TravelMaster Limited
  a. Owner of South Yorkshire multi-modal/operator products
  b. Data owners
  c. Co-owner of Data Book
- West Yorkshire Passenger Transport Executive (WYPTE)
  a. Supporting authority
- Yorcard Limited
  a. Contracting party with the primary supplier
  b. Stored Travel Rights product owner during the Pilot Period
  c. Smartcard Shell owner
  d. Data owner
  e. Co-owner of Data Book

There are also Stakeholders such as Arriva plc and Transdev plc who are actively observing the Pilot and contributing to background activities though not participating in the Pilot itself.

5.2 The Role of ITSO in the Yorcard Pilot

ITSO was formerly the Integrated Transport Smartcard Organisation. Now known as ITSO, it is a member organisation sponsored by the Department for Transport that provides a specification for delivering interoperable products using smart media. ITSO prescribes a number of roles that different participants of a public transport smartcard scheme would undertake for such a scheme to be operational. These roles are:

- Application Issuing
- Collection and Forwarding
- Product Ownership
- Product Retailing
- Service Operating

For the purpose of the Yorcard Pilot, Yorcard has adopted a single-licence multi-OID (Operator Identification) strategy whereby Yorcard Ltd is the sole signatory to the ITSO Operators Licence. Each Yorcard participant is allocated one or more of these roles as defined in Appendix 2.

Glossary

Alighting Passengers - These are passengers who are getting off the bus. They are also referred to as Alighters.

Alighting Time (1) (A(1)) - Time taken for alighting passengers to disembark from the bus (measure from when the first passenger steps off the bus to when the doors close). This is used to measure the Alighting Time for one alighting passenger.

Alighting Time (2) (A(2)) - Time taken for 2 alighting passengers or more to disembark from the bus (measured from when the first passenger steps off the bus to when the last passenger steps off the bus).

Blas - Any influence that distorts the results of a research study

Boarding Passengers - These are passengers who are getting onto the bus. They are also referred to as Boarders.

Boarding Time (1) (B(1)) - Time taken for boarding passengers to carry out their boarding transaction with the driver (measured from when the first passenger steps onto the bus to when the doors close). This is used to measure the Boarding Time for one Boarding Passenger.

Boarding Time (2) (B(2)) - Time taken for 2 Boarding Passengers or more to carry out their boarding transaction with the driver (measured from when the first passenger steps onto the bus to when the last passenger steps onto the bus).

Bus Journey Time - Total service time between defined points

Bus Running Time - Journey Time – Bus Stop Dwell Time

Bus Stop Boarding/Alighting Time - Time taken for the driver to operate the doors and to allow passengers to load and alight at the stop (measured from doors opening to doors closing).

Bus Stop Dead Time - Time at bus stop attributable to operation of doors and pulling in and out of the stop.

Bus Stop Dwell Time - This is the total time that the bus spends at the bus stop, or: Bus Stop Dead Time + Bus Stop Boarding/Alighting Time + Bus Stop Recovery Time (measured from bus stopping at a boarding point to bus leaving the boarding point)

Bus Stop Recovery Time - Estimate of time spent at stop for the purposes of adhering to schedule / regulate the service.

Bus-user - A person who predominantly uses bus transport

Electronic Ticket Machine (ETM) - A device, or devices, on bus used to issue paper based tickets or to issue or validate smartcard based tickets in addition to providing miscellaneous other operational functions.

Focus Group - An interview conducted with a small group of people to explore their ideas on a particular topic

Mean - A descriptive statistic used to define an average and calculated by the sum of all measurements divided by number of measurements

Median - A descriptive statistic used to define an average and calculated by taking the value in the centre of the distribution – or the 50th Percentile

Mode - A descriptive statistic used to define an average and calculated by taking the most frequently occurring value

No Alighting Passengers - Times calculated when no passengers alighted a bus at the stop and there were only boarding passengers

No Boarding Passengers - Times calculated when no passengers boarded a bus at the stop under observation and there were only alighting passengers

Non-User - A person who is neither a predominant bus or train user

No Other Factors - Data, which have Other Factors recorded, removed when calculating Times

Other Factors - Factors observed and noted when collecting the data which may affect the times calculated for this and subsequent phases of the boarding time study. These are defined as either scheduling factors, such as Driver change over, or passenger factors, such as passengers boarding with a buggy

Pilot Acceptance Criteria - A number of targets and measurements that have been set prior to the collection of data that will inform business cases and future development of the Yorcard project

Population - A well defined group or set having specified properties

Primary Data - Data that are collected at first hand

Qualitative Data - Information in non numeric form

Quantitative Data - Information in numeric form

Sample - The process of selecting a sub-set of the Population

Standard Deviation - A descriptive statistic that measures the spread within a set of values

Structured Interview - The interviewer asks respondents the same questions using a script

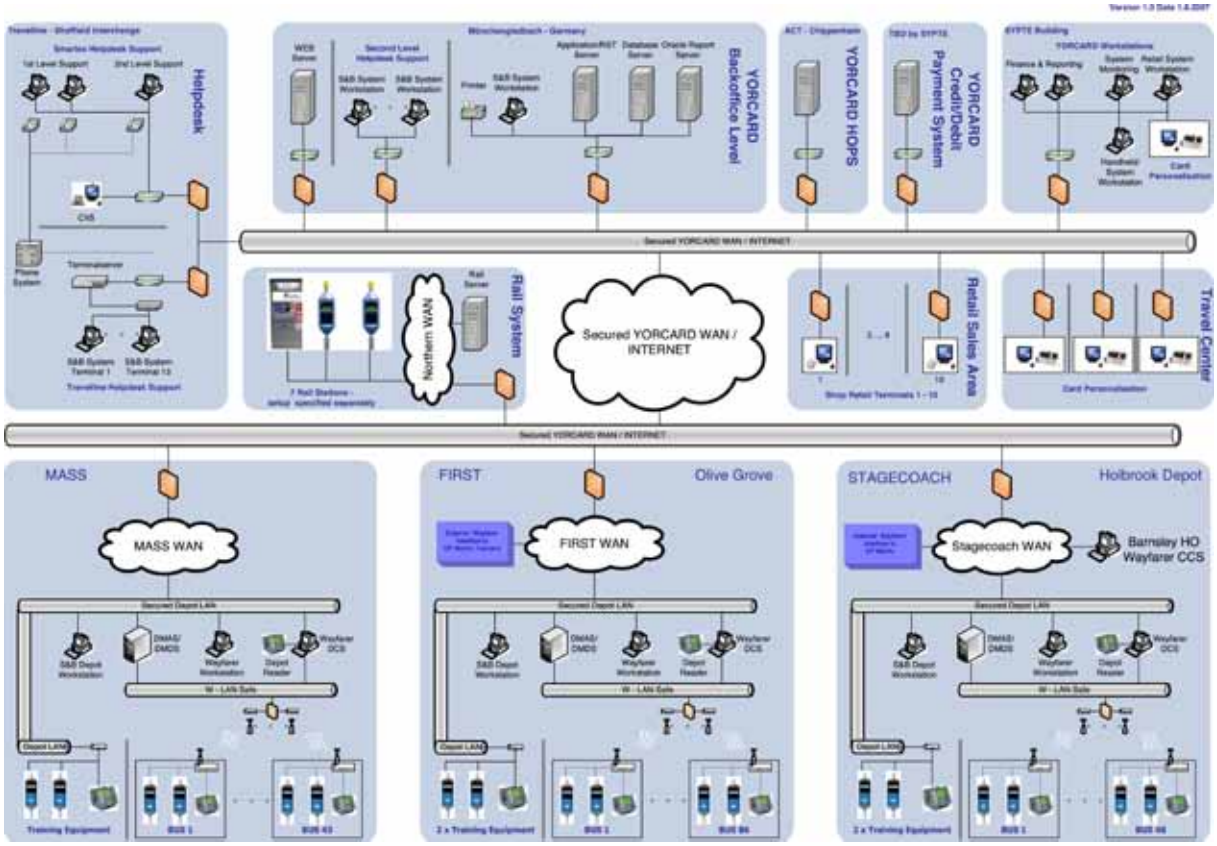
Travel Information Centre (TIC) - Offices operated by SYPTE to provide public transport information and ticket sales to customers.

Train-user - A person who predominantly uses train transport

Appendix 1

Appendix 1: Yorcard Pilot Architecture

Yorcard System Diagram



Appendix 2

Appendix 2: The Role of ITSO

Yorcard Pilot Approach
The participants within the Yorcard pilot have agreed, with the support of ITSO, to implement a single licence multi-OID environment. Within this single licence multi-OID environment, Yorcard Limited holds the Operator's Licence and has applied for a batch of OIDs that have been allocate to scheme participants, which in turn, is used as the basis for delivering product data to their rightful owner. This approach has a number of benefits:

- It does not require all participants to sign the Operators' Licence
- It is not dependent on employing additional functionality (in the form of complex look up tables) and, as such, is capable of inter scheme interoperability and does not require remedial re-engineering on roll out.
- It will also allow integration with 'national products' by means of OID transference from Yorcard Limited to the relevant entity
- Each actor will have (but not own) their own OID and hence their own data and be able to apply their own security policy to the products they own (subject to ITSO role)
- Relevant product owners would be able to add new products and/ or change ITSO roles within the environment subject, of course, to application and approval by ITSO and Yorcard Limited
- Participants do not need to be members of ITSO to implement this approach

The Yorcard approach to ITSO in the pilot, along with the actor roles is presented in figure A2.

Approach to Yorcard Roll Out
Upon the transition to full roll out of the Yorcard scheme, it is intended to move to a multi licence, multi stand alone OID approach. Under this approach, each actor who performs an ITSO role within the Pilot environment would apply for an ITSO Operator's licence for the ITSO role they are performing, and therefore be issued with the relevant OID by ITSO. Each actor would have their own HSAM , asset management system and product accounts that would be associated with the Yorcard HOPS .

Approach to the English National Concessionary Travel Scheme
For the English National Concessionary Travel Scheme (ENCTS), the majority of smartcards of the eligible population (c. 200,000) within South Yorkshire have been issued using ITSO Services Limited as the Application Issuer using an ITSO shell. In addition, approximately 4-5,000 ENCTS smartcards have been issued to pilot area residents using a Yorcard shell. In both instances SYPTE is the product owner. In the case of Yorcard issued ENCTS smartcards, they will be treated as 'on us' transactions and relevant data would reside in the Yorcard back office. However, in the case of ITSO Services Ltd issued smartcards, they will be treated as 'not on us' transactions and the relevant data would reside in the ITSO Services back office. Over time, the ITSO Services Ltd issued smartcards would be re-issued as Yorcard smartcards to ensure that the data from the whole population of these smartcard types will reside in the Yorcard back office.

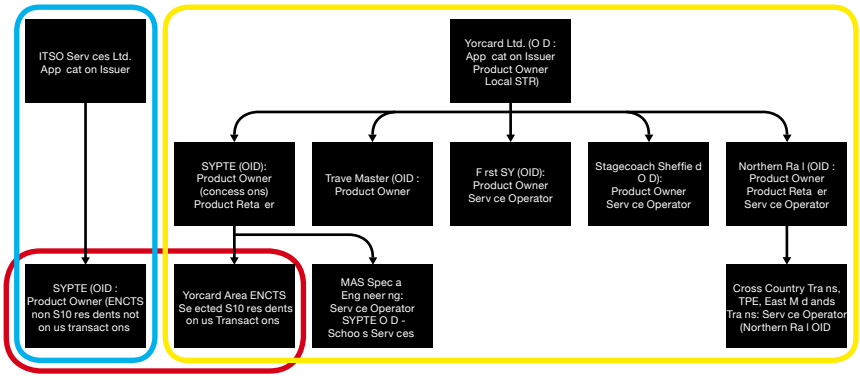


Figure A2: Yorcard Pilot ITSO Model. *This figure outlines the approach to ITSO that Yorcard Ltd has taken to implementing the ITSO environment. Boxes in the yellow area are those under the control of Yorcard Ltd, and boxes in the white area those controlled by ITSO. Those in the red area are representative of the integration involved for the English National Concessionary Travel Scheme.*

RES701 Phase 1: Baselining - Boarding Time Study

Contents

This report has been produced by Newcastle University for South Yorkshire Passenger Transport Executive under a contract with the Department for Transport. Any views expressed in this report are not necessarily those of the Department for Transport.

4.0 Summary & Conclusions

5.0 Advice for the Business Case

6.0 Recomendations

7.0 Appendices

8.0 Annex

Executive Summary

The Yorcard Project is intended to deliver a multi-modal, multi-operator public transport smartcard scheme to be trialled on certain buses in Sheffield and on the local train service between Sheffield and Doncaster and intermediate stations.

This report presents the findings from the Phase 1 Baselining Boarding Time Survey and the purpose of this study was to capture the key time components that form the Bus Stop Dwell Time in order to assess the effect of Yorcard on journey times, and therefore the impact upon the operator, which will then feed into the Yorcard Business Case. Dwell Time is a composite of many affecting factors. These factors have been analysed in this report in order to determine how each contribute to the Dwell Time and to isolate the components of Dwell Time which are directly effected by the introduction of Yorcard, namely the boarding and alighting.

This study has determined a baseline Dwell Time, Boarding Time and Alighting Time per passenger to compare and contrast the results of the future phases with. Boarding Time is seen as a key element of the stakeholder business cases and could help shape the development of many parts of the Yorcard project.

Surveys were carried out at bus stops in Sheffield along the pilot corridor over a variety of days and times in order to obtain the sample size defined in the approved methodology. This report presents the results (which are also summarised in the Table of Statistics) required for comparing the effect of smartcards on Boarding, Alighting and, ultimately, Dwell Times (defined in the Pilot Acceptance Criteria) with the results collected in later phases and demonstrates the impact at this stage upon the Yorcard and Department for Transport (DfT) objectives and the final business case.

For this phase, the business case is at its early stages of development and thus, the recommendations for rollout and deployment will be much more obvious as the results for the later phases are analysed. This report has identified the measurement for inclusion in the Yorcard Business Case and for comparison though out the pilot as the Dwell Time, as this has a large impact upon meeting operator and customer expectations, which are defined in the DfT objectives. However, as Dwell Time is made up of many factors, it is important to also monitor the other measurements highlighted in this report, in particular the Boarding and Alighting Times as these are the times when passengers will use their Yorcard.

The following tables present a summary of the overall results from this Phase 1 Baselining Boarding Time study. A summary table of statistics will be reproduced and presented at the beginning of each phase report to enable the quick comparison the key timings collected in each phase.

Summary Table of Statistics

	Boarding Passengers	Alighting Passengers	Buses Observed
Total	**2944**	**2936**	**1049**

Measurement Description		PHASE 1	PHASE 2	PHASE 3	PHASE 4
		Mean Time – sec (Standard Deviation)	**Mean Time – sec (Standard Deviation)**	**Mean Time – sec (Standard Deviation)**	**Mean Time – sec (Standard Deviation)**
Bus Stop Dwell Time:	per bus	34.25 (72.52)			
	per boarding and alighting passenger	8.29 (13.67)			
Bus Stop Boarding/Alighting Time:	per bus	29.29 (45.12)			
	per boarding and alighting passenger	6.98 (13.01)			
Boarding Time (1) [when only one passenger boards]:	per bus	13.62 (30.56)			
	per boarding passenger [no alighting passengers – see section 3.5]	11.77 (25.59)			
Boarding Time (2) [when 2 or more passengers board]:	per bus	21.91 (39.3)			
	per boarding passenger [no alighting passengers – see section 3.5]	3.27 (4.38)			
The following will be included in Annex 1					
Alighting Time (1) [when only one passenger alights]:	per bus				
	per alighting passenger [no boarding passengers]				
Alighting Time (2) [when 2 or more passengers board]:	per bus				
	per alighting passenger [no boarding passengers]				

Introduction

1.1 Background

The Yorcard Project is intended to deliver a multi-modal, multi-operator public transport smartcard scheme to be trialled in part of the South Yorkshire area during 2008. The scheme is intended to offer certain commercial and concessionary ticket products in 'Smart' format and is built to the ITSO standard (ITSO.co.uk, 2008). Yorcard Limited has procured all the hardware, software and services required to enable the successful implementation of a Pilot scheme. The Pilot is being trialled on the services of three bus operators in the S10 area of Sheffield and on Doncaster to Sheffield rail services including intermediate stations. The Yorcard Pilot aims to issue up to 30,000 smartcards for use on these services.

This Yorcard Phase 1 Boarding Time Report sets down the outputs forming part of a research contract between the South Yorkshire Passenger Transport Executive (SYPTE) and the Department for Transport (DfT), Transport Technology and Standards Division. An overview of the tender can also be found in the General Reference Document.

This report forms the first of four Boarding Time Studies and aims to provide baseline measurements, prior to installation of Yorcard equipment, to which subsequent phases can be compared and contrasted to.

The purpose of this report is therefore to provide the results from the Phase 1 Baselining Boarding Time Study. This report will provide full details of the methodology, results and in depth analysis, and conclusions drawn from the key findings. Boarding Time is considered to form a key part of Yorcard Partner Business Case and the development of the Yorcard scheme, and other similar schemes in terms of ticket products offered and the business rules associated with their operation.

1.2 Meeting DfT Objectives

The DfT have stipulated the following objectives as part of the tender:

a. All elements of the pilot scheme shall be fully compliant to the prevailing ITSO documentation.
b. Conduct a robust analysis of (1) bus boarding times, (2) Systems performance and (3) passenger reaction to address the concerns of all key stakeholders involved in the rollout of smartcard technologies within a deregulated transport industry. This should provide a comparison of existing performance measures prior to the introduction of smartcards to the pilot area.
c. The research shall assess the Customer Experience and the Operator and PTE expectations and provide recommendations for rollout. Included within this analyses shall be a study of the business case for deployment of similar regional schemes.
d. To understand the value of new innovative ticketing products to the key stakeholders
e. To understand the value of using Citizen cards as an alternative to transport only smartcards.
f. To ensure that all deliverables are clear, concise, accurate, thorough, of a high technical quality and well written.
g. The research shall complement the Yorcard pilot timetable.

This report must therefore evaluate how the relevant objectives will be met, particularly objective b and c as these specifically relate to Boarding and Dwell Times. These DfT objectives will be looked at in turn in section 4 to discuss how this study could achieve and inform these objectives. Reference will also be made to how this study can help meet the DfT strategy to deliver improvements to the accessibility, punctuality and reliability of local and regional transport systems by implementing a smartcard based ticketing system. In future phases this study may also meet objective d providing operator ticket type data is made available.

1.3 Meeting Yorcard Objectives

It is also important to consider the objectives of Yorcard and its stakeholders. This report will consider how the 3 most relevant objectives are likely to be influenced by Yorcard. Please refer to the General Reference Document for the full list:

- Reduce barriers to the use of public transport;
- Reduce delays and improving reliability; and
- Inform business cases.

Section 4 will elaborate, in light of the results found, on how this study could affect each of these objectives. This report will recommend which measurements should be used to develop the following business case models identified in the Yorcard Pilot Acceptance Criteria:

- to measure the payment collection process before and during the on/on and on/off trialling;
- to monitor ticket transaction time reductions throughout all the phases;
- to enable the monitoring of journey time reductions throughout the phases by monitoring the changes in Dwell Time at bus stops; and
- to obtain results that will feed into the business case.

The following section will present the methodology used for this Boarding Time study ensuring it meets the relevant objectives.

Method of Recording Boarding & Dwell Times

This section provides details on the methodology used to obtain the timed measurements of the components which make up the Dwell Time. The methodology, which has been developed in this phase, was designed to be both robust and to meet the Pilot Acceptance Criteria, described in section 1.3.

A number of options were considered for this survey, such as, using cameras on the bus and having surveyors on or off the bus. Following discussions (detailed in the Boarding Time Methodology – RES006), an off bus survey at key bus stops along the pilot corridor was chosen. This method allows different bus types and operators to be tested under the same boarding and alighting conditions, thus more robust results can be established throughout the four phases by which to determine the effect of the Yorcard on Boarding Time.

A total of 18 bus stops along the pilot routes have been used for the study and were selected in order to obtain boarding times both in the city centre and the suburbs (see Appendix 1 for the list of locations), with 2 data collectors assigned to each bus stop.

Initially, it was anticipated that the data collectors would identify the time of arrival at the bus stop, the vehicle identification number, route number, direction of travel, operator, type of vehicle and any affecting factors, such as, driver change-over or passenger boarding with a buggy. They would also identify the number of passengers boarding and alighting the vehicle and use a stopwatch to collect key timings as follows:

1st surveyor:

- Start the stopwatch when the bus has come to a halt
- Press the lap counter when the doors are open
- Press the lap counter when the first passenger boards the bus
- Press the lap counter when the last passenger boards the bus
- Press the lap counter when the doors close
- Press the lap counter when the bus departs
- Record each time in a matrix and reset the stopwatch

2nd surveyor:

- Start the stopwatch when the bus has come to a halt
- Press the lap counter when the doors are open
- Press the lap counter when the first passenger alights the bus
- Press the lap counter when the last passenger alights the bus
- Press the lap counter when the doors close
- Press the lap counter when the bus departs
- Record each time in a matrix and reset the stopwatch

Testing of this methodology took place in Newcastle, which has similar buses to those used in Sheffield. A handheld video camera was used over a one hour period, while the testing was being carried out, in order to verify the process used and to ensure that the data collated by the surveyors correlated with the actual boardings. Permission was granted by operators, the council and police, for this test providing that once this video had served its purpose all recordings were destroyed so as to protect the personal privacy of the passengers using the bus stop during this trial. This has been carried out as agreed.

Upon testing the methodology it was found that both of the data collectors were overburdened with tasks, thus potentially leading to missing information and compromising the overall quality of the data collected. As a consequence of resource constraints and time pressures, the tasks carried out by the 2nd surveyor detailed above were removed so that they would collect the following.

2nd surveyor:

- The time of arrival at the bus stop,
- The vehicle identification number,
- Route number,
- Direction of travel,
- Operator,
- Type of vehicle,
- Any affecting factors, such as driver change-over or passenger boarding with a buggy; and
- Identify the number of passengers boarding and alighting the vehicle.

2.1 The Ticketing Environment

This data collected by the second surveyor about each bus surveyed is very important as no ticket type data is captured during the surveys. The operators use much of this information to obtain and provide the ticket type data required for a regression which will provide an average time per ticket type used (this is presented in section 3.8).

However, when the data were collected it was felt that the specific timed measurements for alighting passengers was salient, particularly for creating a baseline to compare the data collected in phase 4 to, and was not captured effectively enough using this methodology. As a result a 3rd surveyor was added to collect the following:

3rd surveyor:

- Start the stopwatch when the bus has come to a halt
- Press the lap counter when the doors are open
- Press the lap counter when the first passenger alights the bus
- Press the lap counter when the last passenger alights the bus
- Press the lap counter when the doors close
- Press the lap counter when the bus departs
- Record each time in a matrix and reset the stopwatch

In order to capture this information in Phase 1, a method, using a significant quantity of data collected relating to alighting passengers only, has been adopted whereby an estimate can be made of the doors opening to first alighting passenger and last alighting passenger to doors closing. Approximately 25% of the sample (269 observations) are observations that have no passengers boarding and thus, only alighting passengers (these are examined in this report in section 3.4).

There also are a number of observations where there are passengers boarding but no passengers alighting. It is possible that the time taken for the first passenger to board (when there are no alighting passengers) could give a good estimate of the time between doors opening and the first passenger alighting and that similarly, the time between the single passenger boarding and doors closing could give an estimate of the time between the last alighting passenger and doors closing.

If it is possible to use these times, then the sample of times where there are only alighting passengers could be used to determine the way in which this affects average timings.

In order to justify the estimate, 2 of the original surveys were repeated using 3 surveyors (carrying out the tasks detailed above) at 2 key bus stops, one where passengers mainly alight and a second where passengers mainly board. The data captured from this subsequent data collection will form an Annex 1 to this report.

For the purpose of future analysis, it is important to outline the ticketing regime at the time the data were collected. For the baseline activities, all ticketing used a paper based regime. Elderly and disabled passengers, and certain child users, had free fare passes (with restrictions) which are used as a flash pass. Tickets were issued by the Electronic Ticket Machine (ETM) for elderly and disabled passengers. A 40p flat fare concession was also being used for eligible children.

The commercial offering again was paper based and generally available in terms of single, day, weekly and longer period tickets. Many of these tickets were printed by the ETM and bought on vehicle, whereas others (particularly longer period products) had photographs attached and would have been pre-printed and purchased off-bus.

It is also assumed that all operators are using ticket machines from which they download all ticket and revenue data at the end of the working period and are willing to provide Newcastle University (the Reviewer under the terms of the Yorcard Data Share Agreement) with the ticket sales outlining the ticket types purchased (e.g. cash or season pass, etc) from their information relating to the vehicle and time of day at the bus stop where the survey was carried out. The minimum information will be a division between cash and non-cash based boarders. This information will be provided in spreadsheet or table format for ease of data extraction and agreed between Newcastle University and operators should this information become available. This will enable comparison of the average Boarding Time and Dwell Time measurement in relation to ticket type.

Results & Analysis

3.1 Summary of Analysis

The results presented in this section are relating to 4 key measurements that have been captured by the methodology in accordance with the Pilot Acceptance Criteria: Dwell Time; Boarding/Alighting Time; Boarding Time; and Alighting Time. These times are illustrated in the diagram below.

The measurements, depicted above, which were analysed and reported in this document will be explained and justified below.

Bus Stop Dwell Time
Bus Stop Dwell Time is the total time that the bus is at a particular stop and, in terms of the analysis, the effect of Yorcard on this time could have the greatest impact for the operator. For example, if there is an increase in the Dwell Time, this is likely to be seen as a negative impact to the operator. However, this measurement gives no information about the cause of an increase or decrease in time, for example, a decrease in Dwell Time could be due to less recovery time, fewer passengers, faster boarding times or a combination of effects. Therefore it is important not to consider the Dwell Time in isolation and to carry out an investigation of the times and variants that combine to create the Bus Stop Dwell Time.

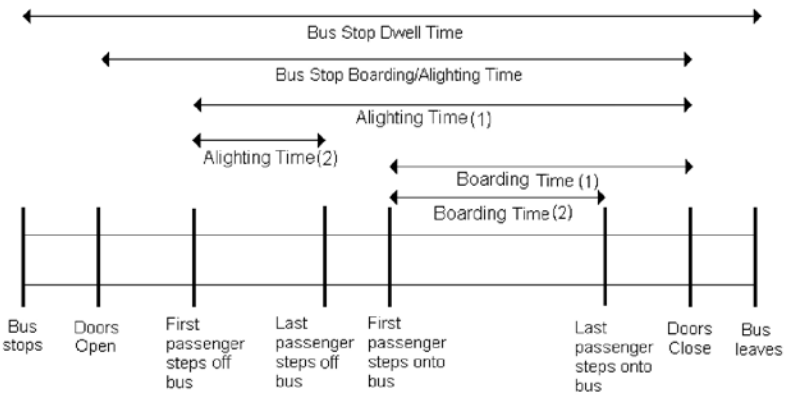


Diagram of Bus Dwell Time components measured in this report (see Glossary for all definitions)

In this report, Dwell Time has been analysed to determine the average Dwell Time and the associated statistics. The average Dwell Time per bus stop has been calculated as this demonstrates the variability of Dwell Time depending upon the stop. The average Dwell Time per boarding and alighting passengers combined has also been calculated as this is effectively the average Dwell Time per passenger and enables the overall analysis of variations in the number of passengers both alighting and boarding. The average Dwell Times baselined in this report can be repeated and monitored through the Yorcard pilot.

The component measurements of Dwell Time which are of most interest for this study are most likely to be the Boarding Time and the Alighting Time. This is where the effect on Dwell Time of passengers using Yorcard will be most evident.

Bus Stop Boarding/Alighting Time
Bus Stop Boarding/Alighting Time (B/A Time) is the measured time from when the doors open to when the doors close. Thus, it is the time when passengers can board and alight, and is not a function of the Dead Time (see glossary).

In this report the B/A Time has been analysed in order to calculate an overall average B/A Time per bus. As with the Dwell Time, the average B/A Time per boarding and alighting passenger has been calculated to allow for the variations of numbers of passengers boarding and alighting without the Dead Time. Additionally, the average B/A Time per boarding passenger (with no alighting passengers) and the average B/A Time per alighting passenger have been calculated to demonstrate the effect that each group of passengers have on the overall time.

Boarding Time
Boarding Time is the measurement from when the first passenger steps on the bus to when the last passenger steps on the bus. This allows the overall Boarding Time to be measured when 2 or more passengers board a bus. This is known as B(2) and is the most useful measurement of Boarding Time as this includes no Dead Time or Recovery Time. In this report the average B(2) has been calculated as has the average B(2) per boarding passenger (both with and without alighting passengers).

However, B(2) does not allow for an average measurement to be calculated when there is only 1 boarding passenger. B(1) is measured from when the first passenger steps on the bus to when the doors closed. This, therefore, does capture when only 1 passenger boards, however it should be noted that this does include some recovery time, for example, if the driver leaves the doors open while waiting at the bus stop. In this report, the average B(1) has also been calculated per boarding passenger (both with and without alighting passengers).

Alighting Time (reported in Annex 1)
Alighting Time is the measurement from when the first passenger steps off the bus to when the last passenger steps off the bus. This allows the overall alighting time to be measured when 2 or more passengers alight a bus. This is known as A(2) and is the most useful measurement of Alighting Time as this includes no Dead Time or Recovery Time. In this report the average A(2) has been calculated as has the average A(2) per alighting passenger (both with and without boarding passengers).

However, A(2) does not allow for an average measurement to be calculated when there is only 1 alighting passenger. A(1) is measured from when the first passenger alights to when the doors closed. This, therefore, captures when only 1 passenger alights, however it should be noted that this does include some recovery time, for example, if the driver leaves the doors open while waiting at the bus stop. In this report, the average A(1) has also been calculated per boarding passenger (both with and without boarding passengers).

3.1.1 Summary of Results

The baselining measurements for this phase 1 Boarding Time study have been calculated and for full details these have been reported in the remainder of this section. For reference, the table of results is also summarised below both with and without Other Factors (see glossary). These results will also feed into the overall business case, and will be used to inform the relevant DfT and Yorcard objectives.

Measurement Description		Mean Time (sec)	Mean Time	Mean Time (No other factors)	Mean Time (No other factors)
Bus Stop Dwell Time:	per bus	34.25	72.52	28.66	68.06
	per boarding and alighting passenger	8.29	13.65	7.08	9.98
Bus Stop Boarding/Alighting Time:	per bus	29.29	45.12	23.78	34.95
	per boarding and alighting passenger	6.98	13.01	5.76	9.22
Boarding Time (1) [when only one passenger boards]:	per bus	13.62	30.56	10.47	23.82
	per boarding passenger [no alighting passengers – see section 3.5]	11.77	25.59	9.51	19.21
Boarding Time (2) [when 2 or more passengers board]:	per bus	21.91	39.30	19.79	37.63
	per boarding passenger [no alighting passengers – see section 3.5]	3.27	4.38	2.91	2.37
The following will be included in Annex 1					
Alighting Time (1) [when only one passenger alights]:	per bus				
	per alighting passenger [no boarding passengers]				
Average Alighting Time (2) [when 2 or more passengers board]:	per bus				
	per alighting passenger [no boarding passengers]				

Table 1: Summary Statistics of Phase 1 Baselining Boarding Time Study (see Glossary for definitions)

3.2 Sample Size

The Boarding Time study for phase 1 was carried out over a period of 5 days from June 2007 to December 2007. It captured data from both peak and off peak times, week days and weekends, thus covering a number of operational scenarios and is therefore considered as representative of the operational environment. All the data required for this report have now been collected, entered into a database and cleaned for data coding errors, inconsistencies and missing information. This cleaning process resulted in 0.57% of data being rejected.

Boarding information has been collected from 1049 buses at 18 different bus stops in a variety of locations from city centre to suburbs along the main routes involved in the Yorcard pilot (please see Appendix 1 for the list of boarding/ alighting points and an overview of their locations). This information accounts for 2944 boarding passengers and 2946 alighting passengers collected during the following times and days:

	Boarders	Alighters
Mon-Fri 07:30-09:30	468	708
Mon-Fri 10:00-13:00	723	959
Mon-Fri 14:00-18:00	830	694
Weekend	923	575

In terms of further analysis, it is apparent that t-tests are not needed at this stage as there are no views or assumptions about means. The final research report, delivered in Phase 7 will demonstrate the analysis of the variables carried out to establish if there are any significant differences between the means. The observations will be separated by boarding point and analysed depending on its location. For example, the city centre bus stops will be examined separately from the suburban bus stops.

Please note that some of the tables referred to in the text in this section have actually been placed in Appendix 2 as they are too large to be placed in the text. However, for consistency the tables are numbered chronologically and as they are referred to in the text.

3.3 Bus Stop Dwell Time

In this study the Bus Stop Dwell Time is defined as the total time spent by a bus at a bus stop and is composed of 3 parts; Bus Stop Dead Time, Bus Stop Boarding/Alighting Time and Bus Stop Recovery Time (see glossary for definitions). Observing how different scenarios and situations affect Dwell Time is essential for creating a baseline as it will be important for comparison throughout this research project and to highlight the true impact of smartcard introduction on the boarding process.

Boarding Time analysis has revealed that the overall average Dwell Time per bus is 34.25sec with a standard deviation of 72.52 (see Table 2, the first column displays the overall statistics).

	Dwell Time (all stops) (Sec)	Dwell Time (stops 1-11) (Sec)	Dwell Time per Boarding and Alighting Passenger (all stops) (Sec)
Mean	34.25	21.180	8.29
Standard Deviation	72.52	17.63	13.67
Minimum	2.66	2.66	0
Quartile 1	10.90	9.6	3.22
Median	18.71	16.4	5.41
Quartile 3	34.07	26.45	8.81
Maximum	1884.03	144.46	242.75
Skewness	16.74	2.47	10.19

Table 2: Dwell Time Statistics

Disaggregating the Dwell Time identifies the average Dwell Time per bus stop (see Table 3, in Appendix 2, and Figure 1). Figure 1 shows that some bus stops have a much higher average Dwell Time than others. In the case of point 16, this high Dwell Time can be explained as the location was a place where the buses either changed driver or waited as they were ahead of schedule. Similarly, point 13 had high numbers of boarding passengers (particularly elderly passengers) and this could be a cause for an increase in overall average Dwell Time. Stop 15 is slightly different as there is one observation in which a large number of people board and this greatly affects the overall average Dwell Time.

Generally the Dwell Times for stops 12 to 18 are more variable compared to stops 1 to 11 as seen in Figure 1. When only the Dwell Times for bus stops 1 to 11 are analysed the overall Average Dwell Time is calculated to be 21.18 sec with a standard deviation of 17.63. Other descriptive statistics, ignoring stops 12 to 18, are given in the second column of Table 2 where it can be seen that the standard deviation and range are also lower, as mentioned, this is largely due to the fact that the activity at these bus stops means that the Dwell Time is fairly consistent.

The effect of the number of boarding and alighting passengers on average Dwell Time is presented in the third column of Table 2. Analysing this through each phase will allow the overall effect of smartcards on Dwell Time to be observed depending upon the throughput of boarding and alighting passengers.

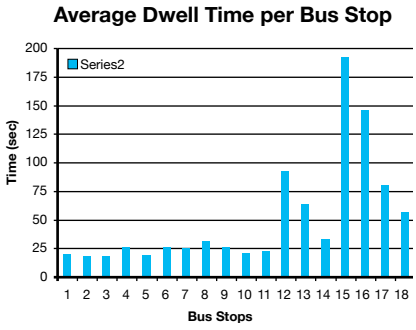


Figure 1: Dwell Time per Bus Stop Location Identifier

3.4 Bus Stop Boarding/ Alighting Time

Surveyors recording the information in this Phase 1 survey were asked to note unusual events (these are defined as Other Factors, see Glossary for definition) when buses stopped at bus stops. This is examined in Section 3.4 where there is an analysis of Dwell Time when Other Factors, such as driver changeover, are considered in isolation as well as the effect of removing these factors on the overall Average Dwell Time.

This study defines the Boarding/ Alighting Time (B/A Time) as the time from when the doors open to when the doors close (see Glossary) and is the normal time when passengers can board and alight. Any late boarders (i.e. those people who board after the main body of the boarding passengers have boarded, or while the bus is waiting or passengers who run and hold the bus up) have been excluded from the data collection.

Observing how different scenarios and situations affect B/A Time is essential for creating a baseline for comparison throughout this research project. It will enable the true impact of smartcard introduction to be highlighted. Of particular interest when analysing B/A Time is the impact that boarding and alighting passengers have on the overall length of the B/A Time (for further analysis of alighting passengers, see Annex 1).

As a result the average B/A Time has been calculated per bus, per boarding and alighting passenger and per alighting passenger when no there are no boarders. It has also been analysed for boarding passengers when no passengers alight.

	Average B/A Time (sec)	Per Boarding and Alighting Passenger (sec)	Per Alighting Passenger (no boarders) (sec)	Per Boarding Passenger (no alighters) (sec)
Mean	29.29	6.98	3.19	10.48
Standard Deviation	45.12	13.01	3.45	18.73
Minimum	0.4	0.4	0.40	0.90
Quartile 1	8.42	2.54	1.70	4.73
Median	15.92	4.37	2.24	6.662
Quartile 3	29.93	7.26	3.41	10.61
Maximum	596.66	241.98	37.19	241.98
Skewness	4.86	11.44	5.67	8.95

Table 4: Boarding/Alighting Time Statistics

The average B/A Time has been found to be 29.29sec per bus with a standard deviation of 45.12; Table 4 gives descriptive statistics for the B/A Time. Overall B/A Time is influenced by both the number of passengers boarding and the number of passengers alighting, however this time is more likely to be influenced by the former. When the B/A Time is divided by the total number of passengers both boarding and alighting the average B/A Time per passenger is 6.98sec (see column 2 of Table 4) and a standard deviation of 13.01. It can be seen in Table 4, columns 5, that when no passengers board the B/A Time per alighting passenger is low at 3.19 sec, which is likely to be due to the fact that passengers alighting do not need to interact with the driver. This suggests more in-depth analysis is required separately for boarding passengers and alighting passengers and is elaborated further in this section (and Annex 1).

Figure 3 (and Figure 3a which does not include the statistics for 89 passengers for reasons of scale) shows that the average B/T Time increases as the number of boarding passengers increase whilst Figure 4 shows the average B/A Time per boarding passenger exhibits a corresponding decrease.

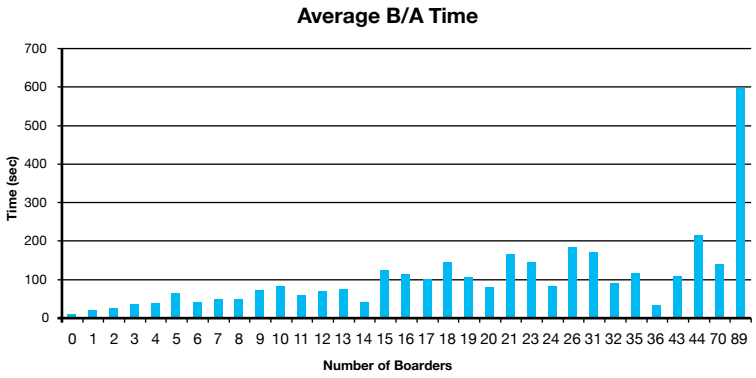


Figure 3: B/A Time for the Number of Boarding Passengers

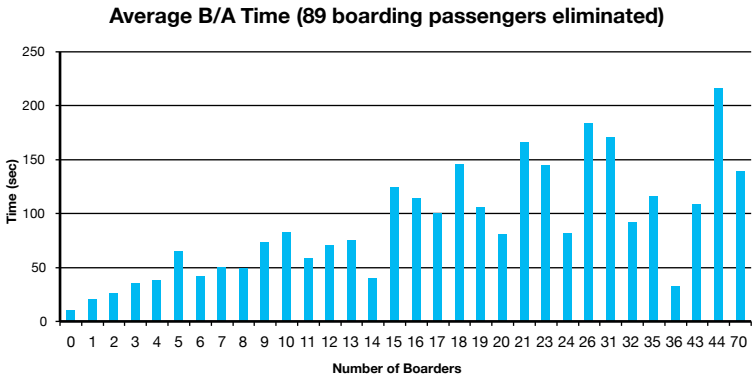


Figure 3a: B/A Time for Number of Boarding Passengers (89 passengers excluded for scale)

Table 5 (Appendix 2) displays the effect of the number of passengers alighting on the B/A Time which shows that as the number of passengers alighting increases the average B/A Time also increases but this increases at a slower rate than for the boarding passengers and this is accompanied by a corresponding decline in Average B/A Time per passenger alighting (see Figure 5). The analysis must be understood in the context that those cases where there are large numbers of passengers alighting there are small sample sizes.

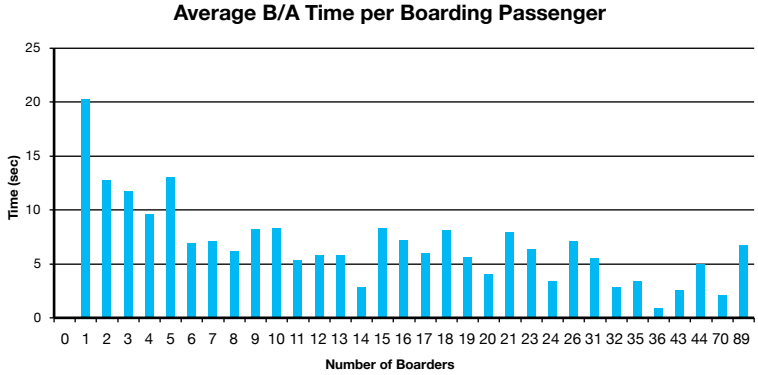


Figure 4: B/A Time per Passenger for the Number of Boarding Passengers

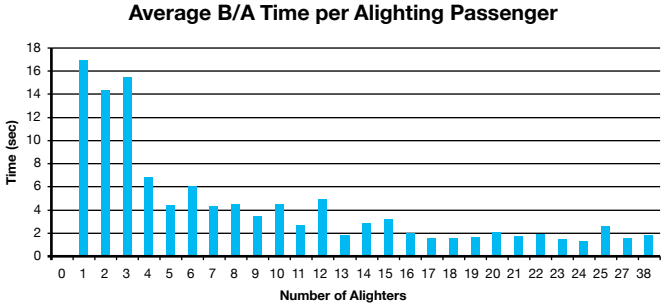


Figure 5: B/A Time per Alighting Passenger

It is likely that boarding will take longer than alighting for passengers so it is therefore important to analyse the B/A Time for passengers alighting when no passengers board. A total of 270 observations were made when only alighting passengers were observed (out of a total of 1243 alighting passengers). An analysis of this data established that the average B/A Time was 10.21 sec per bus with a standard deviation of 7.88 and the Average B/A Time per alighting passenger is 3.19 sec with a standard deviation of 3.45 which is significantly lower than when passengers are both boarding and alighting (see Table 6 for statistics). This confirms that boarding passengers have a larger impact on B/A Time than alighting passengers. See also Annex 1 for the Alighting Time reporting and analysis.

	Average B/A Time (no boarders)	B/A Time per Alighting Passenger (no boarders)
Mean	10.21	3.19
Standard Deviation	7.88	3.45
Minimum	0.40	0.40
Quartile 1	4.36	1.70
Median	7.80	2.24
Quartile 3	14.16	3.41
Maximum	41.06	37.19
Skewness	1.38	5.67

3.5 Boarding Time

Surveyors recording the information in this Phase 1 survey were asked to note unusual events (these are defined as Other Factors, see Glossary for definition) when buses stopped at bus stops. This is examined in Section 3.4 where there is an analysis of B/A Time when Other Factors, such as driver changeover and passenger delays, are considered in isolation as well as the effect of removing these factors on the overall Average B/A Time.

In this study the Boarding Time has two definitions. Boarding Time (1) (referred to as B(1) in this document) is the time from when the first passenger puts their foot on the bus to board to when the doors close and is the time when passengers are able to carry out transactions with the driver (see glossary). This also includes the dead time between when the last passenger has boarded and the doors are yet to be closed.

	Average B(1) Time	Average B(1) Time (no Alighters)
Mean	13.62	11.77
Standard Deviation	30.56	25.59
Minimum	0.60	0.6
Quartile 1	3.99	3.63
Median	6.20	6.10
Quartile 3	11.33	11.80
Maximum	268.35	212.48
Skewness	5.69	6.87

Table 7: Statistics for Boarding Time (1)

B(1) allows for the analysis of the Boarding Time when only one passenger has boarded, thus all the calculations for B(1) are for 1 boarder only and in this case there are 271 observations of this. Table 7 shows the statistics for the B(1). The overall average B(1) was found to be 13.62sec with a standard deviation of 30.56.

B(1) is also a meaningful calculation when only 1 passenger boards and there are no passengers alighting and this figure is then as close to the true time for a single boarder as possible. There are 135 observations of buses when only one passenger boarded and no passengers alighted and the second column of Table 8 displays the statistics where the mean for this is 11.77 sec with a standard deviation of 25.59. This standard deviation is quite high, suggesting that the range of times for one boarder is still very varied despite the lack of alighting passengers, however it can still be assumed that the number of alighting passengers does effect the overall B(1) when only one passenger boards. This means that exit reading actions and customer behaviours should be carefully considered in future phases.

Boarding Time (2) (referred to as B(2) in this document) is the time from when the first passenger puts their foot on the bus to board to when the last passenger puts their foot on the bus to board thus capturing the essence of the Boarding Time per passenger when multiple passengers board. The B(2) definition eliminates any analysis of times that are taken when only one passenger boards and so the calculations here are based upon data collected for multiple boarders. It is useful for analysing the effect of 2 or more boarding passengers on the Dwell Time and the average Boarding Time, which will be useful for comparing and contrasting in future phases.

	Average B(2) Time (sec)	Average B(2) Time (no Alighters) (sec)	B(2) per Boarding Passenger (sec)	B(2) per Boarding Passenger (no Alighters) (sec)
Mean	21.91	19.52	3.81	3.27
Standard Deviation	39.30	29.77	5.62	4.38
Minimum	0.47	0.47	0.24	0.24
Quartile 1	3.50	3.22	1.39	1.25
Median	8.40	7.74	2.52	2.27
Quartile 3	23.98	20.67	4.39	4.0
Maximum	568.60	206.52	66.45	51.51
Skewness	6.67	3.14	7.04	7.31

Table 8: Statistics for Boarding Time (2)

The overall average B(2) was found to be 21.91 sec with a standard deviation of 39.30 and the B(2) per boarding passenger was found to be 3.81 sec with a standard deviation of 5.62 as described in Table 8. Table 9 (Appendix 2) demonstrates the average B(2) in terms of the number of boarding passengers. If B(2) is divided by the number of passengers boarding (see Figure 7), it can be seen that in this relationship the majority of the calculations fall between 2 and 6 seconds, suggesting that B(2) per boarding passenger is not dependent upon the number of passengers boarding.

B(2) can also be calculated when only passengers board, which means that this variable is not then affected by the number of passengers alighting and is therefore as close to the true times of boarding as possible. There are 279 observations of buses when no passengers alight. Calculated in this way, the average B(2) was calculated to be 19.52 sec with a standard deviation of 29.77 and the B(2) per boarding passenger was calculated to be 3.27sec with a standard deviation of 4.38 (descriptive statistics are shown in Table 8 and Table 10 (Appendix 2) and Figure 8 demonstrates the effect as the number of passengers boarding increases). This is slightly lower than the B(2) time when there are alighting passengers, which suggests that alighting has little to no real effect on the value for B(2) but as with B(1), this should be monitored throughout the subsequent phases.

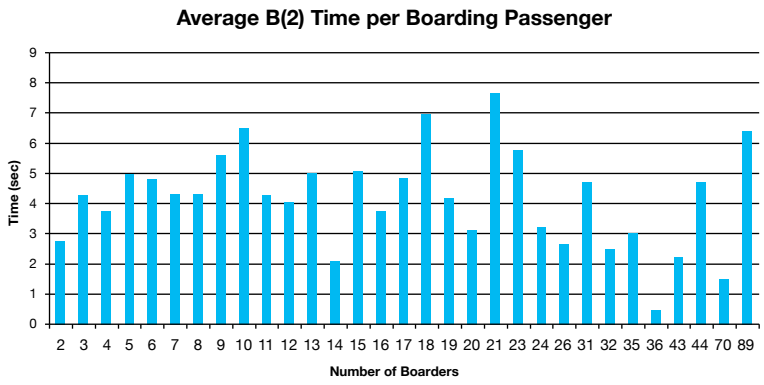


Figure 7: B(2) Time per Boarding Passenger

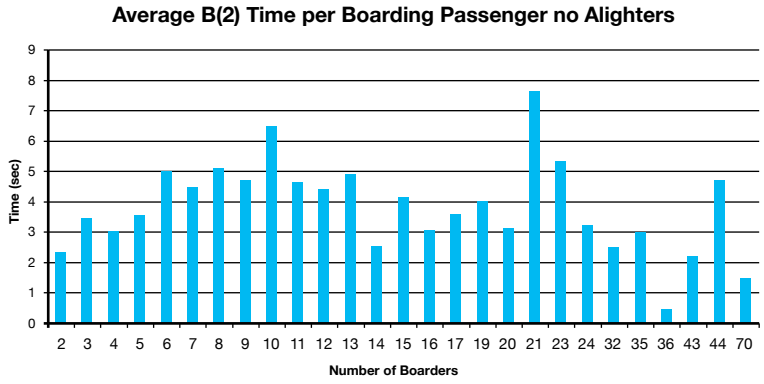


Figure 8: B(2) Time per Boarding Passenger with no Alighting Passengers

3.6 Analysis of Factors Affecting Average Times

Any factors that may have had an impact on the observed times measured were recorded by the survey staff and entered into the database for easy identification of affected data. These factors have been categorised in this study as: factors dependant upon the operation, such as driver changes and recovery time when the bus is ahead of schedule; and factors dependant upon the passenger, such as passengers boarding with buggies, and disabled and elderly passengers. Table 11 displays the average Dwell, B/A, B(1) and B(2) times, alongside their standard deviations, for each of these factors compared to the average times when the data affected by other factors are removed.

Table 11 (see Appendix 2) and Figure 9 provide the results for the data affected by scheduling. It is important to note the scale for the times (compared to Figure 10) as this shows that scheduling has a higher impact than passenger factors on the times calculated. Of particular interest is the effect of scheduling factors on B(1) and B(2). It would be expected that B(1) would increase as it is likely that the doors would remain open while the bus was at a stand still. However, B(2), which is the time from the first passenger boarding to the last passenger boarding, also showed that there was an increase in this time when the bus was ahead of schedule. This suggests that data collection may well have been influenced by these 'Other Factors'. In particular, passengers who board after the main body of passengers should neither have been counted nor their time included in this study. The fact that B(2) is affected by these scheduling factors suggests that some late boarding passengers may have been included. It should be noted for later phases that staff must ensure that this does not happen.

Table 12 (see Appendix 2) and Figure 10 provide the results for the data affected by passenger factors. In this case it can be seen that overall these factors tend to affect the Dwell Time and the B/A Time. Also, it can be seen that the factors do have an impact on B(1) and B(2) (as seen when there are no alighters), however, this is mostly observed with passengers boarding with buggies and disabled passengers, as elderly passengers appear to have less impact. It is important to note the scale for the times in Figure 10 (compared to Figure 9) as this shows that scheduling has a higher impact than passenger factors on the times calculated.

It is clear that the factors mentioned do have an impact on the times that are being monitored in this report, thus it is important to be aware of their possible effect. However, it is also clear that there are not enough occurrences of these incidents to have a significant impact upon the calculations discussed above.

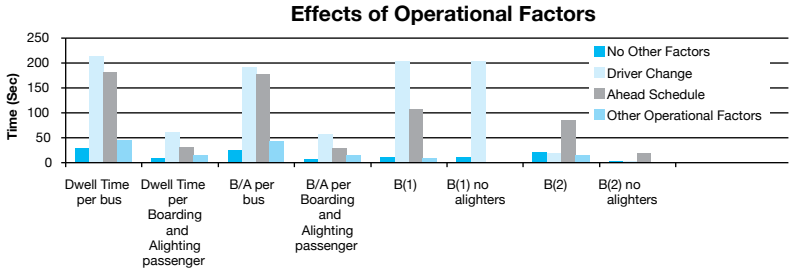


Figure 9: Effects of operational factors compared to other factors removed

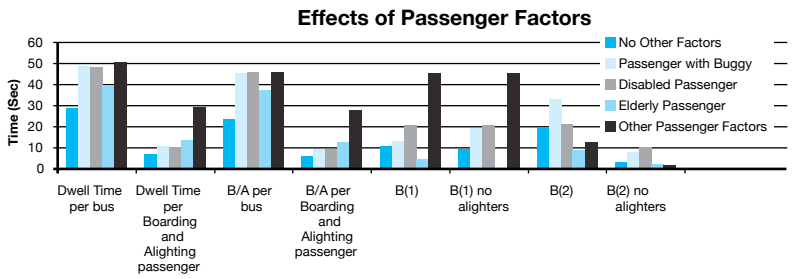


Figure 10: Effects of Passenger factors compared to other factors removed

3.7 Analysis of Operational Conditions

In order to analyse the effect of operational conditions upon the data collected, data analysis has been carried out on Dwell Time to contrast the impact of locations, time of day and weather.

A number of different locations were used through out this study in order to assess the true conditions throughout the pilot corridor. When the Dwell Time data is disaggregated for the 18 bus stops at which the surveys were carried out, it can be seen that the majority have similar average Dwell Times (see Figure 1). However, it can also be seen that a number of bus stops have particularly high Dwell Times, primarily due to their location. For example, stops outside of a school can have very high numbers of boarding passengers at certain times in the day, which greatly effects the overall Dwell Time. Similarly, city centre locations, are likely to have higher numbers of boarding passengers than those in sub-urban locations. One other observation, in particular, was that the Sheffield Bus Interchange is a location where drivers commonly change shifts and the effect was that this increased the overall Dwell Time.

The data was collected over 3 different periods of the day defined as:

AM – 7:30-9:30
MID – 10:00-13:00
PM – 15:00-18:00

Analysis of Dwell Time for each of these different times of day is presented in Table 13 and demonstrates that overall the average Dwell Time per time of day is lowest in the morning peak and highest in the evening peak, suggesting that time of day does have an impact. However, as is described in the introduction to this section, this could be because more passengers board during this time period than any of the other periods.

	AM	MID	PM
Number of Observations	287	404	357
Mean	24.81	33.35	37.70
Standard Deviation	32.07	41.55	54.81
Minimum	2.86	2.66	3.20
Quartile 1	9.13	11.38	11.53
Median	17.24	19.14	19.60
Quartile 3	27.02	38.07	35.52
Maximum	279.28	325.16	402.42
Skewness	5.32	3.32	3.51

Table 13: Statistics for Dwell Time per Time of Day

The data were also collected over 3 different periods of the week: Monday; Mid-week; and Weekend. The statistics displayed in Table 14 suggest that Dwell Time is highest at weekends with an average of 55.23 sec. However, the standard deviation is also very high at 73.67, which suggests that there is more variety of Dwell Times and some higher Dwell Times are affecting the overall average time. This may be the result of infrequent passengers using the service or passengers boarding with a lot of shopping. It could also be due to buses using the stops observed at the weekend in order to keep to schedule.

	Monday	Mid-week	Weekend
Number of Observations	58	740	250
Mean	33.48	24.74	55.23
Standard Deviation	28.69	26.28	73.67
Minimum	4.88	2.66	3.33
Quartile 1	16.09	10.29	11.45
Median	22.87	17.46	25.77
Quartile 3	46.67	28.08	55.14
Maximum	144.46	325.16	402.42
Skewness	2.06	4.33	2.20

Table 14: Statistics for Dwell Time per Time of Day

3.8 Analysis of Ticket Type

Analysis has also been carried out to establish if Dwell Time is affected by the weather experienced and noted by the data collectors (and verified against the statistics provided to the project by the Weston Park Weather Station in Sheffield). Table 15 displays the statistics for the different weather experienced whilst the data was collected. This table demonstrates that Dwell Time is lower when the weather is dry and mild or sunny. It also shows that it is higher when the weather is dry and cold. This could mean that people take longer to board when the weather is dry and cold, however, this analysis is not conclusive as the number of observations that are collected under this condition is a lot higher than for the other categories, therefore, more analysis would need to be carried out by carrying out this analysis in further phases and comparing the results.

	Sunny	Dry and Mild	Dry and Cold	Rain
Number of Observations	413	126	450	59
Mean	19.59	19.22	49.12	24.39
Standard Deviation	13.69	16.71	62.14	19.18
Minimum	2.66	3.20	3.33	2.86
Quartile 1	9.77	8.28	13.73	13.30
Median	16.10	13.31	25.65	18.75
Quartile 3	25.46	2.35	53.87	28.00
Maximum	80.80	100.28	402.42	107.70

Table 15: Statistics for Dwell Time per Weather

Undertaking an analysis of ticket type is subject to data being provided by the participant bus operators and will thus be performed once this data has been obtained and Annexed to this report (Annex 2).

A regression model, using data collected from a previous study, has demonstrated the theory that the variability in Boarding Time can be explained in terms of the different ticket types used by passengers. This will enable the calculation of the average Boarding Time for passengers using a smartcard, and thus can be monitored throughout .

Discussions have revealed that satisfactory data may not be available to link ticket type recording via the on-bus ticket machine to the specific buses in the Phase 1 survey although it is assumed that this will not be a limitation in the future Phases of this work.

Summary & Conclusions

The analysis carried out for this report has enabled the identification of the important calculations to compare throughout this research project. Each of the times analysed in this report will be taken in turn to highlight and summarise the important findings.

Dwell Time

- Dwell Time is affected by the location of the bus stop, thus it is important to disaggregate the time for each boarding point, throughout the phases.
- Dwell Time increases as the total number of passengers boarding and alighting increases.
- Dwell Time per boarding passenger decreases as the number of boarding passengers increase.
- When Other Factors are analysed it can be seen that Scheduling Factors have a greater impact on Dwell Time, compared to Passenger Factors and that elderly passengers seem to have less impact on the calculated Dwell and Boarding Times.
- The time of day and day of week appear to have an impact upon the overall Dwell Time which may be due to levels of traffic throughout the day, or an increase of passengers boarding with shopping at the weekends.
- Weather also appears to have an effect on Dwell Time. Passengers seem to board more quickly during sunny weather compared to dry and cold weather. Analysing this through out each of the phases will enable a more rigorous analysis of this as there are low observations of some weather conditions at this stage.

Average Boarding and Alighting Time (B/A Time)

- B/A Time per boarding passenger decreases as the number of boarding passengers increase.
- B/A Time is influenced mainly by boarding passengers. When this time is analysed by alighting passengers only (i.e. there are no passengers boarding) it can be seen that the average B/A Time per alighting passenger is greatly reduced.
- B/A Time per alighting passenger decreases as the number of alighting passengers increase.

Boarding Time (1)

- When B(1) Time is analysed when no passengers alight, this time reduces slightly which suggests that alighting passengers affect average B(1) Time. This should be monitored throughout, particularly in phase 4, to determine the effect exit reading has on boarding time.

Boarding Time (2)

- B(2) provides the best indication of Boarding Time (when more than one passenger boards) and the analysis suggests that as the number of passengers increase, the average B(2) per passenger remains fairly constant.
- When B(2) Time is analysed when no passengers alight, this time reduces very little which suggests that alighting passengers does not affect average B(2) Time. This should be monitored throughout, particularly in phase 4, to determine the effect exit reading has on Boarding Time.
- It is important that boarding passengers who board outside the main body of passengers boarding (i.e. those who run for the bus or board when the bus is waiting due to their timetable) are not included in the survey.

Alighting Time (1)

- Overall conclusions for this time will be included in Annex 1

Alighting Time (2)

- Overall conclusions for this time will be included in Annex 1

Other Factors

- Other factors were noted when the data was collected and have been listed as either scheduling or passenger affected.
- The analysis has found that overall the other factor do affect the times listed above. Scheduling has the biggest impact, particularly on Dwell Time, B/A Time and B(1).
- Scheduling does effect B(2) a little, which suggests that is important to ensure that the surveyors only capture boarding passengers who board together and not those who board after this when the bus is waiting, etc.
- The effects of passengers were less pronounced but still evident and therefore, it is important to continue to note these factors for comparison in later dates. The statistics for each of the times above have been noted when the other factors have been removed and this will be built into the future phase methodology for data analysis and repeated throughout each of the phases.

4.1 Limitations

Operational Conditions

- The data was analysed for Dwell Time and it has been seen that location, time of day and day of week, and weather all appear to have an impact.
- Bus stop location can have a large impact, as some stops are much more likely to have high boarding or alighting passengers and other stop are more likely to places drivers wait when they are ahead of schedule.
- Time of day had an impact as Dwell Time was higher in the evening peak. This could be because more passengers boarding were captured at that time.
- The day of the week appeared to have an impact. For example, the average Dwell Time was highest at the weekend, which could be the result of more passengers, particularly with shopping, or more infrequent passengers than during the week.

Ticket Types

- Overall conclusions from this analysis will be included in Annex 2

Limitations have been identified and therefore, further work may be required to ensure data quality in later phases. The limitations are as follows:

- It was noted after the completion of the data collection that a figure for the alighting time (from when the first passenger alights to when the last passenger alights) was essential for monitoring the impact in phase 4 (when passengers must use their card when they alight). This has resulted in additional data collection using 3 surveyors at each bus stop which will be reported in Annex 1. This methodology will be repeated in all other phases.
- At present ticket type information, which will enable the calculation of the average Boarding Time for passengers using a smartcard, is unavailable. If this is the case then this will be a limitation to quality of the methodology and the data collected. If this data does become available, the analysis of the ticket types will be appended in Annex 2.

4.2 Objectives

This study has met the objectives of the stakeholders involved in the Yorcard project. In particular, a number of existing performance measures have been taken prior to the introduction of smartcard ticketing. It is important that the measurements and information contained within this report are carefully monitored in future phases to establish if there are any key components driving any changes to Boarding Time, Dwell Time or any component thereof. In addition, this report has provided some guidance as what measurements can be used within business case models.

It is also important that this report is not taken in isolation and that the data from other research tasks are used to help support these findings wherever possible. This process will begin with the end of phase report for phase 1.

This study has set out to meet the objectives of the stakeholders involved in the Yorcard project. In particular, this report documents the existing performance measures which have been taken prior to the introduction of smartcard ticketing. It is important that the measurements and information captured and reported by this study are carefully monitored in future phases to establish if there are key components driving any changes to the overall Bus Stop Dwell Time.

In terms of meeting the objectives of this study it can be seen that this has been achieved as the analysis has identified and baselined the key measurements for comparison throughout this research project. The methodology developed has been demonstrated as robust, as it was developed based upon informing the following business case models identified in the Yorcard Pilot Acceptance Criteria, and is it recommended that it is used as a basis for repetition of measurements:

- to measure the payment collection process before and during the on/on and on/off trialling;
- to monitor ticket transaction time reductions throughout all the phases;
- to enable the monitoring of journey time reductions throughout the phases by monitoring the changes in Dwell Time at bus stops; and
- to obtain results that will feed into the business case.

There are also elements of the Pilot Acceptance Criteria which will be introduced through the later phases as they relate directly to smartcards, such as, to monitor the effects on journey times. These elements will be elicited through direct comparison and repetition of the analysis in this report in phases 2, 3 and 4. It is also important that this report is not taken in isolation and that the data from other research tasks are used to help support these findings wherever possible.

The effects that smartcard technology could have in the future have been identified in this report and should be monitored throughout the later phases. The elements that have been identified could certainly have an effect on the following Yorcard objectives:

- Reducing the barriers to the use of public transport
- Reducing delays and improving reliability
- Informing the business case

This reporting process also informs the following DfT objectives and will be elaborated during the reporting process for phases 2, 3 and 4:

- Analysing the bus boarding times (b(1))
- An assessment of the Operator and PTE expectations (c)

The third DfT objective; to understand the value of new innovative ticketing products (d) will form part of the evaluation in future phases.

These Yorcard and DfT objectives are studied in more detail below in light of the results from this study.

Reducing Barriers to the Use of Public Transport

There could be a number of ways that the new technology could have an impact upon the barriers to using public transport. In terms of this study, it is important to analyse the current Bus Stop Dwell Time and its component times in order to monitor how smartcard ticketing has could impact upon Bus Journey Times. If the overall impact is a reduction in Dwell Time as a result of, for example, reduced boarding times, this could have a positive impact upon the variability of times spent at a bus stop and therefore the overall journey time. This in turn could impact upon the overall customer experience, particularly if they also feel the new technology is easier to use (see Consumer Survey Report) and may reduce their perceived barriers to travel. Part of this may include a reduction in the driver-passenger interaction time as a result of smartcard technology, which could potentially be seen as a benefit to both parties in terms of barriers to travelling by public transport. The results for this objective could also potentially inform the DfT strategic objective to improve the accessibility of public transport.

Reducing Delays and Improving Reliability

This objective relates closely to the main DfT strategic objective to improve the punctuality and reliability of public transport. As with the previous objective, if there are reductions in Bus Stop Dwell Time as a result of the introduction of smartcard ticketing, then this could have a positive impact upon the reduction in delays and improving the overall reliability of journey times.

Advice for the Business Case

Business Case
At this stage the business case for Yorcard is yet to be defined and will become more apparent as the comparisons are carried out between this study and the other phase 1 studies with the other repeat studies carried out in the other phases. However, it is possible to make some predictions about how Yorcard could have an impact on the business case in light of this equipment user study. For example, each of the objectives above could certainly feed into a business case for Yorcard, particularly if there is evidence of time savings and increased customer satisfaction.

Analysing the Bus Boarding Time (DfT b.(1))
The study documented in this report and the process which will be followed during the following phases will feed into the analysis of the Bus Boarding Time as this time, as a factor of Bus Stop Dwell Time, will be monitored through out each of the phases (phases 1-4) and will inform this analysis.

An assessment of the Operator expectations (DfT c.)
The monitoring of the Bus Stop Dwell Time, and its component parts, allows the impact of smartcard ticketing to be assessed and observed. This will essentially allow the overall impact that Yorcard could have on bus operation to feed into an assessment of the operator expectations.

At this stage, this task has enabled the identification of the measurement to compare throughout the future phases, which is the Average Dwell Time (34.25sec). However, the business case is at its early stages of development and thus, the recommendations for rollout and deployment will be much more obvious as the results for the later phases are analysed. This will enable the identification of which factors Yorcard is likely to be able to influence.

The report explains how other factors can affect the data collected and thus, it is important to also monitor the other measurements which are highlighted as key for comparison through out the subsequent phases and are detailed in the Recommendations section.

Recommendations

To date, the data collection for phase 1 has been completed and the resulting data has been entered into a database and cleaned for obvious coding errors. The analysis presented in this report has provided robust results suggesting that the data collected are reliable. As outlined in the methodology, in order to analyse the effect of alighting passengers on the Boarding Time, three surveyors will be used at each bus stop for all subsequent data collection. The methodology, which has been developed in this phase, is both robust and meets the pilot acceptance criteria.

In order to keep the data collected consistent, it is recommended that this methodology is repeated in phases 2, 3 and 4, thus meeting the Yorcard and DfT objectives that are to develop a robust methodology for use in subsequent phases and to establish the key measurement by which the effect of the introduction of the Yorcard can be assessed.

The remainder of this section will outline the measurements which are recommended for subsequent phases as they will be key for comparing and understanding the effect of smartcards, both in Phase 3 and Phase 4, on boarding and alighting times.

This document will be used as a baseline for future phases and also as a reference for glossary definitions, back ground information, justification for analysis and Yorcard and DfT objectives. This allows the format for the future phase reports to change in order to focus on the any change in measurements obtained in future phases.

Dwell Time per bus
Calculating and comparing Dwell Time throughout each of the phases will help to establish the general factors that affect Dwell Time and determine over the subsequent phases how boarding and alighting passengers effect the time that the bus is at a stop by calculating the average Dwell Time per boarding and alighting passenger. This measurement will feed directly into the business case.

Average B/A Time per boarding and alighting passenger
The average B/A Time per boarding and alighting passenger enables the effect of the total number of passengers to be analysed in order to establish if there has been an overall effect on this time which is useful for comparison.

Average B/A Time per alighting passenger
This must be calculated out when no passengers are boarding as the analysis in section 3.2 has shown that the B/A Time per alighting passenger was largely influenced by the number of boarding passengers, and it shows that overall the time is less variable as the standard deviation is lower. This calculation is particularly important for establishing the effect that alighting passengers have on the overall B/A Time and comparing it in each of the phases, particularly Phase 4 when exit reading is introduced.

Boarding Time (1) per boarding passenger
This is the only way to analyse the average Boarding Time when one passenger boards, which will be important for comparison throughout.

Boarding Time (2) per boarding passenger
This provides analysis of the Boarding Time for 2 or more passengers, which will be essential for analysing how the Boarding Time is affected by the use of smartcards throughout each phase.

Alighting Time (1) per boarding passenger (see Annex 1)
This is the only way to analyse the average alighting time when one passenger alights, which will be important for comparison throughout.

Alighting Time (2) per boarding passenger (see Annex 1)
This provides analysis of the alighting time for 2 or more passengers, which will be essential for analysing how the Alighting Time is affected by the use of smartcards, particularly in phase 4.

Operational Factors
It will be important to monitor the operational factors and the ticketing environment through out all the phases as they could have a big impact on the Boarding Time.

Appendix 1

List of Bus stops used in Survey
The following bus stop locations have been alphabetised and the stop number location identifiers (which are referred to in the text, see section 3.3) have been removed for reasons of commercial confidentiality.

Bus Stop Numbers and Locations	Description of Location	Direction of Travel
Crimicar Lane / Castlewood Road	In the suburbs of Sheffield with a collection of convenience shops nearby	Eastbound
Crookes Road / Lydgate Lane (University)	By the University	Eastbound
Fulwood Road / Notre Dame School	Outside Notre Dame School	Westbound
Fulwood Road / Ranmoore Park Lane	Outside Notre Dame School	Eastbound
Glossop Road / Clarkehouse Road (Hallamshire Hospital) (into city)	Nearby Hallamshire Hospital	Eastbound
Glossop Road / Hallamshire Hospital (into city)	Outside Hallamshire Hospital	Eastbound
Glossop Road / Hallamshire Hospital (out of city)	Outside Hallamshire Hospital	Westbound
Leopold Street / City Hall	City Centre, many shops nearby. Often many people boarding with extra baggage	Eastbound
Northfield Road / Eastfield Road (Northfield Av)	Suburbs, few convenience stores nearby	Eastbound
Parkside Road/Middlewood	Suburbs, a few convenience stores nearby	Eastbound
Salt Box Lane / Main Street	Suburbs no convenience stores nearby	Eastbound
Sheffield City centre, Church Street	City Centre, many shops nearby. Often many people boarding with extra baggage	Westbound
Sheffield Interchange	City Centre Bus station, common driver change over point	Westbound
Sheffield, Flat Street	City Centre, few shops nearby, common point to wait when ahead of schedule	Westbound
West Street / Rockingham Street	City Centre, many shops nearby. Often many people boarding with extra baggage	Westbound
Western Bank Brook / Favelle Road	Outside Sheffield University	Westbound
Western Bank Brook / Sheffield University	Outside Sheffield University and the Children's Hospital	Westbound
Whitham Road / Broomhill	Broomhill area on outskirts of city centre, busy area for shops	Eastbound

Appendix 2

Results and Tables
The following tables relate back to the analysis which is presented in section Results and Discussion. For consistency the tables are numbered chronologically as they are referred to in the text.

Bus Stop Location Identifier	Average Dwell Time	Standard Deviation	Median
1	20.314	12.415	17.57
2	18.281	15.478	13.55
3	18.255	15.256	13.55
4	26.13	24.02	17.3
5	19.42	13.28	15.1
6	26.29	24.12	18.91
7	25.39	25.38	18.05
8	31.17	14.68	37.4
9	25.95	12.19	25.15
10	20.71	20.64	13.99
11	22.34	14.77	19.43
12	92.82	47.55	88.2
13	63.5	76.5	36.4
14	32.77	22.65	24.65
15	192.0	535.0	23.0
16	145.9	105.4	132.3
17	80.5	98.8	26.9
18	56.56	49.77	43.12

Table 3: Dwell Time Statistics per Stop

		Average B/A Time			B/A Time per Alighting Passenger		
Number of Alighting passengers	**No of Observations**	**Average Dwell per Alighting pass**	**Standard Deviation**	**Median**	**Average Dwell per Alighting pass**	**Standard Deviation**	**Median**
0	415	37.62	99.53	20.8	*	*	*
1	194	19.66	23.44	11.56	16.87	22.93	8.38
2	100	31.83	50.16	14.88	14.34	25.01	5.86
3	59	53.2	79.5	19.1	15.48	23.69	4.88
4	54	29.89	46.9	14.32	6.86	11.66	3.27
5	45	34.77	62.61	16.2	4.344	5.426	2.608
6	29	39.28	47.27	16.6	6.08	7.85	2.43
7	23	33.2	52.9	19.9	4.33	7.36	2.46
8	25	37.9	55.8	19	4.46	6.96	2.01
9	25	32.9	21.97	24.3	3.399	2.442	2.281
10	17	47.4	52.5	26.3	4.47	5.21	2.57
11	10	30.81	12.16	25.81	2.639	1.105	2.18
12	8	61.4	88.5	29.4	4.92	7.3	2.36
13	7	25.16	5.47	25.9	1.77	0.36	1.708
14	9	41.57	17.17	45.61	2.853	1.408	2.996
15	6	49.03	17.21	46.67	3.137	1.148	2.962
16	2	34.625	0.87	34.625	1.985	0.228	1.985
17	2	28.365	0.516	28.365	1.5212	0.074	1.5212
18	3	29.77	9.97	24.14	1.56	0.497	1.295
19	4	31.77	5.43	33.85	1.608	0.291	1.74
20	1	42.83	*	42.83	2.061	*	2.061
21	4	37.54	14.91	31.7	1.72	0.73	1.45
22	2	44.18	4.36	44.18	1.8693	0.1353	1.87
23	1	34.7	*	34.7	1.4343	*	1.43
24	1	34.68	*	34.68	1.3283	*	1.33
25	1	70.61	*	70.61	2.5924	*	2.59
27	1	43.46	*	43.46	1.5207	*	1.52
38	1	68.02	*	68.02	1.7687	*	1.77
38	1	68.02	*	68.02	1.7687	*	1.77

Table 5: Average B/A Time and B/A Time per Alighting passenger

		Average B(2) Time			B(2) Time per Boarding Passenger		
Number of Boarding passengers	No of Observa-tions	Average B(2) (sec)	Standard Deviation	Median	Average B(2) per Boarding Passenger (sec)	Standard Deviation	Median
2	185	5.523	11.796	2.8	2.762	5.898	1.4
3	107	12.84	23.87	6.84	4.279	7.957	2.28
4	57	15.02	11.68	13.22	3.755	2.92	3.305
5	39	24.91	26.62	14.3	4.981	5.324	2.86
6	21	28.88	21.06	24	4.813	3.509	4
7	22	30.25	18.12	29	4.321	2.588	4.143
8	7	34.6	27	25.2	4.32	3.38	3.15
9	13	50.3	28.03	39.86	5.588	3.115	4.429
10	8	64.9	50.5	55.5	6.49	5.05	5.55
11	4	46.88	11.95	46.25	4.261	1.086	4.205
12	6	48.31	8.31	45.08	4.026	0.692	3.756
13	6	65.09	24.22	61.75	5.007	1.863	4.75
14	3	28.92	11.02	35.17	2.066	0.787	2.512
15	6	75.84	17.36	77.98	5.056	1.157	5.199
16	2	59.9	15.1	59.9	3.741	0.942	3.741
17	2	82.2	29.7	82.2	4.83	1.75	4.83
18	1	125.4	*	125.4	6.97	*	6.97
19	4	79.2	46.3	76.8	4.17	2.44	4.04
20	1	62.1	*	62.1	3.11	*	3.11
21	1	160.36	*	160.36	7.64	*	7.64
23	3	132.5	67.2	152.2	5.76	2.92	6.62
24	1	77.2	*	77.2	3.22	*	3.22
26	1	68.65	*	68.65	2.64	*	2.64
31	1	145.77	*	145.77	4.70	*	4.70
32	1	79.33	*	79.33	2.48	*	2.48
35	1	105.33	*	105.33	3.01	*	3.01
36	1	16.51	*	16.51	0.46	*	0.49
43	1	94.93	*	94.93	2.28	*	2.21
44	1	206.52	*	206.52	4.69	*	4.69
70	1	103.76	*	103.76	1.48	*	1.48
89	1	568.6	*	568.6	6.39	*	6.39

Table 9: Average B(2) Time and B(2) Time per Boarding passenger

		Average B(2) Time no Alighters			B(2) Time per Boarding Passenger no Alighters		
Number of Boarding passengers	**No of Observations**	**Average Dwell per Boarding passenger**	**Standard Deviation**	**Median**	**Average Dwell per Boarding Passenger**	**Standard Deviation**	**Median**
2	101	4.658	8.718	2.4	2.329	4.359	1.2
3	59	10.35	19.81	6.59	3.452	6.604	2.197
4	30	12.09	6.3	10.77	3.022	1.576	2.692
5	17	17.8	10.54	14.09	3.56	2.107	2.818
6	16	29.92	22.57	24.43	4.987	3.762	4.072
7	15	31.26	20.53	29.4	4.466	2.933	4.2
8	4	40.9	36.3	25.1	5.12	4.54	3.14
9	7	42.24	17.99	34.16	4.694	1.999	3.796
10	2	64.7	45.5	64.7	6.47	4.55	6.47
11	3	51.07	10.42	52.5	4.642	0.948	4.773
12	2	52.66	12.54	52.66	4.388	1.045	4.388
13	3	63.57	3.42	63.1	4.89	0.263	4.854
14	1	35.4	*	35.4	2.5286	*	2.5286
15	3	62.17	10.05	56.62	4.145	0.67	3.775
16	1	49.2	*	49.2	3.075	*	3.075
17	1	61.14	*	61.14	3.5965	*	3.5965
19	3	76.3	56.3	65.6	4.02	2.96	3.45
20	1	62.1	*	62.1	3.105	*	3.105
21	1	160.36	*	160.36	7.6362	*	7.6362
23	2	122.6	91.9	122.6	5.33	4	5.33
24	1	77.2	*	77.2	3.2167	*	3.2167
32	1	79.33	*	79.33	2.4791	*	2.4791
35	1	105.33	*	105.33	3.0094	*	3.0094
36	1	16.51	*	16.51	0.45861	*	0.45861
43	1	94.93	*	94.93	2.2077	*	2.2077
44	1	206.52	*	206.52	4.6936	*	4.6936
70	1	103.76	*	103.76	1.4823	*	1.4823

Table 10: Average B(2) Time and B(2) Time per Boarding passenger with no Alighting passengers

	No Other Factors		Driver Change		Ahead Schedule		Other Operational Factors	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Dwell Time per bus	28.66	68.06	211.83	108.09	180.68	79.47	44.85	32.26
Dwell Time per Boarding and Alighting passenger	7.08	9.98	60.49	53.35	29.41	36.83	14.55	15.57
B/A per bus	23.78	34.95	190.12	90.74	175.75	78.19	41.04	33.25
B/A per Boarding and Alighting passenger	5.76	9.22	56.88	53.81	28.42	35.58	13.03	14.26
B(1)	10.47	23.82	202.22	*	106.48	54.58	8.2	*
B(1) no alighters	9.51	19.21	202.22	*	*	*	*	*
B(2)	19.79	37.63	17.47	23.30	82.7	67.87	12.74	17.91
B(2) no alighters	2.91	2.37	2.36	1.70	18.14	28.92	0.46	*

Table 11: Statistics to demonstrate the affects of scheduling on times (see Glossary for definitions of terms)

	No Other Factors		Passenger with Buggy		Disabled Passenger		Elderly Passenger		Other Passenger Factors	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Dwell Time per bus	28.66	68.06	48.62	28.64	47.92	25.60	39.35	19.55	50.33	22.61
Dwell Time per Boarding and Alighting passenger	7.08	9.98	10.46	9.81	10.03	10.69	13.7	7.61	29.20	28.96
B/A per bus	23.78	34.95	45.02	28.35	45.7	25.96	36.95	19.95	45.78	20.87
B/A per Boarding and Alighting passenger	5.76	9.22	9.33	8.83	9.29	9.82	12.47	6.27	27.45	28.38
B(1)	10.47	23.82	13.11	9.77	20.6	*	4.67	*	45.20	37.48
B(1) no alighters	9.51	19.21	19.5	5.96	20.6	*	*	*	45.20	37.48
B(2)	19.79	37.63	32.93	33.04	20.98	32.00	8.86	6.77	12.73	13.57
B(2) per passenger (no alighters)	2.91	2.37	7.46	10.17	9.85	*	2.13	0.18	1.88	0.97

Table 12: Statistics to demonstrate the affects of certain passengers on times (see Glossary for definitions of terms)

Annex Alighting Times

1 Introduction

1.1 Background

It was identified after the completion of the Phase 1 boarding time survey that a figure for the alighting time (from when the first passenger alights to when the last passenger alights) was essential for monitoring the impact of smartcard use. This is particularly important in Phase 4 when passengers must use their card when they alight. This resulted in an additional boarding time survey using 3 surveyors at each bus stop to collect the data relating to both the alighting passengers and the boarding passengers.

1.2 Objectives

The objectives of the alighting time study are to:

- conduct a robust analysis of the alighting times;
- identify the relationships between the boarding times and the alighting times;
- provide a baseline to monitor changes in the alighting times; and
- inform business cases. And therefore form part of the DfT and Yorcard objectives as defined in the full report.

2 Methodology

It is hypothesised that the time taken for the first passenger to board (when there were no alighting passengers) could give a good estimate of the time between doors opening and the first passenger alighting (when there were no boarding passengers). This is referred to as Start Leg (SL). Similarly, the time between the last passenger boarding (when there were no alighting passengers) and the doors closing could give a good estimate of the time between the last alighting passenger (when no boarding passengers) and the doors closing. This is referred to as End Leg (EL). See Appendix 1 for the detailed illustration.

In order to justify the estimates, three tests were carried out using the data collected from both surveys. A 2-sample t-test was adopted based on the following assumptions:

- the data in each sample follow a normal distribution;
- the variances for each sample are equal; and
- the samples are independent, i.e. who is in the second sample does not depend on who is in the first sample.

3 The Results

Table 1 shows the descriptive statistics of the alighting time data collected from the 2nd boarding time survey in Phase 1. This table provides the data that are missing from the Summary Table of Statistics in the Executive Summary of the main report (p8) and the Table 1 in section 3.1.1 of the main report (p15).

Measurement Description		Mean Time (sec)	Standard Deviation	Mean Time (No Other Factors) (sec)	Standard Deviation (No Other Factor)
Alighting time (1) (when only 1 passenger alights)	Per bus	11.36	10.3	9.34	6.32
	Per alighting passenger (no boarding passengers)	8.97	4.55	7.57	1.83
Alighting time (2)	Per bus	20.32	12.05	18.95	10.76
	Per alighting passenger (no boarding passengers)	2.65	1.90	2.44	0.76

Table 1: Descriptive statistics of the 2nd Boarding Time Survey in Phase 1(Definitions of all terms in this table can be found in the Glossary).

3.1 Test 1 – Boarding/Alighting Time (B/A)

The first test aimed to examine the null hypothesis that the boarding/alighting time of survey 1 (B/A_1) does not differ from the boarding/alighting time of survey 2 (B/A_2) when there were no boarding passengers.

The distributions of the data from 2 samples which were used for B/A test are shown in Figures 1 and 2 in the Appendix 2 with an aim to distinguish the outliers. Data marked with Other Factors and three outliers (red circled in Figures 1 and 2) were removed from the 2 samples.

The statistical results of the 2-sample t-test indicate that there is no significant difference between the boarding/alighting time of survey 1 (when there were no boarding passengers) and the boarding/alighting time of survey 2 (when there were no boarding passengers) at a 5% level (p=0.07, see Table 2), which suggests that the two samples come from the same population.

2-sample t-test	N	Mean	Std. Deviation	P
B/A_1	261	2.80	1.79	0.07
B/A_2	110	3.18	2.06	

Table 2: The statistics results of the Boarding/Alighting time test

3.2 Test 2 – Start Leg (SL)

The second test aims to examine the null hypothesis that the time from the doors opening to the first passenger boarding in survey 1 (SL_1) (when there is no alighting passenger) does not differ from the time from the doors opening to the first passenger alighting in survey 2 (SL_2) (when there is no boarding passenger).

The distributions of the data from 2 samples which were for the SL test are shown in Figures 3 and 4 in the Appendix 2 with an aim to distinguish the outliers. Data marked with Other Factors and three outliers were removed from the 2 samples.

The statistical results of the 2-sample t-test indicate that there is no significant difference between the time from the doors opening to the first passenger boarding in survey 1 (SL_1) (when there is no alighting passenger) and the time from the doors opening to the first passenger alighting in survey 2 (SL_2) (when there is no boarding passenger) at a 5% level (p=0.29, see Table 3). Therefore, it can be said that the time taken for the first passenger to board when there is no alighting passenger can give a good estimate of the time taken for the first passenger to alight when there is no boarding passenger.

2-sample t-test	N	Mean	Std. Deviation	P
SL_1	376	2.12	1.68	0.29
SL_2	111	1.94	0.96	

Table 3: The statistical results of the Start Leg test

3.3 Test 3 – End Leg (EL)

The third test aims to examine the null hypothesis that the time from the last passenger boarding to the doors closing in survey 1 (EL_1) (when there was no alighting passenger) does not differ from the time from the last passenger alighting to the doors closing in survey 2 (EL_2) (when there was no boarding passenger).

The distributions of the data from 2 samples which were used for EL test are shown in Figures 5 and 6 in the Appendix 2 with an aim to distinguish the outliers. Data marked with Other Factors and 2 outliers were removed from the 1st sample.

The statistical results of the 2-sample t-test indicate that there is a significant difference between the time from the last passenger boarding to the doors closing in survey 1 (EL_1) (when there was no alighting passenger) and the time from the last passenger alighting to the doors closing in survey 2 (EL_2) (when there was no boarding passenger) at a 5% level (p=0.001, see Table 3). We are 95% confident that the difference between the two End Leg times is between 0.98sec and 4.44sec. A number of reasons lead to the result that the EL_1 is always longer than the EL_2:

- a passenger boarding needs to buy a ticket or the driver needs to check a pre-paid ticket/pass;
- the bus driver has to wait for people to sit down;
- a large number of passengers to move away from the front area or go upstairs.

4 Summary and Conclusions

2-sampe t-test	N	Mean	Std. Deviation	P	95% confidence interval of the difference% confidence interval of the difference	
					lower	upper
EL_1	250	10.56	8.73	0.001	0.98	4.44
EL_2	126	7.84	6.51			

Table 4: The statistical results of the End Leg test

The tests carried out in this study have suggested that:

- the two samples obtained from the two phase 1 surveys came from the same population;
- the time taken for the first passenger to board when there is no alighting passenger can give a good estimate of the time taken for the first passenger to alight when there is no boarding passenger; and
- the time taken from the last passenger boarding to the doors closing when there is no alighting passenger is significantly longer than the time taken from the last alighting passenger alighting to the doors closing. We are 95% confident that the difference between the two times is between 0.98sec and 4.44sec. A number of reasons lead to the result that the last passenger boarding to the doors closing always takes longer time than the last alighting passenger:
  - a passenger boarding needs to buy a ticket or the driver needs to check a pre-paid ticket/ pass;
  - the bus driver has to wait for people to sit down; and
  - a large number of passengers to move away from the front area or go upstairs.

4.1 Limitations

The limitation of this study is that the difference between the time taken from the last boarding passenger to the doors closing and the time taken from the last alighting passenger to the doors closing can not be defined precisely but on an interval [0.98, 4.44].

4.2 Objectives

The three tests undertaken in this study have enabled a better understanding of the alighting times and the relationships between the boarding times and the alighting times, and therefore complimented the work undertaken to date in terms of meeting DfT and Yorcard objectives as outlined in the full report. A baseline to monitor changes for alighting times has been established and the statistics have been presented in Table 1. These statistics should form part of future Executive Summaries for the boarding time studies in future phases. At this stage, a business case is yet to be defined and will become obvious in the later phases.

5 Advice for Business Case

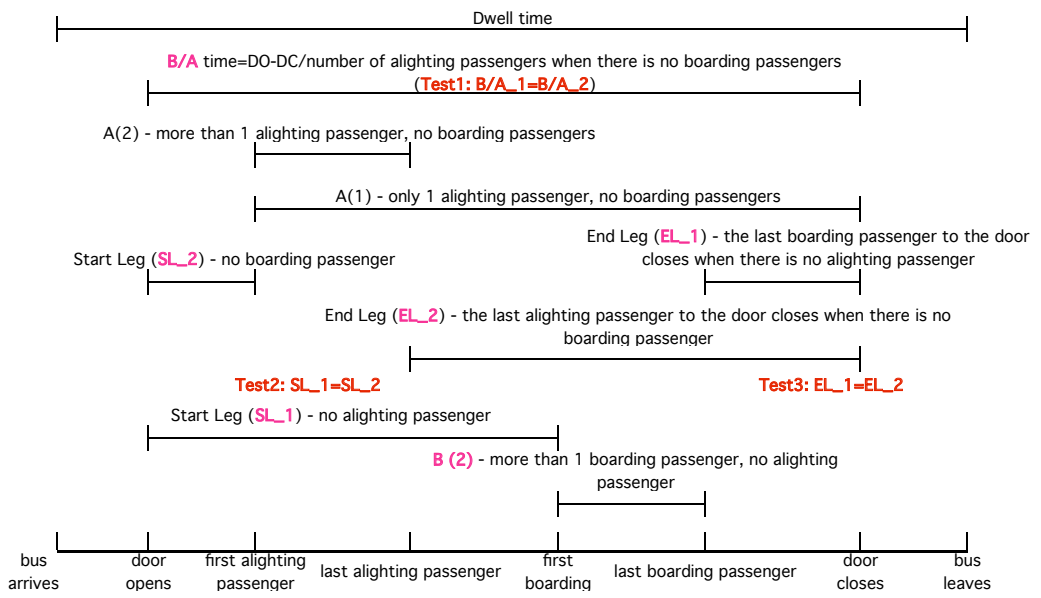
This study has enabled the identification of an additional measurement to the average dwell time to compare throughout the future phases. The results from the later phases will enable a sound understanding of how Yorcard is likely to affect the alighting times, particularly in Phase 4 when the passengers must use their cards when alighting.

6 Recommendations

This study suggests that the changes in the average alighting times at various points from the doors opening to the doors closing are important for comparison throughout and essential for analysing how the alighting time is affected by the use of smartcards. The statistics of these average alighting times, should form part of future Executive Summaries for the boarding time studies in future phases.

Appendix 1

Appendix 1: Yorcard boarding time survey illustration



SURVEYOR 1	Y	Y			Y	Y	Y	Y
SURVEYOR 2	Y	Y	Y	Y			Y	Y
SURVEYOR 3	Y							
1,2	Date	Bus number	Time of the day number					
3	Date	Bus number	Time of the day number	Operator	Vehicle type	No. of boarders No. of alighters	Bus ID no.	Other factors

Appendix 2

Appendix 2:
The list of Figures

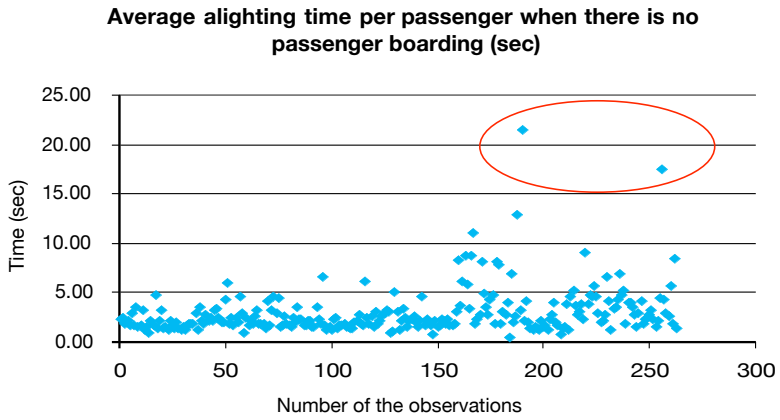


Figure 1: The distribution of B/A_1 when there was no boarding passenger (N=263)

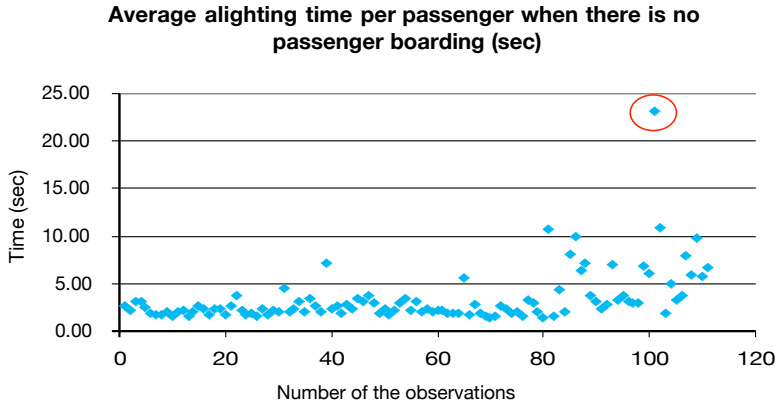


Figure 2: The distribution of B/A_2 when there was no boarding passenger (N=111)

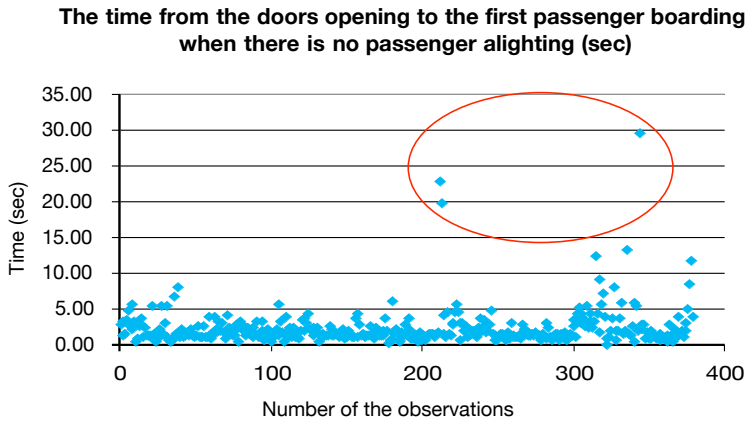


Figure 3: The distribution of SL_1 (N=379)

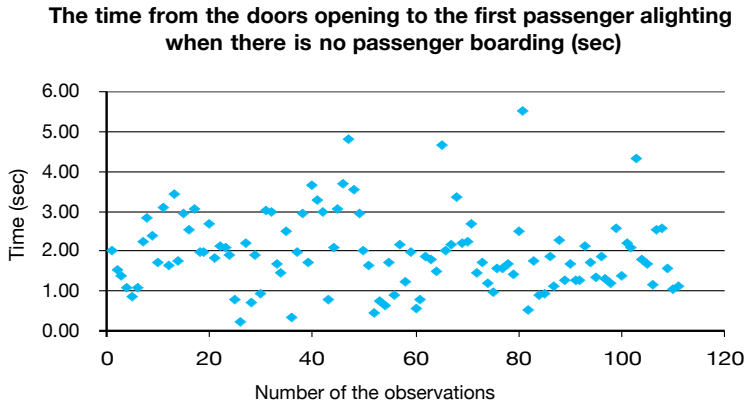


Figure 4: The distribution of SL_2 (N=111)

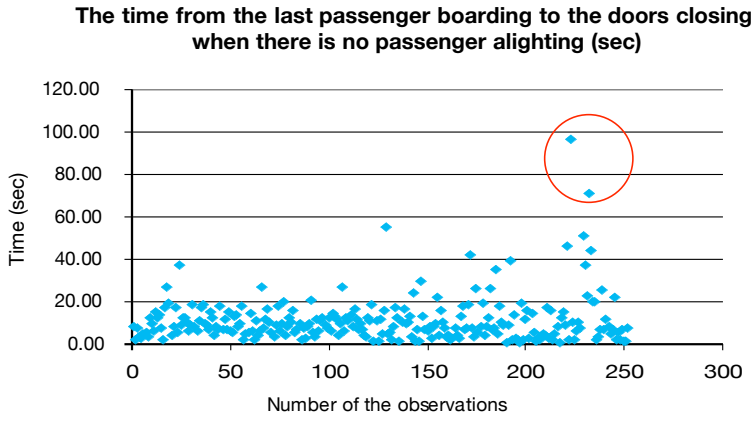


Figure 5: The distribution of EL_1 (N=252)

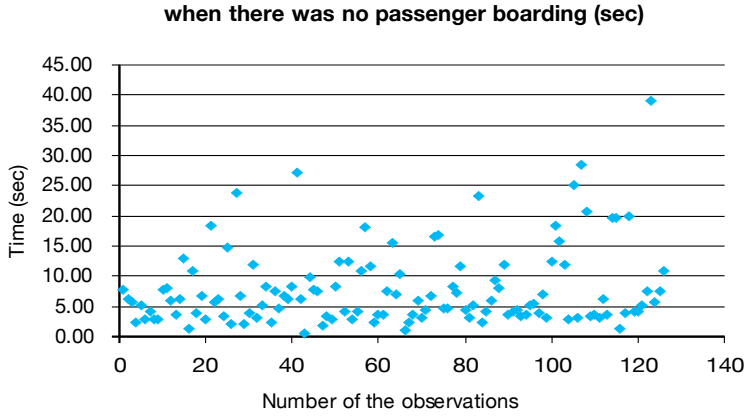


Figure 6: The distribution of EL_2 (N=126)

RES702 Phase 1: Baselining - Equipment User Survey

Contents

1.0 Introduction

2.0 Methodology

3.0 Results & Discussion

This report has been produced by Newcastle University for South Yorkshire Passenger Transport Executive under a contract with the Department for Transport. Any views expressed in this report are not necessarily those of the Department for Transport.

4.0 Summary & Conclusions

5.0 Advice for the Business Case

6.0 Recomendations

Executive Summary

The Yorcard Project is intended to deliver a multi-modal, multi-operator public transport smartcard scheme to be trialled on a certain corridor of buses in Sheffield and on the local train service between Sheffield and Doncaster and intermediate stations.

This report presents the findings from the Phase 1 Baselining Equipment User Survey. The survey was carried out as self-administered questionnaires in Sheffield by the bus drivers from each of the three participating operators and by the staff of the participating Travel Information Centres (TIC). The aim was to create a profile of the drivers and TIC staff who may or may not be affected by Yorcard, and to glean information about their overall opinion of the existing equipment, prior to the installation of smartcard technology. The response rate collected for this phase was fairly low, however, it has enabled a baseline to be created for comparison in later phases.

This report demonstrates that the methodology and the data collected meets the research objectives as this Phase 1 study has enabled: the development of a robust methodology which meets the Pilot Acceptance Criteria and that can be re-used throughout the subsequent phases; and the identification of the baseline measurements with which the subsequent phases can be compared with.

The key finding from this Phase 1 study are presented below:

Bus Driver Survey:

- Each of the pilot routes were driven on by nearly half of the participants.
- All of the tasks questioned in the survey were found to be between fairly easy and very easy, and fairly quick to very quick.
- The most time consuming tasks using the current equipment were related to issuing paper based tickets, for example, replacing or un-jamming the ticket roll and issuing paper tickets with wallets.
- The most difficult task using the current equipment was also un-jamming the ticket roll. The other tasks which had the lowest rank for ease were regarding the use of the machine, for example, scrolling menus or selecting tickets and memorising what the buttons do.
- The majority of drivers felt that it was easy to keep to their timetable and the most common cause of ticket related delays were thought to be customers not having their fare ready.
- The greatest risk to safety and security was thought to be carrying cash on the bus and the greatest impact to improve safety and security was thought to be less cash-handling.
- Many of the drivers stated that they experienced fraud 0-2 times a day. A small number stated that they experienced it more than 7 times a day. The most common type of fraud experienced was said to be passengers trying to use out of date tickets.

Travel Information Centre Survey:

- The number of participants is very low for this survey. However, the TIC process is a significant part of the Yorcard pilot as customers will buy their Yorcard products or have smartcards issued from the TIC. Monitoring the opinions of the staff is important throughout the pilot and, therefore, it is recommended that the lack of participation is assessed by Yorcard.
- Mostly staff sell the pass or ticket that the customers ask for. Smartcard introduction may affect this process as staff may have to spend longer with customers explaining the new technology and ticket products. This could have a positive impact upon customer service and ensuring that customers purchase the ticket which most suits their travel needs.
- Using the current technology, logging onto the system and entering data into the system is seen to be neither time consuming nor quick.
- The staff felt that offering a refund or exchange is slightly more time consuming than taking payment.

At this stage there are certain aspects of smartcard technology that could have an impact upon the equipment users. These are the issuing of tickets off the bus and the validation of tickets and collection of payment by the technology. They could have an impact upon the driver tasks during the boarding process, passenger related delays, safety and security, and fraud. These aspects will be monitored throughout the pilot.

For this phase, the business case is at its early stages of development and thus, the recommendations for rollout and deployment will be much more obvious as the results for the later phases are analysed. At this stage, the measurements for inclusion in the business case and for comparison though out the pilot will be to monitor and compare the equipment users' opinion of each of the keys tasks which the introduction of the smartcard could have an impact upon.

Introduction

1.1 Background

The Yorcard Project is intended to deliver a multi-modal, multi-operator public transport smartcard scheme to be trialled in part of the South Yorkshire area during 2008. The details of the scheme can be found in the General Reference Document.

This Yorcard Phase 1 Equipment User Survey Report sets down the outputs forming part of a research contract between the South Yorkshire Passenger Transport Executive (SYPTE) and the Department for Transport (DfT) Transport Technology and Standards Division. An overview of the contract can be found in the General Reference Document. This report forms the first of the Equipment User Survey Studies and aims to provide and document the baseline measurements, prior to the installation of Yorcard equipment, of the equipment users' opinions. The subsequent phases will be compared and contrasted to this baseline.

The purpose of this report is therefore to provide the results from the Phase 1 Equipment User Survey Study. Self-administered questionnaires were carried out by two types of equipment users affected by the introduction of smartcards. These users are bus drivers and Travel Information Centre (TIC) staff. This report will provide full details of the survey work which has been carried out; namely, the methodology, results and in depth analysis of equipment user opinion, and conclusions drawn from the key findings. The Equipment User Survey is considered to form a key part of Yorcard Business Case and the development of the Yorcard scheme, and other similar schemes in terms of ticket products offered.

1.2 Meeting DfT Objectives

The DfT have stipulated the following objectives as part of the contract:

a. All elements of the pilot scheme shall be fully compliant to the prevailing ITSO documentation.
b. Conduct a robust analysis of (1) bus boarding times, (2) Systems performance and (3) passenger reaction to address the concerns of all key stakeholders involved in the rollout of smartcard technologies within a deregulated transport industry. This should provide a comparison of existing performance measures prior to the introduction of smartcards to the pilot area.
c. The research shall assess the Customer Experience and the Operator and PTE expectations and provide recommendations for rollout. Included within this analysis shall be a study of the business case for deployment of similar regional schemes.
d. To understand the value of new innovative ticketing products to the key stakeholders
e. To understand the value of using Citizen cards as an alternative to transport only smartcards.
f. To ensure that all deliverables are clear, concise, accurate, thorough, of a high technical quality and well written.
g. The research shall complement the Yorcard pilot timetable.

This report must therefore evaluate how the relevant objectives will be met, particularly objectives b, c and d, listed above, as these specifically relate to the results presented in this report. These DfT objectives will be looked at in turn in section 4 to discuss how this study could achieve them. Reference will be made to how this study can help meet the DfT strategy to deliver improvements to the accessibility, punctuality and reliability of local and regional transport systems by implementing a smartcard based ticketing system. Objectives (f) and (g) are common to all deliverables, and (a) and (e) are not relevant to this study, so will not be discussed in this report.

1.3 Meeting Yorcard Objectives

It is also important to consider the objectives of Yorcard and its stakeholders. For the purpose of this report, the four relevant Yorcard pilot objectives will also be evaluated as they are noticeably different to those stipulated by DfT (please refer to the General Reference Document for the full list): reducing barriers to the use of public transport; reducing delays and improving reliability; reducing fraud; and informing business cases.

Section 4 will elaborate on these objectives in light of the results found in this study but at this stage it is useful to examine how this study could affect each of the objectives:

Reducing Barriers to the Use of Public Transport
There could be a number of ways that the new technology could have an impact upon the barriers to using public transport. In terms of this study, it is important to understand and document the reaction of the equipment users as they are the people who will have the first contact with customers using Yorcard. If the equipment users find the equipment easy to use then this is likely to have a positive impact upon how they deal with customers and thus, the overall experience could be better for the customer and may reduce their perceived barriers to travel.

Reducing Delays and Improving Reliability
Equally, if the new technology is easier and quicker to operate, then this could have a positive impact upon the reduction in delays and improve the overall reliability both on and off the bus. Additionally, if the technology is easier for the passenger to use this could also reduce delays and improve reliability.

Reducing Fraud of all types
There are two main types of fraud which need to be considered; passenger and driver. In terms of passenger fraud, smartcards could be more difficult to replicate or use in other fraudulent ways as the card communicates directly with the ETM. Also, any reduction in the amount of cash carried on bus could reduce the likelihood of driver fraud.

Inform Business Cases
At this stage the business case for Yorcard is yet to be defined and will become more apparent as the comparisons are carried out between this and the other Phase 1 studies, and with the repeat studies carried out in the later phases. However, it is possible to make some predictions about how Yorcard could have an impact on the business case in light of this equipment user study. For example, each of the objectives above could certainly feed into a business case for Yorcard, particularly if there is evidence of time savings, a positive impact upon the objectives above.

Methodology

2.1 Focus Groups

This section provides details on the methodology used to obtain opinion of existing equipment from both the bus driver and TIC perspectives. Both types of equipment users were treated in the same way, for example, focus groups were carried out to test the draft questionnaire and to feed into the design of the final questionnaire, and self-administered questionnaires were sent out to the relevant departments in order to be distributed. For the TIC, the questionnaire was emailed to the TIC staff individually. Only the content of the questionnaires differ to reflect the different types of equipment used and the different business processes in the two environments. The process for this will be described in the rest of this section.

A draft questionnaire for both types of equipment users was created and designed to focus on the Pilot Acceptance Criteria and achieve the research objectives. This was piloted through the use of focus groups which enabled the draft questionnaire, plus additional quantitative questions to be tested. Thus the product of the focus groups was a robust questionnaire that could obtain sufficiently high quality data to be analysed and used in the relevant reports. The focus groups were used to formulate the wording of the questionnaires to ensure that the questions were not ambiguous or irrelevant. They also provided the ability to identify other key questions which may have been overlooked. This was achieved through discussion as the focus group facilitator was given a script which asked certain probing questions about the operation of the technology and general related activities. Thus, this identified the salient aspects of the equipment users' daily routine which could impact upon the business case for Yorcard, which were included in the questionnaire.

It was proposed that three focus groups for bus drivers were used and divided into operator groups to avoid any issues associated with commercial sensitivities. Candidates for the focus group work were canvassed at two of the three pilot bus depots at Holbrook (Stagecoach), Olive Grove (First), and at the Transport Interchange in Sheffield for the TICs. At the time of this preparation MASS drivers were unavailable due to the summer holidays and the limited time before the questionnaires had to be distributed. Focus groups will be held with all three operators in subsequent Phases.

There was not a mix of male and female bus drivers, which is fairly representative of the male to female ratio of bus drivers, but there was a mix for the TIC focus group. There was a mix of different driver and TIC employment profiles where possible, such as varying levels of experience.

2.1.1 Bus Driver Focus Group

Generally, the driver focus groups confirmed that the draft questionnaire touched on the necessary points raised in the Pilot Acceptance Criteria. However, the area which was partially overlooked at the drafting stage was the issue of safety and security. During the discussions in the focus groups this was certainly an area that was of concern for the drivers, for example, a number of the drivers stated that they felt threatened at some point every day, and thus more emphasis was made on this in the questionnaire. Another area which was highlighted as an issue during the discussion was fraud. The drivers stated that they experience fraud everyday with some stating that they experienced it at "every other stop". It was raised that out of date tickets and copied or fake tickets were the main type of fraud experienced. It was raised in both focus groups that they felt there are too many different passes and tickets available, making it difficult sometimes to tell the real and fake passes apart. These responses fed directly into the questionnaire design (see Fraud in Other Factors, Section 3.1.4).

2.1.2 Travel Information Centre Focus Group

There are three central TIC sites (17 staff) which will be affected by the introduction of smartcards and staff from these sites took part in the focus group. Again, the focus group mainly identified and confirmed the appropriate focus of the questionnaire. There were no particular areas which had been overlooked, however, it was highlighted that the tasks were not necessarily difficult as the staff were accustomed to the processes. They were considered more time consuming and this was then used in the questionnaire so as to monitor the time consumption of tasks using the old and new equipment.

This focus group also identified that the future focus group could be useful for feeding into the results of this study, the studies carried out in later phases, and essentially the business case as the activities carried out at the TIC are less time dependent than those carried out on the bus; therefore, it is harder to quantify the benefits or disbenefits of Yorcard on the TIC process. The result of the introduction of Yorcard at the TICs is likely to be an impact upon customer experiences and their perceived barriers to travelling by public transport and this qualitative element will be important to capture in the focus group discussions with both customers and the TIC staff in later phases.

2.2 Design for the Self-Administered Questionnaire – Bus Drivers

The self-administered questionnaire was tailored to suit each operator, but retained the same questions and questionnaire structure. This was important as, for example, the instructions for returning the questionnaire were different for all operators and only the most relevant routes could be stated as answers, but it allowed responses to be consistent between operators.

The questionnaire first asked generic questions about the individual e.g. age, gender, address (or postcode), in order to gain a personal profile of those interviewed.

The second section looked at the interviewees employment habits and enquired about the ticket machines used, usual shift patterns (e.g. part time, full time, does regular overtime), type of service provided (e.g. schools, same route, route varies daily) in order to obtain an employment profile of each driver by which to compare and contrast the responses to section 3 in the questionnaire.

Questions in the third section related directly to the Pilot Acceptance Criteria, and explored specific areas such as; the ease of use of the existing equipment, and driver perceptions of delays, safety and security, and fraud. This section will enable the comparison of tasks before and after the implementation of smartcard technology.

2.3 Design for the Self-Administered Questionnaire – TIC

The self-administered questionnaire firstly asked generic questions about the individual e.g. age, gender, address (or postcode) etc. in order to gain a personal profile of those surveyed.

The second section looked at the interviewees' employment habits and usual shift patterns (e.g. part time, full time, does regular overtime) in order to obtain an employment profile of each staff member by which to compare and contrast the responses to section 3 in the questionnaire.

Questions in the third section relate directly to the Pilot Acceptance Criteria to explore specific areas such as ease of logging into the system and ways the process could be made simpler, problems associated with data capture, ease of cutting and pasting photographs for concessionary permits, and ease of inputting data using a PC. This section will enable the comparison of tasks before and after the implementation of smartcard technology.

Results & Discussion

Introduction
The Equipment User Surveys for Phase 1 took place at various times that were convenient for each operator and the TIC, and were distributed as detailed in section 2. An incentive of £50 per bus operator was available by means of a prize draw to facilitate a high response rate. Newcastle University conducted the prize draw for each operator once their questionnaires were received. An incentive was not used for the TIC questionnaire.

All questionnaires were returned by collection from depots. All questionnaires were sealed and sent directly to Newcastle University to enable data to be treated confidentially. The data were entered into a database and cleaned for data coding errors and inconsistencies. The total number of questionnaires returned was 105 and 6 for drivers and TIC respectively, however, only the useable responses for each of the questions were used to formulate the statistics that are presented in this report (i.e. no answers which were partially complete were included). Data have been analysed in this report using SPSS and Minitab, which enabled the cross evaluation of responses.

This document will report the findings of the key questions relating to the equipment used prior to the installation of the smartcard technology. The questions will be assessed for significant differences according to the following variables: age; experience; and employment profile (e.g. part or full-time, route driven, etc.). This will be reported where appropriate. Further in depth analysis will be carried out to determine the meaning behind certain responses and to establish where error may have crept in due to misunderstanding, question formation, or otherwise.

A set of limitations and lessons learned will be provided in order to inform the later phases of this research and elicit the best possible data. For ease of reporting and reading, the results will be separated into two subgroups: Driver questionnaire; and TIC questionnaire.

3.1 Driver Questionnaire

3.1.1 Reporting

The driver questionnaire is structured in the following order :

Section 1 – questions regarding the users' personal attributes
Section 2 – questions regarding the driver's employment profile
Section 3 – questions regarding the driver's shift patterns
Section 4 – questions designed to elicit opinions of ETM
Section 5 – questions designed to elicit opinions of Time Keeping
Section 6 – questions designed to elicit opinions of Safety and Security
Section 7 – questions designed to elicit opinions of Fraud

The reporting of the results will be presented in the following sections:

- Sample Profile presenting the profile of the participants; age, sex, etc;
- ETM presenting the opinions of the existing technology;
- Other Factors presenting the resulting answers from sections 5 to 7.

The results presented will take into account the differences in the sample where appropriate and interesting.

3.1.2 Sample Profile

The total number of questionnaires collected was 105, which was a representative selection of responses from each of the operators; however, this can not be displayed due to commercial sensitivities The majority of participants were male, which is fairly representative of the population of bus drivers and the age distribution is displayed in Table 1.

Age	Male	Female	Total n =
18-24	4%	0%	4
25-34	19%	0%	18
35-44	29%	100%	31
45-59	35%	0%	33
60+	13%	0%	12
Total n =	95	3	98

Table 1: percentage distribution of age groups collected (n=98)

Figure 1 presents the employment history of the drivers and it can be seen that a significant proportion of the participants have more than 8 years experience. Also, 87% of the drivers participating in the survey work full time.

How many years experience as a bus do you have in total?

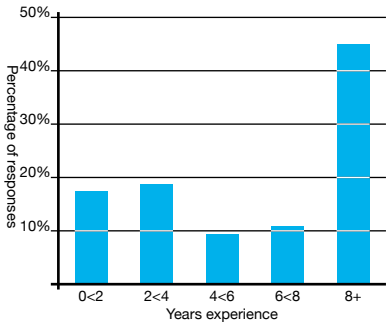


Figure 1: Percentage of years experience (n=105)

The drivers were asked which routes they drive on in order to determine how the responses relate in later phases to those drivers affected by the pilot. It was found that at least 46% of the drivers questioned worked on pilot routes. Given this response it could be assumed that most drivers are likely to drive on a variety of routes which could include the pilot routes.

3.1.3 Electronic Ticket Machine

In section 4 of the questionnaire the drivers were asked questions in order to determine their opinion of the existing equipment prior to the installation of the new smartcard enabled technology. The drivers were asked a series of questions regarding the ease and time consumption of carrying out certain tasks. The tasks that have been chosen in this section were done so as they were highlighted by the focus groups and are also directly related to the Pilot Acceptance Criteria.

For each of the tasks the drivers were asked to rank the level, where 1 is negative and 10 is positive, for ease and time, and this section will analysis these questions and their responses.

The results have been analysed in order to determine the weighted mean. This allows differing levels of responses to be taken into account and gives an average number out of 10 for each task in terms of both ease and time consumption. This is displayed in the graph below (Figure 2) and demonstrates how each of the tasks compares to each other. The tasks which were seen to be the easiest were 'updating the fare stage', 'logging on' and 'issuing paper tickets'. The tasks which were seen to be the quickest to carry out were 'updating the fare stage', 'reading the ETM display' and 'pressing the buttons'.

The task which was seen overall as being the most difficult was 'un-jamming the ticket roll' followed by 'scrolling menus or selecting tickets' and 'memorising what the buttons do'. In terms of time consumption, many of the tasks were seen to be not difficult at all but often the main issue was regarding the time it takes to carry it out. The task which was seen overall as being the most time consuming was again 'un-jamming the ticket roll' followed by 'changing ticket rolls' and 'issuing paper tickets with wallets'.

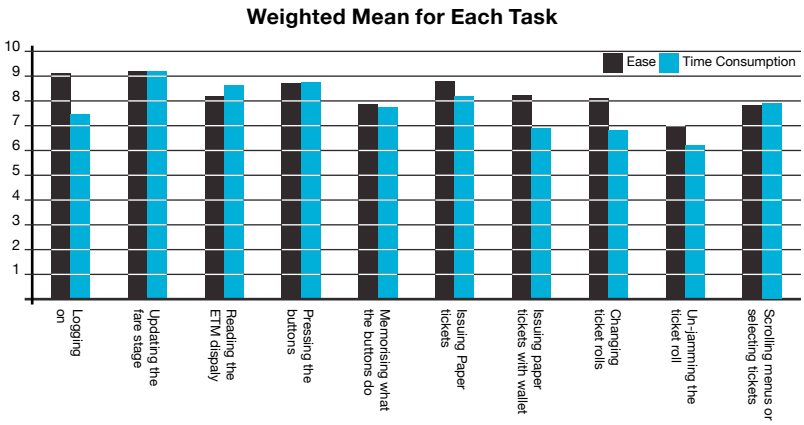


Figure 2: Weighted Mean for Each ETM Task – Displaying Ease and Time Consumption

There are certain tasks which may benefit from a change in the technology, particularly during the boarding process. Mostly the worst ranking tasks are associated with the ticketing process, for example, the worst ranking task for both difficulty and time consumption was 'un-jamming the ticket roll'. Ultimately smartcard ticketing could help reduce the time consumption or frequency of tasks associated with ticketing (such as issuing tickets, replacing or un-jamming the ticket roll) if tickets or receipts are not issued when smart enabled tickets are used. However, if this is phased out in the future or if the new technology is easier to use then there may be an overall positive impact, but at this stage it is uncertain what the impact of the new technology will be.

'Issuing paper tickets with wallets' was also seen as time consuming and is certainly an area that smartcards could offer a solution as the issuing of 'tickets', in this case a smartcard with products loaded onto it, is carried out off the bus and will therefore have a positive impact on this task and the time it takes. In this pilot the extent of the impact noticed for this task will depend ultimately upon the dissemination and marketing of the Yorcard pilot.

It is important to monitor the tasks which may have an impact on both the Yorcard and DfT objectives throughout the phases as any effects should be taken into consideration and may potentially feed into the business case. It is also important to reflect on these findings, and evaluate them in terms of the ticketing environment in general.

3.1.4 Other Factors

This section will present the results from sections 5 to 7 of the questionnaire. Each of these sections was designed to elicit opinions of the factors which the use of smartcards could have an impact on. Namely: Time Keeping; Safety and Security; and Fraud. The drivers were asked a number of questions regarding issues in these areas to determine if smartcards could have an overall positive impact for the drivers through comparison of the responses in subsequent phases.

Time Keeping

The drivers were asked in this section whether they felt it was easy to keep to their timetable of which 73% of the participants said "Yes" they felt that is was easy. The response to this question (Yes or No) is displayed in the table below (Figure 3), which demonstrates the cross tabulation of the results against the most common causes of delays. The response to this question suggests that some of the drivers did not understand the question and as a result stated more than one cause as 'the most common cause', thus the response rate for this question is more than the number of participants.

In both cases, a significant number of the drivers felt that 'customers not having their fare ready' was the most common cause of delays. For the drivers who said "Yes" they felt it was easy to keep to time they also stated that 'customers paying with notes' and being 'unable to read the passenger's pass or ticket' were common causes. In these cases, smartcard technology could offer a solution as smartcards reduce the need to deal with cash and the smartcard reader 'reads' the pass. For the drivers who said "No" they felt that it was difficult to keep to the timetable, they stated that 'customers paying with notes' caused delays. Also 21% of these drivers stated 'other delays' were the main cause. These 'other delays' were mainly traffic related, for example, cars using the bus lane and other general traffic delays. Such other delays are not able to be influenced by Yorcard and therefore are not discussed further in this report.

Safety and Security

In this section the drivers were asked what they felt was the greatest security risk they experienced in their job. The results have been cross tabulated to show the overall response and split by age to determine if age has an impact on the response to the question. Of the risks listed, the drivers felt that 'carrying cash on the bus' was the greatest risk. Table 3 demonstrates that the younger drivers were more likely to feel threatened by 'passenger confrontation over fares' than older drivers and drivers aged 35-59 were more likely to feel threatened by 'carrying cash to the depot'.

Greatest security risk	Frequency					
	18-24	25-34	35-44	45-59	60 & over	**Total**
Carrying cash on the bus	50%	48%	47%	37%	71%	**55**
Carrying cash to the depot	0%	14%	22%	30%	14%	**28**
Carrying cash on a Monday or Tuesday	0%	19%	22%	23%	14%	**26**
Passenger confrontation over fares	50%	19%	8%	9%	0%	**13**
Total	**2**	**21**	**49**	**43**	**7**	**122**

Table 3: Cross tabulation of greatest security risk and age

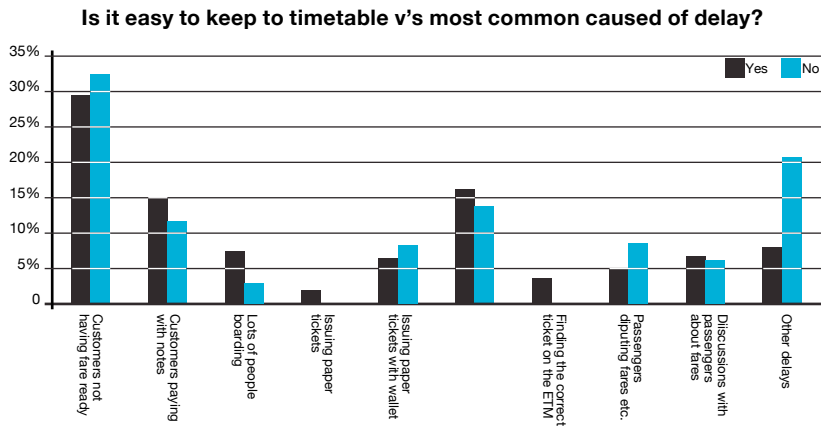


Figure 3: Cross tabulation of 'Is it easy to keep to timetable?' and the most common causes of delay

This section also analysed the remedial actions that introducing smartcard technology could have on safety and security, the opinions of these actions and the effect they could have on the drivers. Again this has been cross tabulated to show the overall response and split by age to determine if age has an impact on the response to the question. This is shown in Table 4. Of the remedial actions listed, overall the drivers felt that 'less cash-handling' would have the greatest impact on safety and security. Table 4 also demonstrates that in particular drivers aged 35-44 felt that not accepting payment from large notes would improve their safety and security. In this case, smartcard technology could certainly help to improve the safety and security for drivers as it could dramatically reduce the overall cash handling, including payment from large notes, as passengers buy their tickets and passes off the bus and the technology on the bus only validates it and/or deducts the necessary payment.

An area which could cause problems is if a card is rejected as invalid and the passenger's reaction to this. At present, few drivers have stated that they feel insecure due to 'passenger confrontation over fares' but this should be monitored throughout the pilot particularly in the younger drivers.

Greatest impact to improve safety and security Frequency	Frequency					
	18-24	25-34	35-44	45-59	60 & over	**Total**
Less cash-handling	50%	71%	44%	59%	56%	**67**
Reliable way to validate a ticket or pass	0%	13%	24%	24%	22%	**26**
Not accepting payment from large notes	50%	17%	32%	16%	22%	**29**
Total	**2**	**24**	**50**	**37**	**9**	**122**

Table 4: Cross tabulation of age and the greatest impact to improve safety

Fraud

Fraud is potentially another manner in which smartcards could provide a business case benefit, because it is more difficult for passengers to use a pass that is expired or create a fake pass or ticket. In this section the drivers were asked how often they experience fraud in a day, to which the largest proportion of drivers said they experience it 0 – 2 times (58%). However, there were still a significant number of drivers who stated then experience it more than 3 times a day, and indeed some drivers (5%) stated they experience it more than 7 times a day. The results for this are displayed below in Figure 4. When the weighted mean is calculated for this the average fraud experienced by drivers is 3-4 times per day.

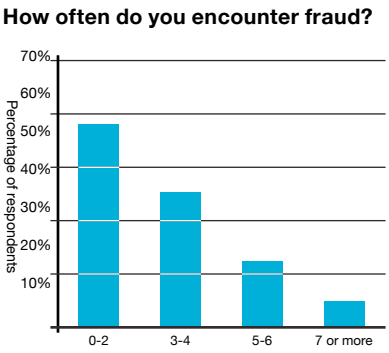


Figure 4: Frequency of Fraud experienced by Drivers

The drivers were also asked what they perceived the most common type of fraud was. The focus groups highlighted that the main types of fraud were out of date tickets and copied or fake passes. In the questionnaire, the majority of drivers said that this was passengers using out of date tickets. The other main cause were passengers over-riding, or riding beyond where they had paid, and passengers rushing past the driver or hiding behind other boarders (see Figure 5). Few drivers felt that copied or fake tickets and passes were a common type of fraud, however, this might be because the cannot tell the difference between the real and fake ones, as was highlighted as a problem in the focus groups.

3.2 Travel Information Centre

Most common fraud

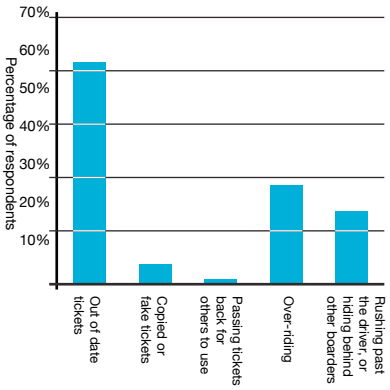


Figure 5: Most common fraud experienced by drivers

Smartcard technology could certainly have an impact on passengers using out of date tickets as the ETM validates each ticket and is likely to be more reliable than the driver at identifying fraudulent tickets. If a ticket is out of date or not valid the driver will be informed immediately and will be able to take remedial action. Smartcards will also be able to prevent passengers over-riding; however, this evidence is not likely to be seen in this pilot until phase 4, the closed system when exit reading technology is to be used. Passengers will have to tap both when boarding and alighting, and the smartcard technology will automatically deduct the amount the passenger owes. Presumably if the passenger does not tap when alighting they will have the default amount deducted which is likely to be more than their journey.

3.2.1 Reporting

The TIC questionnaire is structured in the following order:

Section 1 – questions regarding the participant's employment profile
Section 2 – questions regarding the participant's personal attributes
Section 3 – questions designed to elicit opinions of the ticket sale process
Section 4 – questions designed to elicit opinions of the ticket equipment
Section 5 – questions designed to elicit opinions of the payment process

The reporting of the results will be presented in the following sections:

- Sample Profile presenting the profile of the participants; age, sex, and employment profile;
- Ticket Sale Process;
- Ticket Equipment; and
- Payment Process.

The results presented will take into account the differences in the sample where appropriate and interesting.

3.2.2 Sample Profile

The total number of questionnaires collected was 6 (35% of the staff). There are three TICs which are affected by the pilot and therefore, only a limited number of participants (17) can be targeted to carry out the questionnaire. However, it was anticipated that there would be higher response rate, especially given the importance of the TIC and their integration in the Yorcard process. As a result Yorcard may wish to investigate the cause of the low response and to discuss if the future phases would benefit from either the use of an incentive or face to face interviews. The latter would have a resource implication in terms of time consumption; however, given the low number of potential participants, this is likely to not be a problem.

Despite the limited number of responses, the questionnaire has allowed a certain level of incite into the TIC processes which are a significant part of the pilot delivery and has allowed the baseline measurements to be captured. Customers could buy their Yorcard products from the TIC and, therefore, the processes and opinions of the staff need to be monitored in accordance with the stated methodology.

The participants represent staff with a variety of experience, including less than 2 years and more than 8, and a wide range of ages between 25 and 60 plus. Both clerical staff and supervisory staff were targeted and have participated in the questionnaire.

3.2.3 Ticket Sale Process

This section was designed to elicit opinions and understanding of the ticket range and the sales process. The participants were asked if they felt they understood all the tickets that were on offer and 4 of the 6 participants felt that they did. The participants were also asked questions regarding the way in which they sell the tickets. Generally the participants tend to sell the customer the tickets they ask for rather than discussing the tickets available first, although most also stated that they usually discussed ticket types with customers everyday. They also all felt that they are only under pressure to serve customers quickly when there are long queues.

Ideally customers who buy their tickets from the TIC should be given lots of advice about the different tickets and products available to ensure that they get the pass that suits the way they travel. The results above suggest that not all of the staff at present follow this procedure, which was highlighted by a third of the participants who did not have an entirely coherent understanding of the products on offer. Smartcard introduction is unlikely to have a big impact upon the ticket sale process; however, it may have an effect on how long is spent with each customer as they come to grips with the new technology and style of ticketing. The time spent with each customer at present may be less as customers are familiar with the products available.

3.2.4 Ticket Equipment

This section asked the participants about using the current ticket and pass issuing equipment as this will be monitored throughout the phases to determine how the same tasks are viewed by the users as the technology changes.

The TIC staff were asked about two tasks in terms of time consumption. The results for this show that more staff find 'Logging on to the system' is generally more time consuming than 'Entering data into the system'. When the weighted mean is calculated it was found that the average for both tasks results in the same answer: 'neither time consuming nor quick'. They also stated that when issuing concessionary passes, the most time consuming task was identifying the customer in the database. At this stage it is unclear how the new technology will work, however, it is likely that once a customer has been entered into the database, finding the customer again could be simplified. This will become evident throughout the phases.

All of the staff stated that when issuing concessionary passes they regularly encounter customers with the wrong documents required for proving identity in terms of age and residency. Staff also encounter customers who either have the wrong types of photographs or are not eligible for the pass.

3.2.5 Payment Process

There is potential that payment for the Yorcard products could move away from cash towards card and automated payments, thus this section asks about the current payment process. The TIC staff were asked about two tasks in terms of time consumption. The weighted mean has also been calculated and it was found that 'offering refunds' is slightly more time consuming than 'taking payments'.

The staff were also asked which aspects of payments were the most time consuming. The most staff stated that not having enough change was time consuming, followed by payment using chip and pin.

Summary & Conclusions

4.1 Bus Driver Survey

To date, the data collection for this Phase 1 Baselining study has been completed before the installation of the equipment and within the timescales stated in the methodology. The resulting data has been entered into a database and cleaned for obvious coding errors. Overall the sample size was fairly low despite incentives for the driver surveys. For the TIC, potentially it would be wise to offer an incentive in order to encourage the maximum participation. As it is, the response has enabled some level of analysis and results for comparison.

The results from analysis of the responses are summarised below followed by ways in which the new smartcard technology could make a difference and the limitations found at this stage.

The analysis has highlighted where some areas could be improved to enable the collection of a more complete data set in future phases and elicit more useful feedback regarding the new technology. This will be highlighted later in this section.

The following results were found:

- Each of the pilot routes were driven on by nearly half of the participants.
- All of the tasks questioned in the survey were found to be between fairly easy and very easy, and fairly quick to very quick.
- The most time consuming tasks using the current equipment were related to ticketing, for example, replacing or un-jamming the ticket roll and issuing tickets with wallets.
- The most difficult task using the current equipment was also un-jamming the ticket roll. The other tasks which had the lowest rank for ease were regarding the use of the machine, for example, scrolling menus or selecting tickets and memorising what the buttons do.
- The majority of drivers felt that it was easy to keep to their timetable and the most common cause of delays were thought to customers not having their fare ready.
- The greatest risk to safety and security was thought to be carrying cash on the bus and the greatest impact to improve safety and security was thought to be less cash-handling.
- Many of the drivers stated that they experienced fraud 0-2 times a day. A small number stated that they experienced it more than 7 times a day. The most common type of fraud experienced was said to be passengers trying to use out of date tickets.

Smartcard technology could affect the results found in this study during the later phases through the following ways: buying tickets off the bus; not issuing paper tickets on the bus; and the technology validating and collecting the payment. Each of these will be looked at separately.

Buying tickets off the bus could have an impact on the drivers in three different ways:

- Reducing the time consumption of the boarding process by eliminating certain tasks, for example, issuing a paper ticket with a wallet.
- Reducing passenger delays as this could reduce the number of passengers paying with notes
- Increasing safety and security as this could reduce the cash-handling

In this pilot, paper tickets may be issued for certain smartcard holders, however, not issuing paper tickets on the bus (such as in Singapore or London) could have a positive impact in the future by eliminating some of the more difficult and time consuming driver tasks relating to the ticket roll.

The technology validates and collects payments and could therefore have a positive impact in the following ways:

- Reducing the time consumption of some of the problematic driver tasks relating to the use of the ETM, such as finding destinations and memorising what the buttons do.
- Reducing passenger delays resulting from difficulties with reading the passenger's pass or ticket as the machine does this.
- Improving safety and security as this reduces the number of cash payments received on the bus.
- Reducing fraud as it is much more difficult to replicate tickets or use out of date passes.

4.2 Travel Information Centre Survey

The following results were found:

- The number of participants is very low for this survey as only three TICs will be affected by the pilot. However, the TIC process is a significant part of the Yorcard pilot as customers will buy their Yorcard from the TICs. Therefore monitoring the opinions of the staff is important throughout the phases.
- Mostly staff sell the pass or ticket that the customers ask for. Smartcard introduction may affect this process as staff may have to spend longer with customers explaining the new technology and ticket products.
- Using the current technology, logging onto the system and entering data into the system is seen to be neither time consuming nor quick.
- The staff felt that offing a refund or exchange is slightly more time consuming than taking payment.

At this stage it is unclear how the new technology will work, however, smartcard technology could affect the results found in this study in the later phases as follows:

- Smartcard introduction is unlikely to have a big impact upon the ticket sales process, however, it may have an effect on the time that is spent with each customer as they come to grips with the new technology and style of ticketing.
- It is likely that once a customer has been entered into the database, finding the customer again will be relatively easy as the process could be simplified.
- There is a potential that the use of smartcard technology could affect the payment process. However, this will become clearer throughout the subsequent phases.

4.3 Limitations

4.3.1 Driver Survey
Limitations have been identified and therefore, further discussion and work may be required to elicit certain responses in later phases. The limitations are as follows:

- Section 3 of the questionnaire asks about the driver's shift patterns (Questions 3 a, b and c). The answers to this question were too varied to be properly analysed and of interest. It is suggested that these questions are removed for future phases.
- The response to question 5 b suggests that some of the drivers did not understand the question and as a result stated more than one cause as 'the most common cause'. Although this is not necessarily a problem, it is suggested that in future phases the driver is asked to choose one option rather than ranking the options.
- There may also have been an issue regarding the layout of the questionnaire, which was designed in order to make it seem very short and therefore improve the response rate. It was noted, however, that a few drivers missed out the middle section, which suggests that the layout ought to be altered slightly to avoid this in the future.

4.3.2 Travel Information Centre Survey
Limitations have been identified and therefore, further discussion and work may be required to elicit certain responses in later phases:

- There was a very limited response rate, thus it may be suggested that either an incentive is used or one-to-one interviews are carried out in future phases
- Potentially, some of the questions leading to comments were unnecessary, thus if the questionnaire needs to be expanded to include smartcard related questions, these 'filler' questions could be removed.

4.4 Review of Objectives

This study has set out to meet the objectives of the stakeholders involved in the Yorcard project. In particular, this report documents the existing performance measures which have been taken prior to the introduction of smartcard ticketing. It is important that the measurements and information captured and reported by this study are carefully monitored in future phases to establish if there are key components driving any changes to the opinions of equipment users.

In terms of meeting the objectives of this phase it can be seen that this has been achieved as the analysis has identified and baselined the key measurements for comparison throughout this research project. The methodology developed has been demonstrated as robust and is it recommended that it is used as a basis for repetition of measurements.

The Pilot Acceptance Criteria (to survey opinions of physical tasks carried out on the ETM so as to monitor the ease of use of the new equipment) has been used to develop the methodology and can be identified throughout the analysis. There are also elements of the Pilot Acceptance Criteria which will be introduced through the later phases as they relate directly to smartcards, such as, to monitor the effects on journey times and fraud. These elements will be elicited through direct questions in phases 2, 3 and 4. It is also important that this report is not taken in isolation and that the data from other research tasks are used to help support these findings wherever possible.

The effects that smartcard technology could have in the future have been identified in this report and should be monitored throughout the later phases. The elements that have been identified could certainly have an effect on the following Yorcard objectives:

- Reducing the barriers to the use of public transport
- Reducing delays and improving reliability
- Reducing fraud
- Informing the business case

This reporting process also informs the following DfT objectives and will be elaborated during the reporting process for phases 2, 3 and 4:

- Analysing the system performance (b(2))
- An assessment of the Operator and PTE expectations (c)

These Yorcard and DfT objectives will be studied in more detail below in light of the results from this study.

The third DfT objective; to understand the value of new innovative ticketing products (d) will form part of the evaluation in future phases.

Reducing Barriers to the Use of Public Transport

There could be a number of ways that the new technology could have an impact upon the barriers to using public transport. In terms of this study, it is important to understand and document the reaction of the equipment users as they are the people who will have the first contact with the customers using Yorcard, and thus they could have a big impact upon the overall customer experience. If the equipment users find the equipment easy to use then this is likely to have a positive impact upon how they deal with customers and thus, the overall experience could be better for the customer and may reduce their perceived barriers to travel. Part of this may include a reduction in the driver-passenger interaction time as a result of smartcard technology, which could potentially be seen as a benefit by both parties in terms of barriers to travelling by public transport. The results for this objective could also potentially inform the DfT strategic objective to improve accessibility of public transport.

Reducing Delays and Improving Reliability

This objective relates closely to the main DfT strategic objective to improve the punctuality and reliability of public transport. As with the previous object, if the new technology is easier and quicker to operate, then again this could have a positive impact upon the reduction in delays and improving the overall reliability both on and off the bus. Additionally, if the technology is easier for the passenger to use this could also reduce delays and improve reliability. Both the drivers and the TIC staff were asked a series of questions to understand the ease and time consumption of carrying out tasks on the ETM or relevant equipment. These questions will be asked in each of the phases to monitor the positive or negative impact of the new technology. The drivers were also asked about their perceptions of passenger delays. These questions will be repeated to determine if Yorcard can reduce these passenger delays.

Reducing Fraud of all types
There are two main types of fraud which need to be considered; passenger and driver. In terms of passenger fraud, smartcards could be more difficult to replicate or use in other fraudulent ways as the card communicates directly with the ETM and it is possible to 'hotlist' a card so that it can no longer be used. The results presented in this report suggests that passenger fraud could be reduced by the introduction of smartcard ticketing because the drivers stated that the most frequently experienced fraud was out of date or copied tickets. In addition, the drivers also stated that they would feel more secure if cash-handling on the bus was reduced, and this could be presented as a non-financial business case benefit. The reduction in the amount of cash could reduce the likelihood of driver fraud.

Business Case
At this stage the business case for Yorcard is yet to be defined and will become more apparent as the comparisons are carried out between this study and the other phase 1 studies with the other repeat studies carried out in the other phases. However, it is possible to make some predictions about how Yorcard could have an impact on the business case in light of this equipment user study. For example, each of the objectives above could certainly feed into a business case for Yorcard, particularly if there is evidence of time savings or a reduction in fraud.

Analysing the system performance (DfT b.(2))
The study documented in this report and the process which will be followed during the following phases will feed into the analysis of the system performance as the equipment user opinion of the ease of use of the new technology and its time-saving effects will inform this analysis.

An assessment of the Operator and PTE expectations (DfT c.)
The opinions provided by the drivers and TIC staff are likely to enable the collection of the wider operator and PTE expectations respectively. Both positive and negative experiences are likely to be collected throughout this pilot process.

Advice for the Business Case

At this stage there are certain aspects of smartcard technology that could have an impact upon the equipment users. These are the issuing of tickets off the bus and the validation and collection of payment by the technology. They could have an impact upon the driver tasks during the boarding process (which could in tern effect the boarding time study which is being carried out in parallel to this study), passenger related delays, safety and security, and fraud. They could also have an impact upon the TIC tasks such as the time spent informing customers of tickets and the payment process.

For this phase, the business case is at its early stages of development and thus, the recommendations for rollout and deployment will be much more obvious as the results for the later phases are analysed. At this stage, the measurements for inclusion in the business case and for comparison though out the pilot will be to monitor and compare the opinions of the equipment users to each of the keys factors mentioned which the introduction of the smartcard could have an impact upon.

Recommendations

To date, the data collection for this study has been completed and the resulting data has been entered into a database and cleaned for obvious coding errors. The analysis presented in this report has provided robust results suggesting that the data collected are reliable, robust and meet the Pilot Acceptance Criteria, which are:

- To provide survey rating regarding the Bus ETM
- To provide survey rating regarding the TIC permit/ticket issuance.

This recommendations section is designed to highlight the lessons learnt from this Phase 1 Baselining Equipment User Survey. Any recommendations will feed into the subsequent phases of this research. The recommendations are as follows:

Overall

- All parallel studies should be analysed as a collective in order to cross refer reports and document where overlaps may occur particularly if they form part of the business case.
- The methodology detailed in this document should be repeated to ensure consistency.

Driver Survey

- Focus groups should be carried out with all operators in subsequent phases and therefore it should be ensured that they are not carried out during the school summer holidays.
- It was felt that the overall response level for the driver survey was adequate for providing useful results, however it would be advised to increase the incentive offered to the drivers in the later phases as a way of maintaining the response rate.
- It is suggested that the questions 3 a, b and c are removed for future phases.
- It is suggested that in future phases question 5 b is altered so that the driver is asked to choose one option rather than ranking the options.
- It is suggested that the layout ought to be altered slightly to avoid drivers missing sections in the future.
- All sections need to be expanded to elicit details regarding the use of the smartcard technology. It is recommended that in order to not extend the length of the questionnaire, and thus reduce the response rate, some of the less important questions are removed.

Travel Information Centre Survey

- For the TIC, it was anticipated that the response rate would be higher; therefore, it would be wise to either offer an incentive or carry out one-to-one interviews in order to encourage more participation in the later phases.
- All sections need to be expanded to elicit details regarding the use of the smartcard technology. It is recommended that in order to not extend the length of the questionnaire, and thus reduce the response rate, some of the less important or interesting questions are removed.
- That the use of a Time and Motion study be evaluated for appropriate use in the future phases to enable business case benefits to be quantified

RES703 Phase 1: Baselining - Consumer Survey

Contents

1.0 Introduction

2.0 Methodology

3.0 Results

This report has been produced by Newcastle University for South Yorkshire Passenger Transport Executive under a contract with the Department for Transport. Any views expressed in this report are not necessarily those of the Department for Transport.

4.0 Summary and Conclusions

5.0 Advice for the Business Case

6.0 Recommendations

Executive Summary

The Yorcard Project is intended to deliver a multi-modal, multi-operator public transport smartcard scheme to be trialled in on a certain corridor of buses in Sheffield and on the local train service between Sheffield and Doncaster and intermediate stations.

This report presents the findings from the Phase 1 Baselining Consumer Survey. The survey was carried out on-street in Sheffield as a one-to-one interview with a variety of respondents. The aim was to create a profile of the customers who may or may not be affected by Yorcard, to glean information about the overall appeal of public transport (in this case bus and train), the opinion of the existing ticketing scheme and how and why people buy certain tickets. The sample size collected was in accordance with the methodology, with an even split of male and females and an age distribution which is a reasonable representation of the population within Sheffield.

This report demonstrates that the methodology and the data collected meets the research objectives as this Phase 1 study has enabled: the development of a robust methodology which meets the Pilot Acceptance Criteria and that can be re-used throughout the subsequent phases; and the identification of the baseline measurements with which the subsequent phases can be compared with.

The key finding from this Phase 1 study are presented below:

Sample:

- More non-users and bus users were from within the pilot corridor (S1 – S10) than outside the corridor
- The majority of train users were from outside the pilot corridor.
- The majority of bus users interviewed were frequent users. The main journey purpose for bus users was for work and these participants tended to travel daily. The other main reasons were for education and shopping, however these participants tend to travel less frequently.
- The majority of train users interviewed were infrequent users. The main journey purpose for train users was for visiting family and friends and these participants tended to travel less than once a week.

Public Transport Appeal:

- The most popular reason for using a mode other than train and bus was convenience, followed by speed and cost savings.
- For the statement 'I find it easy to buy tickets' most participants agreed with this; however, there are statistically significant differences between bus and train users and more bus users responded strongly agree than train users.
- For the statement 'I find it convenient to buy tickets' most participants agreed with this; however, there are statistically significant differences between bus and train users and more bus users responded strongly agree than train users.
- For the statement 'the tickets available are easy to use' most participants agreed with this; however, there are statistically significant differences between users and non-users where users are more likely to state that they agree or strongly agree with this statement.
- For the statement 'If it were easier to pay for tickets' most participants stated that this definitely would not encourage them to use public transport more or they had no view. There are statistically significant differences between users and non-users where non-users are more likely to state that this definitely would not encourage them to use public transport more.
- For the statement 'If the tickets were more secure' most participants stated that this definitely would not encourage them to use public transport more or they had no view. There are statistically significant differences between the type of tickets bought by users and their response to this question. Customers who buy return or day tickets and monthly passes are more likely to respond positively to this question.
- For the statement 'If there was a ticket available to suit your needs' most participants stated that they had no view, however a large proportion of both non-users and users responded positively. There are statistically significant differences between users and non-users where users are more likely to respond more positively to this question.
- When participants were asked what was the most frequent cause of delay the most frequent cause was seen as passengers not having their money ready followed by lots of people boarding.

Ticket Types and Purchasing

- Most bus users surveyed buy single tickets on board the bus TIC because they see it as the most convenient and best value ticket.
- Most train users surveyed buy return tickets from the railway station, however a significant proportion also buy their tickets online and state that they do so as they see this as being the best value.
- Most participants obtain information about tickets from the TIC, online or at the railway station. The majority of participants found that this information was accurate.

Participants were also asked if they had heard of Yorcard and the majority responded 'No' with rail being the group which responded 'No' the most.

Introduction

1.1 Background

The Yorcard Project is intended to deliver a multi-modal, multi-operator public transport smartcard scheme to be trialled in part of the South Yorkshire area during 2008. The scheme is intended to offer certain commercial and concessionary ticket products in 'Smart' format and is built to the ITSO standard (ITSO.co.uk, 2008). Yorcard Limited has procured all the hardware, software and services required to enable the successful implementation of a Pilot scheme. The Pilot is being trialled on the services of three bus operators in the S10 area of Sheffield and on Doncaster to Sheffield rail services and intermediate stations. The Yorcard Pilot aims to issue up to 30,000 smartcards for use on these services.

This Yorcard Phase 1 Consumer Survey Report sets down the outputs forming part of a research contract between the South Yorkshire Passenger Transport Executive (SYPTE) and the Department for Transport (DfT) Transport Technology and Standards Division. This report forms the first of three Consumer Survey Studies and aims to provide baseline measurements, prior to installation of Yorcard equipment, of consumer opinion to which subsequent phases can be compared and contrasted to. Phase 2 will take place when the new technology has been implemented on to buses and no Consumer Survey will take place in this phase. Phase 3 will take place when the smartcard tickets are in use on entry to the bus and Phase 4 will take place when the smartcard tickets are in use for both entry and exit to the bus. Surveys are planned for both Phases 3 and 4 to gather user opinions of the trial.

The purpose of this report is therefore to provide the results from the Phase 1 Consumer Survey Study. The questionnaires were carried out as one-to-one interviews at a variety of locations from the inner city to the suburbs along the main corridor of the pilot scheme:

- Sheffield Interchange (bus and rail) – City Centre
- Broomhill Centre – Outer City Centre
- Royal Hallamshire Hospital/ University – Outer City Centre
- Woodhouse - Suburbs
- Notre Dame School – Suburbs

This report will provide full details of the survey work which has been carried out; the methodology, results and in depth analysis of user opinion, and conclusions drawn from the key findings. The Consumer Survey is considered to form a key part of Yorcard Business Case and the development of the Yorcard scheme, and other similar schemes in terms of ticket products offered.

1.2 Meeting DfT Objectives

The DfT have stipulated the following objectives as part of the tender:

a. All elements of the pilot scheme shall be fully compliant to the prevailing ITSO documentation.
b. Conduct a robust analysis of (1) bus boarding times, (2) Systems performance and (3) passenger reaction to address the concerns of all key stakeholders involved in the rollout of smartcard technologies within a deregulated transport industry. This should provide a comparison of existing performance measures prior to the introduction of smartcards to the pilot area.
c. The research shall assess the Customer Experience and the Operator and PTE expectations and provide recommendations for rollout. Included within this analysis shall be a study of the business case for deployment of similar regional schemes.
d. To understand the value of new innovative ticketing products to the key stakeholders
e. To understand the value of using Citizen cards as an alternative to transport only smartcards.
f. To ensure that all deliverables are clear, concise, accurate, thorough, of a high technical quality and well written.
g. The research shall complement the Yorcard pilot timetable.

This report must therefore evaluate how the relevant objectives will be met, particularly objective b (3) and c as these specifically relate to the consumer experience. These DfT objectives will be looked at in turn in section 4 to discuss how this study could achieve and inform these objectives. Reference will also be made to how this study can help meet the DfT strategy to deliver improvements to the accessibility, punctuality and reliability of local and regional transport systems by implementing a smartcard based ticketing system. In future phases this study may also meet objective d providing operator ticket type data is made available.

1.3 Meeting Yorcard Objectives

It is also important to consider the objectives of Yorcard and its stakeholders. This report will consider how the 5 most relevant objectives are likely to be influenced by Yorcard. Please refer to the General Reference Document for the full list:

- Reduce barriers to the use of public transport;
- Reduce delays and improving reliability;
- Enhance the image of public transport;
- Improve sales channels; and
- Inform business cases.

This report will consider how these objectives are likely to be influenced by Yorcard. Section 4 will elaborate, in light of the results found, on how this study could affect each of these objects. This report will recommend which measurements should be used to develop the following business case models identified in the Yorcard Pilot Acceptance Criteria:

- The perception of boarding and journey times
- Ease of product purchase
- Customer support
- Public transport appeal; and
- To obtain results that will feed into the business case.

The following section will present the methodology used for this Consumer Survey study ensuring it meets the relevant objectives.

Methodology

2.1 Initial Design for the Questionnaire

This section presents the outline methodology as recommended in the approved Baselining Stage Plan (reference YC-IGO-RES-003 draft K). The recommendation was to use focus groups in the first instance to aid the design of a questionnaire and obtain qualitative data. The questionnaire would be conducted as a one-to-one interview using trained interviewers on-street within the immediate geographical area of the pilot services.

During this phase, it was proposed not to ask questions regarding consumer views of smartcards as the respondent may not have much experience of smartcards and thus have a limited view. Therefore, the methodology defined in this phase of the research will need to be revised further once the smartcard based transactions are conducted on vehicles and smartcards are actively being used by the public. All questions that are used in this phase of the research must be used, with reasonable amendments, in subsequent phases to maintain consistency.

The questionnaire was designed to ask generic questions about the individual, e.g. age, gender, postcode, in order to gain a personal profile of those interviewed.

One section was designed to look at the participants travel habits and enquire about their usual mode of transport, frequency of travel, usual time of travel and usual tickets purchased, in order to obtain a travel profile of those interviewed and determine if the way participants travel affects their responses.

The questions also relate directly to the Pilot Acceptance Criteria in order to elicit and explore specific areas, such as:

- What is it about using public transport that appeals to you?
- What is it about using public transport that does not appeal to you?
- What changes would need to happen before you would consider increasing the number of public transport journeys you make – how do you think traveling could be made simpler?
- What do you think causes delays?
- How do you feel about the level of customer care you receive?

Some of these questions will also be aimed at non-users in order to ascertain why they do not use public transport and what improvements related specifically to ticketing may encourage them to use public transport in the future.

2.2 Proposal for the use of Focus Groups

The proposal for the use of focus groups was based on the requirement to ensure that the questionnaire collects all the data required to meet the Pilot Acceptance Criteria, and provides robust and sufficiently high quality data to be used in the relevant reports. The person conducting the focus group had the objectives to test the draft questionnaire, ask the group how it can be improved and obtain qualitative data. There was a researcher script to direct this process. Discussions led to better use of words in questions and the addition and subtraction of questions.

6 focus groups of 6-12 participants were used and segmented as detailed below:

- Senior and Disabled concessions - Bus Users
- Regular bus users – people who make 1 or more return bus journey per week
- Young people concessions – Bus and Non-users
- Infrequent public transport users – people who make less than 1 return bus journey per week
- Rail users
- Non-users – people who do not use bus or train

Candidates for the focus group work were canvassed at the locations noted in section 1.1 of this document and the groups were run at convenient locations within the geographical pilot area. There were a mix of male and females, and different social groups. An incentive of £25 was offered to all who participated in the focus group work. Due to time constraints it was not possible to carry out a focus group with the young people concessions as the focus groups ran during the school holidays in order to develop the questionnaire for the on-street survey originally to be held in September and therefore, participants from Notre Dame School could not be recruited. In future phases it will be ensured that a focus group is held with this group of users.

Generally, the focus groups were able to confirm that the questionnaire touched on the necessary points as raised in the Pilot Acceptance Criteria. The focus groups also allowed for more in depth discussion about the way in which people travel and their use of public transport ticketing. For example, where, how and why customers buy the ticket they currently use, and where there may be potential barriers to using public transport. A common theme throughout the focus groups was that the participants found they did not like having to interact with the drivers, thus this may be a way in which smartcards could reduce the barriers to travel as they could potentially limit the need for passenger/driver interaction. Questions related to this should be added to the questionnaire in phases 3 and 4 in order to understand if this is the case.

It was stated in a number of the focus groups that participants felt that information, particularly for buses, about times and tickets was not always available or reliable. Many of the participants, in particular the concessionary users, stated that they relied more on word of mouth rather than, for example, asking the driver.

The focus group leader gave a description of Yorcard to each group at the end of the discussion in order to promote dialogue about their initial reactions to the idea. Generally, particularly for the frequent and infrequent bus user participants, the reaction was positive. There were many questions about how the smartcard would work and there was particular concern about not knowing how much money was stored on the card or “double swiping” meaning being charged twice for the same journey. Questions specifically related to Yorcard and its use will be introduced into both the focus groups and the questionnaires in phases 3 and 4.

2.3 Sample Size for the On-Street Questionnaire

It was important that a sample of at least 934 on-street interviews were conducted and this section will explain how this was broken down in order to generate this sample number. The sample size stated for the bus, train and non-users was recalculated to gain a larger (and therefore more reliable) sample size. Therefore, the sample size in this document differs compared to the one reported in the original methodology document (Consumer Survey Methodology RES008 Draft E). As a result, the split between bus, train and non-users for this survey was defined as:

- Bus users 42.4%
- Train users 15.2%
- Non-users 42.4%

In order to analyse public opinion by age and gender for each of the categories above, the bus and non-users will be split into 3 age groups, with an even split of male and females in each. The interviewers aimed to collect the following sample size of ages, which were representative of the Sheffield population (as stated in the Census survey, 2001):

- 11 – 16 years 8.2%
- 17 – 59 years 66.3%
- 60 years and over 25.5%

The interviews with children were treated with extreme caution due to the obvious need for parental consent and police checks, thus the interviews took place under supervision at Notre Dame school, which is the key school being served by the pilot. Unfortunately, the school is some distance from the centre of town and therefore there were no train users for the under 16 age group. The following sample was used for train users:

- 60 years and over 26.7%
- 17 - 59 years 73.3%

For each sub-group to provide statistical significance it must consist of at least 30 responses. Taking into account the population age group split in Sheffield (see Table 2 for population split) the table below gives an outline of the sample that the data collectors aimed to collect:

Type of users	Age	Sex	No. Ques-tionnaires
Bus user	<17	M	30
Bus user	<17	F	30
Bus user	17-59	M	123
Bus user	17-59	F	123
Bus user	>60	M	45
Bus user	>60	F	45
Train user	17-59	M	41
Train user	17-59	F	41
Train user	>60	M	30
Train user	>60	F	30
Non-users	<17	M	30
Non-users	<17	F	30
Non-users	17-59	M	123
Non-users	17-59	F	123
Non-users	>60	M	45
Non-users	>60	F	45
		Total	**934**

Table 1: Sample of participants for Consumer Questionnaire

The draft questionnaire was tested using feedback from the participants of the focus groups and an on-street test in Newcastle city centre. This test was used to identify any gaps in the questionnaire, irrelevant questions and strange wording. The questionnaire used and approved by the Yorcard Working Group was the result of this testing.

Results

3.1 Reporting

The Consumer Survey for Phase 1 took place over a 5 day period, including both week days and weekend days, in early December 2007 and at times between 8am and 7pm. Interviews for school children took place on one day during the week beginning 3rd December and at times between 9am and 4pm. All the data has now been collected, entered into a database and cleaned for data coding errors and inconsistencies. The total number of questionnaires collected was 946, however, only the useful responses for each of the questions (i.e. those questions which were answered in full) were used to formulate the statistics that are presented in this report.

This document will report the findings of the key questions in order to elicit public transport and ticketing opinion. The questions will be assessed for significant differences according to the following variables: age; sex; origin (within pilot corridor/outside); occupation; and type of transport used. Further in depth analysis will be carried out to determine the meaning behind certain responses and to establish where error may have crept in due to misunderstanding, question formation, or otherwise. A set of limitations and lessons learned will be provided in order to inform the later phases of this research and elicit the best possible data.

The questionnaire was structured in the following order:

Section 1 – details the users' personal attributes (answered by all)
Section 2 – questions designed to elicit the participant's use of transport (only answered by non-users)
Section 3 – questions regarding public transport appeal (answered by all)
Section 4 – questions regarding opinions of ticket types and purchasing (answered by public transport users only)
Section 5 – questions designed to elicit the participant's use of transport (only answered bus-users
Section 6 – questions designed to elicit the participant's use of transport (only answered by train-users)

The reporting of the results will be presented in the following sections: Sample profile; Public Transport Appeal; and Ticket Types and Purchasing. Sample size will present the profile of the participants; age, sex, postcode, occupation and type of transport used. The Public Transport appeal and Ticket Types and Purchasing section will present the resulting responses taking into account the differences in the sample.

3.2 Sample Profile

The total number of questionnaires collected was 946. The split of male to female was even, which is representative of the population in Sheffield, and the age distribution for 11-16, 17-59 and 60 is displayed in Table 2 and demonstrates that the sample collected was reasonably representative of population distribution in Sheffield and the sample which was presented in the methodology, Section 4.3 of this document.

Age	Sample Collected	Population in Sheffield (2006 Census)
16 and under	7.9%	8.2%
17-59	65.2%	66.3%
60 and over	26.6%	25.5%

Table 2: percentage distribution of age groups collected (n=944)

3.2.1 Participant Origin

Postcode information is considered quite contentious in terms of privacy infringement, as a result a number of participants were not willing to provide this information (10.7%). However, the majority of participants did provide this information and as a result it is known that the participants were from a wide range of locations. A large percentage of the participants were from Sheffield (S1-S10: 44.5%) and the remaining participants were from the surrounding areas of Sheffield and a variety of locations around the UK and a minority were from Europe. This spread of participant origins within Sheffield has been mapped using GIS (see Figure 1) in order to demonstrate the extent of this research and the diversity within Sheffield, which will be important for understanding the outreach that Yorcard could have. The responses to the questions presented in this report will be divided by the origins of the participants and analysed to determine if there is a statistically significant correlation between answers from participants from Sheffield (S1 – S10) compared to the answers provided by participants who are not from Sheffield.

It is possible that in this baselining phase there are no obvious differences to report between participants from the pilot corridor and those from other regions; however, as responses are gathered in later phases (Phases 3 and 4), it will be important to be able to reflect back on this initial survey for comparison of opinions once Yorcard has been implemented in the area to determine if there has been any positive (or negative) effects.

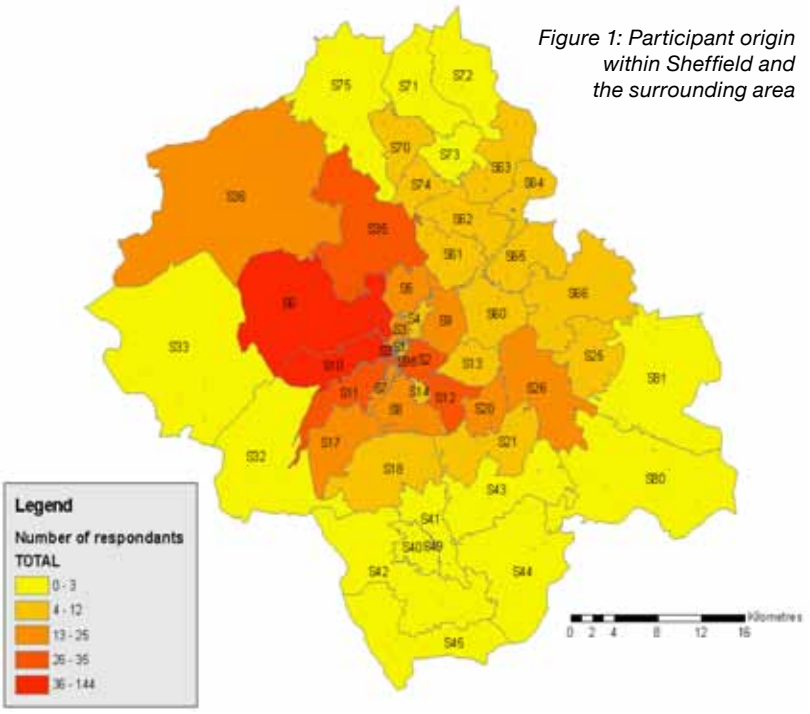


Figure 1: Participant origin within Sheffield and the surrounding area

3.2.2 Work Status

In order to determine the diversity of the sample, the occupation of each participant was also collected. With the exception of a minority of consumers, participants were happy to provide this information and this sample is displayed in Table 3.

Work status	Sample Percentage
employee in full time work (30+hours)	28.6%
employee in part time work (<30hours)	7.3%
self employed (full or part time)	1.7%
on government training programme	0.4%
unemployed and available for work	2.6%
permanently sick or disabled	0.9%
wholly retired from work	24.7%
looking after the home	1.4%
in full time education at school, college or university	32.3%

Table 3: Percentage distribution of participants occupation (n=922)

3.2.3 Type of Transport Users and Profile

The sample for the type of transport used is as follows: 397 bus users; 165 train users; and 384 non-users. The percentage split for the number of bus and train users presented in the methodology was met; however, some discrepancies from the original sample size plan for non-users have crept in. This was expected and prepared for by ensuring the total sample size was an overestimate of the requirements for providing statistically significant analysis. Thus, regardless of this it is possible to elicit a robust consumer opinion of public transport and ticketing that will be representative of the population in Sheffield. Subsequently, the types of transport used have been broken down to produce a percentage distribution of the users' origins and is presented in Table 4. This table shows that more bus and non-user participants were from Sheffield; however, the majority of train users interviewed were from elsewhere, which is to be expected as the pilot corridor for the train extends beyond Sheffield to Doncaster. Of the rail users who live outside of the S10 area, 25% live in the S11 to S81 areas, and 12% and 8% are from Lincolnshire and North and West Yorkshire respectively.

	live in Sheffield	live outside Sheffield	TOTAL
bus user	55%	45%	350
train user	26%	74%	141
non-user	54%	46%	354
TOTAL	421	424	845

Table 4: Percentage distribution of transport type used against origin (n=845).

Sections 5 and 6 of the questionnaire were used to ask participants about their chosen mode of transport in order to build up a profile of the users. Initially the users were asked to describe their main purpose for using this mode and how often they travelled for this purpose in a typical week. The results of these questions are displayed in Figures 2 and 3. For bus-users, the main purpose was for work (the majority making 11 or more journeys per week), education (a large percentage making 7-10 journeys per week) or shopping (the majority making 1-3 journeys per week). For train-users the main purpose for travelling was to visit family or friends (the majority travelling less than once a week).

Bus users - Number of journeys per week and purpose

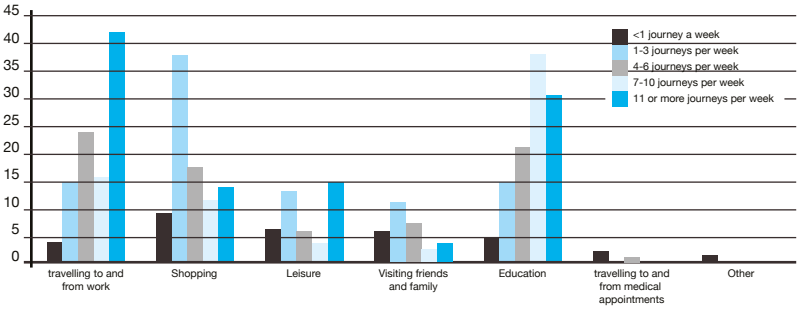


Figure 2: Bus-users – Purpose versus number of journeys per week (see Table 1 in Appendix 1)

Train users - Number of journeys per week and purpose

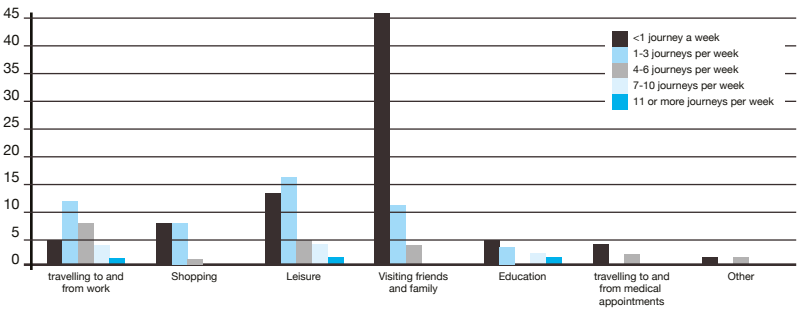


Figure 3: Bus-users – Purpose versus number of journeys per week (see Table 2 in Appendix 1)

3.3 Public Transport Appeal

As defined in Section 4.2, frequent users are those who make at least one return journey per week. Overall, it can be seen that the majority of bus-users interviewed are frequent users (91.15%) as they tend to use the bus 1-3 times a week or more. There is an almost even split of the frequency with which users travel from 1-3 times a week to 11 or more journeys (see Table 6). Bus-users also tend to make return journeys (62.5%) when they travel and usually leave before 9:00 and return between 15:30 and 17:30. Of the bus users interviewed 72.5% (n=287) used the services that are part of the pilot and therefore could be affected by the Yorcard pilot.

Overall, it can be seen in Table 6 that almost half the train users interviewed were infrequent train users and tend to use the train less than once a week. The majority of train users (88.5%) make return journeys by train when they travel and they mostly stated that they did not have a fixed time to travel. Of the train users interviewed 42.3% (n=163) travelled and used stations between Sheffield and Doncaster and therefore could be affected by the Yorcard pilot. The weighted mean was calculated to determine the average number of journeys made by bus users and by train users which was 7.29 journeys per week and 2.26 journeys per week, respectively. These means will be monitored throughout each of the phases in order to determine if there is any change in patronage during the pilot.

How many journeys do you usually make every week

	Bus	Train	TOTAL
<1journey a week	8.85%	49.10%	116
1-3 journeys per week	24.22%	30.54%	144
4-6 journeys per week	20.57%	12.57%	100
7-10 journeys per week	18.75%	5.99%	82
11 or more journeys per week	27.60%	1.80%	109
TOTAL	**384**	**167**	**551**

Table 6: Frequency of journeys usually made per week

3.3.1 Non-Public Transport Users

Of the participants who did not use either bus or train, a section was specifically asked to determine which type of transport they did use and why. These results are presented in Table 7. The results show that overall the most popular reason for using an alternative mode to bus or train is that it is more convenient. The subsequent reasons are that it is quicker followed by it is cheaper. Looking more specifically at certain modes, it can be seen that the reasons differ slightly. For example, participants who mainly walk cited exercise and cost savings highly as their reason for using this mode. Equally, for participants who use either tram or car the main reasons for using these modes were convenience and time taken with cost featuring with less prominence. A fairly large number of the participants also stated 'other' as their reason for travelling by modes other than bus or train. These 'other' reasons tended to be because that mode was 'cleaner' or 'nicer', therefore it is not necessary to extend the options available in this section for the later phases.

Why do you prefer to use this mode of transport (most frequently) rather than bus or train?

	Tram	Car	Taxi	Motor cycle	Pedal cycle	Walking	Park and tram	Other	Total
It is convenient	89	100	1	1	2	21	2		216
It costs less than using other modes	14	14		1	1	24	1		55
I can travel alone	2	12				2			16
It's quicker than other modes	24	36	1	1	1	9	1		73
I can exercise at the same time		4			2	19			25
I don't know how to use public transport						1			1
Other	60	32				12		2	106
Total	**189**	**198**	**2**	**3**	**6**	**88**	**4**	**2**	**492**

Table 7: Non-users - Type of transport used and reason

3.3.2 Opinion of Existing Ticketing

Section 3 of the questionnaire asked all the participants questions about public transport appeal, focusing on ticketing and payment to elicit an understanding of issues or benefits associated with the existing scheme. The first question in this section asked the participants to agree or disagree with a number of statements.

'I find it easy to buy tickets'

Table 8 presents the responses for the statement 'I find it easy to buy tickets'. Overall it can be seen that the participants agreed with this statement; however, age had a statistically significant (p=0) impact upon the response, meaning that the respondent was less likely to agree or strongly agree with the statement if they were older.

Age	I find it easy to buy tickets				
	strongly disagree	disagree	no view	agree	strongly agree
16 and under	0	2	9	16	41
17-59	11	21	55	251	260
60 and over	0	0	180	27	38
Total	**11**	**23**	**244**	**294**	**339**

Table 8: Responses to 'I find it easy to buy tickets' (n=911)

Age	I find it convenient to buy tickets				
	strongly disagree	disagree	no view	agree	strongly agree
16 and under	3	8	7	22	27
17-59	12	39	68	265	216
60 and over	0	2	189	26	29
Total	**15**	**49**	**264**	**313**	**272**

Table 9: Responses to 'I find it convenient to buy tickets' (n=913)

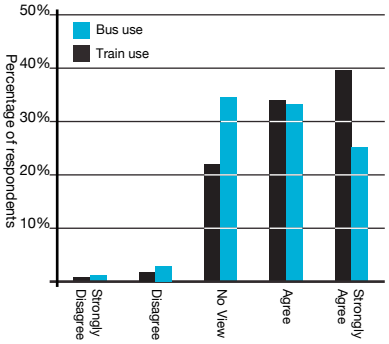


Figure 4: Disaggregation of responses to 'I find it easy to buy tickets' by train and bus users (see Table 3 in Appendix 1)

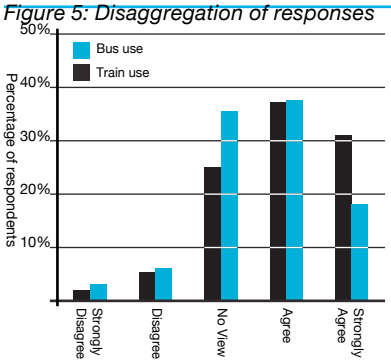
Analysing this question in terms of bus or train users, it can be seen that mode also has a statistically significant impact (p=0) upon the response given. Figure 4 displays a diagram of the disaggregated responses between bus and train user participants and demonstrates that the bus users interviewed strongly agree more than train-users with this statement

'I find it convenient to buy tickets'

For the statement 'I find it convenient to buy tickets' (see Table 9), overall it can be seen that the participants agreed with this statement; however, age had a statistically significant (p=0) impact upon the response, meaning that the respondent was less likely to agree or strongly agree with the statement if they were older.

Analysing this question in terms of transport type used, it can be seen that mode has a statistically significant impact (p=0) upon the response given. Figure 5 displays a diagram of the disaggregated responses for bus or train users. The bus users interviewed strongly agree with this statement more than train-users.

Figure 5: Disaggregation of responses



to 'I find it convenient to buy tickets' (see Table 4 in Appendix 1)

'The tickets available are easy to use'

Table 10 presents the responses when asked if the participant agrees or disagree with the statement 'The tickets available are easy to use'. Overall it can be seen that the participants agreed or strongly agreed with this statement. There is no statistically significant correlation between age and the response given.

Table 10: Responses to 'The tickets availably are easy to use' (n=908)

Age	The tickets available are easy to use				
	strongly disagree	disagree	no view	agree	strongly agree
16 and under	5	3	8	18	33
17-59	8	5	60	266	256
60 and over	0	0	88	39	119
Total	**13**	**8**	**156**	**323**	**408**

Analysing this question in terms of user and non-user, it can be seen that mode has a statistically significant impact (p=0) upon the response given. Figure 6 displays a diagram of the disaggregated responses by users and non-users and demonstrates that users are more likely to state that they agree or strongly agree with this statement.

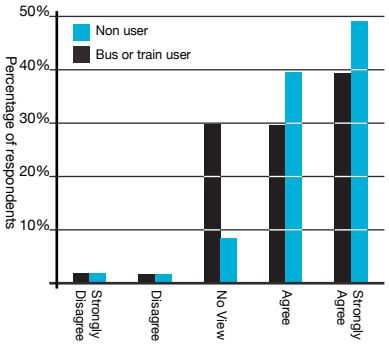


Figure 6: Disaggregation of responses to 'The tickets available are easy to use' by non and bus or train users (see Table 5 in Appendix 1)

'I have a travel pass to suit my needs'

When asked the statement 'I have a travel pass to suit my needs', overall it can be seen that the participants agreed or strongly agreed with this statement (see Table 11); however, the correlation between age and the response given has been found to be statically significant (p=0). The participant was more likely to strongly agree if they were over 60. However, this is probably related to holding a concessionary pass which offers free travel.

It is felt that this question is of interest to this research particularly if the question probed further in other phases to understand why certain participants did not feel they had a pass to suit their needs; however, it is likely that this question boarders on commercial sensitivity. As a result it is recommended that this question is discussed and reflected upon when developing the questionnaire in later phases.

Age	I have a ticket or pass to suit my travel needs				
	strongly disagree	disagree	no view	agree	strongly agree
16 and under	3	1	3	17	43
17-59	73	44	86	190	204
60 and over	3	0	52	42	151
Total	**79**	**45**	**141**	**249**	**398**

Table 11: Responses to 'I have a travel pass to suit my needs' (n=912)

3.4 Encouraging Public Transport Use

Question 3(b) asks respondents whether a number of changes to existing methods for paying and using tickets would encourage more public transport use.

3.4.1 'If it Were Easier to Pay for Tickets'

Table 12 presents the responses when asked 'if it were easier to pay for tickets' the participant would travel more by public transport. Overall the response to this question was definitely not or no view. There is a statistically significant (p=0) correlation between age and the response given, the participant was more likely to give a more positive answer to this question if they were 60 or over. There is no statistically significant correlation between the types of tickets the participants bought and their response to this question.

Age	If it were easier to pay for tickets				
	strongly disagree	disagree	no view	agree	strongly agree
16 and under	28	11	9	10	16
17-59	243	117	80	94	75
60 and over	22	6	186	7	10
Total	**293**	**134**	**275**	**111**	**101**

Table 12: responses to 'If it were easier to pay for tickets' (n=914)

Analysing this question in terms of user and non-user, it can be seen that mode has a statistically significant impact (p=0) upon the response given. Figure 7 displays a diagram of the disaggregated responses by users and non-users and demonstrates that non-users are more likely to state that this definitely would not encourage them to use public transport.

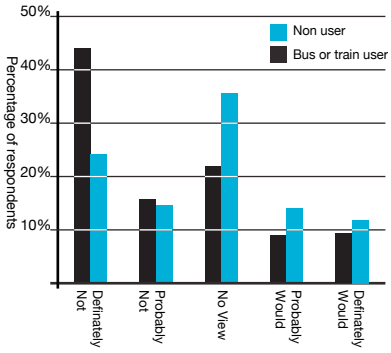


Figure 7: Disaggregation of responses to 'If it were easier to pay for tickets' by bus or train user and non-user (see Table 6 in Appendix 1)

Analysing this further in terms of modal choice, it can be seen that the type of transport used has a statistically significant impact (p=0) upon the response given. Figure 8 displays a diagram of the disaggregated responses by train and bus user participants, and demonstrates that train users are more likely to respond positively to this statement.

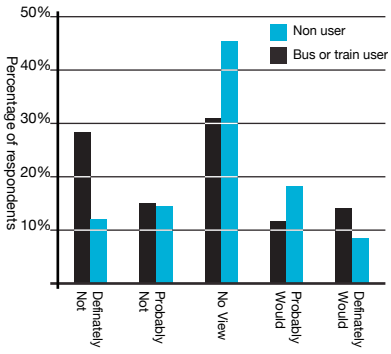


Figure 8: Disaggregation of responses to 'If it were easier to pay for tickets' by bus users and train users (see Table 7 in Appendix 1)

3.4.2 'If the Tickets Were More Secure'

Table 13 presents the responses when asked 'If the tickets were more secure' would the participant travel more by public transport. Overall the response to this question was definitely not or no view. There is a statistically significant (p=0) correlation between age and the response given, the participant was more likely to give a more positive answer to this question if they were 60 or over. There was no statistically significant difference for modal choice for this question.

Age	The tickets were more secure				
	definitely not	probably not	no view	probably would	definitely would
16 and under	15	3	7	17	32
17-59	191	87	83	123	122
60 and over	19	4	179	15	14
Total	225	94	269	155	168

Table 13: Response to 'The tickets were more secure' (n=911)

When the response to this question is analysed by ticket type it was found that there was a significant correlation (p=0.021) between the type of ticket passengers buy and their response to this question. Participants who bought return or day tickets and monthly tickets were more likely respond positively to this question.

3.4.3 'If there was a Ticket Available to Suit Your Needs'

Table 14 presents the responses when asked 'If there was a ticket available to suit your needs' would the participant travel more by public transport. Overall the response to this question was definitely not or no view. There is a statistically significant (p=0) correlation between user and non-user responses given. See Figure 9. Users were more likely to respond positively to this question. When this statement was considered in terms of age it was found that there was no statistically significant correlation for the responses given.

User verses non-user	non user	bus or train user
definitely not	26%	11%
probably not	7%	6%
no view	27%	36%
probably would	19%	22%
definitely would	21%	25%

Table 14: Response to 'If there was a ticket available to suit your needs' disaggregated by non-user and user (n=905).

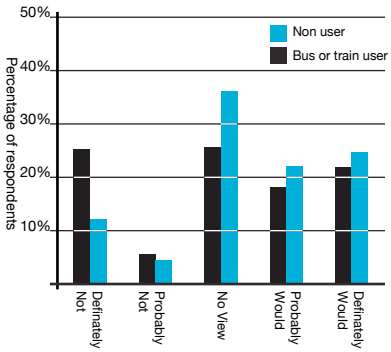


Figure 9: Response to 'If there was a ticket available to suit your needs' disaggregated by non-user and user (see Table 8 in Appendix 1)

3.5 Cause of Delay

Question (c) asked respondents to put in to order what they consider to be the main causes of delay. Table 15 displays a cross tabulation of the most frequent cause of delay against age with the most frequent cause being passengers not having their money ready followed by lots of people boarding. There is no statistically significant difference between age and response.

Main cause of the delay

	Age of Respondent			Total
	16 and under	17-59	60 and over	
people paying with notes	16%	18%	22%	168
lots of people boarding	36%	41%	16%	293
people not having their money ready	41%	33%	51%	336
long conversations with the driver	7%	9%	11%	78

Table 15: Cross tabulation of age and what participants consider to be the main cause of delay (n=875)

When each of these statements was considered in terms of sex it was found that there was no statistically significant correlation for the responses given.

3.6 Ticket Types and Purchasing

This section was only answered by those respondents who had used either bus or train in the past month as it asks about how the user buys their ticket when they travel, thus a certain level of use and knowledge about tickets is required. The participants were asked to answer the questions for their predominant mode of transport of the two options.

During the evaluation of the responses collected during the consumer research, it became clear that the wording of certain questions was slightly ambiguous and therefore open to different interpretation by some respondents. Despite rigorous testing of the questionnaire during a pilot exercise, the issue of how concessionary bus passengers might respond when asked about the ticket that they had 'bought' and where they had 'bought' it from was not fully explored.

As a result, the following findings need to be interpreted in the light of this issue. While some concessionary respondents may have interpreted the act of 'buying' tickets as obtaining an senior and disabled free boarding ticket, others may have interpreted it in relation to the need to buy a full fare ticket if travelling before 0900 on weekdays. Also, some concessionary respondents appear to have interpreted the question about where tickets were bought as referring to obtaining their concessionary pass from a Travel Information Centre, rather than obtaining a ticket on bus.

Rather than introduce subjectivity into this report by attempting to identify how different concessionary bus passengers might have responded to the questions, the following provides a faithful representation of the actual research findings, except where it is possible to draw conclusions about misinterpretation without compromising the objectivity of the research.

Prior to the next round of consumer research during Phase 3 of the pilot, the questionnaire will be fully reviewed and tested to ensure that any ambiguity is removed such that future reports do not suffer from this issue.

3.6.1 Bus User Ticket Types

Table 16 displays a cross tabulation of the types of tickets bus-users use and where they buy them from. With the exception of free concessionary pass holders it can be seen that almost all bus tickets are bought on the bus (64.8%). This suggests that if the number of tickets sold on the bus is reduced due to the introduction of the Yorcard, it could have a positive impact upon the dwell time and thus journey time, by reducing the time and the perceived time a bus is at each stop. Monitoring this throughout will enable a record of affects on journey time to be kept which is in line with the Pilot Acceptance Criteria.

It should be noted that concessionary pass holders will normally get their pass from the Travel Information Centre (TIC), however, if they travel outside the times of validity of the pass, they must buy a ticket to travel, hence why some tickets are bought on the bus or by other means.

Most often used mode	Type of ticket	Where do you usually buy your ticket from?						
		On the bus	Railway station	Online	TIC	On train	A local shop or paypoint store	Other
Bus	Single n=109	104	1	2	2	0	0	0
	Free concessionary pass n=96	11	1	0	74	0	0	10
	40p concessionary pass n=40	36	0	0	4	0	0	0
	Return or day ticket n=60	55	2	1	2	0	0	0
	Weekly, monthly or longer period ticket n=61	31	1	2	18	1	2	6

Table 16: Bus-user – Cross tabulation of type of ticket usually used and where usually buy ticket from (n=366)

3.6.2 Train User Ticket Types

Table 17 displays a cross tabulation of the types of tickets train-users use and where they buy them from. A large proportion of participants buy their tickets at the railway station, however, it can also be seen that a large proportion of passengers buy their tickets online. This suggests that train users are already quite familiar with using technology to buy their tickets, thus they may be more open to buying and using smartcard technology. There is a significant difference between the mode and the type of ticket used.

3.6.3 Purchase by Participant origin

Combining this information and analysing it by participant origin for correlation demonstrates that the difference in the types of ticket that are usually bought are statistically significant (p=0.014). This is displayed in Figure 10 and it can be seen that people who live outside Sheffield are more likely to buy singles tickets and people living in Sheffield along the pilot corridor are more likely to buy weekly, monthly or longer period ticket.

Most often used mode	Type of ticket	Where do you usually buy your ticket from?						
		On the bus n=6	Railway station n=72	Online n=31	Travel centre n=43	On train n=7	A local shop or paypoint store n=0	Other n=6
Train	Single n=14	1	7	5	0	1	0	0
	Free concessionary pass =n=44	0	0	0	39	0	0	5
	40p concessionary pass n=1	1	0	0	0	0	0	0
	Return or day ticket n=82	4	50	21	1	5	0	1
	Weekly, monthly or longer period ticket n=24	0	15	5	3	1	0	0

Table 17: Train-user – Cross tabulation of what type of ticket usually used and where usually buy ticket from (n=165)

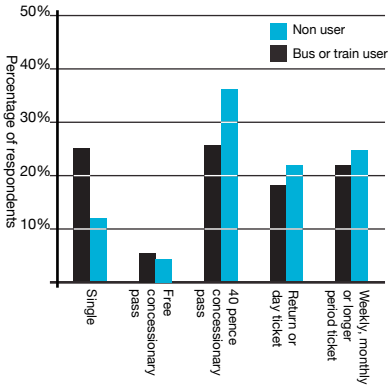


Figure 10: Cross tabulation of type of ticket usually used by participant origin (see Table 9 in Appendix 1)

3.6.4 Reason for Ticket Type Purchase

Looking overall at the responses to how participants choose which ticket to buy, it is interesting to note these responses in relation to the places they buy their tickets. Table 18 displays this cross tabulation and it can be seen that participants who buy their ticket on the bus do so because of convenience and also they perceive that it is the best value. This may be an interesting way that Yorcard could capitalise their marketing by focusing on the products for sale and emphasising the cost savings benefits. Also, not having to have the right money ready (something that was rated highly as a cause of delay – see Table 15) could be seen as even more convenient.

Another interesting point to note in Table 18 is that people who buy tickets online do so because they perceive it to be cheaper (73%). Of the participants who responded that they had bought their tickets from TICs, 79% of these were concessionary pass holders, suggesting that wording of this question may have been misinterpreted. There is a statistically significant difference (p=0) between participant origin and the place where participants buy their ticket, however, there is no difference between their reasons for buying the particular ticket and their origin.

How do you decide which ticket to buy?

	On the bus	Railway station	Online	Travel centre	On train	A local shop or paypoint store	Other
Convenience	79	34	6	9		1	2
Unsure when returning	22	12	1	4			
It's the best value for the travelling I do	138	36	30	19	4	1	2
I don't know what other tickets are available	5	1					
I use more than one operator	6	2					
I use a concessionary pass	37	5	4	120			16

Table 18: Cross tabulation – how do you decide which ticket to buy and where do you buy your ticket? (n=596)

3.6.5 Ticket Information Source

The respondents were also asked where they get their information regarding tickets and these responses are presented in Table 19. The most common responses were at the Travel Centre, online and at the Railway station. When asked if this information source is usually accurate (cross tabulated in Table 19), the majority of participants stated that their information source was usually accurate. The only sources which were seen to be inaccurate by any of the participants were online and at the bus stop, which had an accuracy rate of 87% and 81% respectively. The overall accuracy of ticket information was seen to be 97%. No significant difference has been found between the responses of the bus users and train users, or between people who live in Sheffield and people who live outside Sheffield.

Information source	Information accuracy	
	Yes	No
Traveline	7	0
On the bus	15	0
Online	33	2
At the railway station	30	0
Travel centre	55	0
On the train	1	0
At the bus stop	16	3
Word of mouth	10	0
Other	5	1

Table 19: Info source and accuracy (n=172)

3.7 Yorcard

Every respondent was asked if they had heard of Yorcard to establish the dissemination of the pilot in these early stages. The responses will be considered in terms of type of transport used to determine which group appears to have the most knowledge of the scheme. This can then feed into the marketing strategy for the project.

By looking at the responses as a whole in Figure 11 it is clear that the majority of participants had not heard of Yorcard. Figures 12, 13 and 14 demonstrate how the responses can be split into transport types used. Only 2% of train users had heard of Yorcard, however, this could be explained by the fact that the majority of train users are from outside Sheffield.

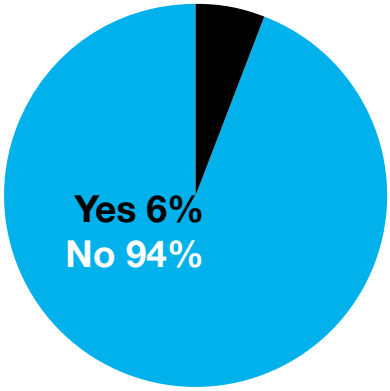


Figure 11: Have you heard of Yorcard (n=929)

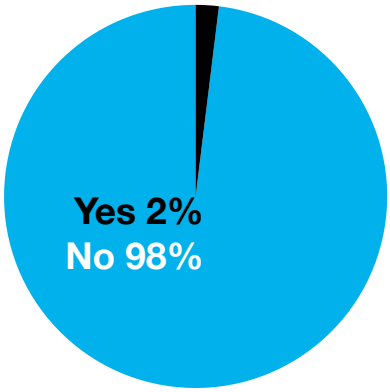


Figure 12: Train user (n=163)

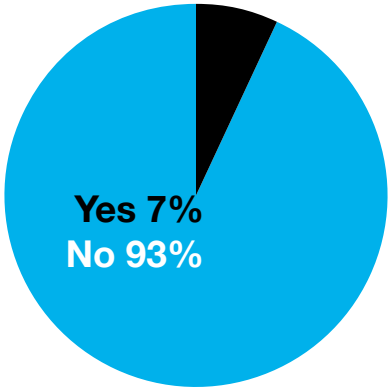


Figure 13: Bus user (n=394)

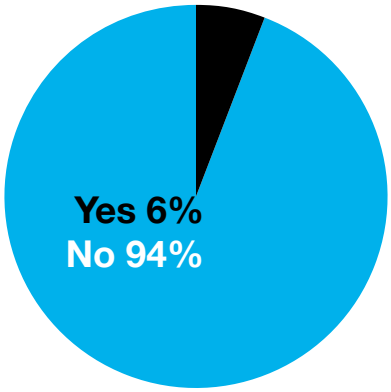


Figure 14: Non-user (n=372)

Summary and Conclusions

To date, the data collection has been completed and the resulting data has been entered into a database and cleaned for obvious coding errors. Initial analysis has established that the sample size was achieved; however there was some deviation away from the sub-targets but this has little effect on the overall robustness of the data collected. However, this initial analysis has highlighted where some areas could be improved to enable the collection of a more complete data set in future phases. For example, it should be ensured that permission is granted to spend more time carrying out the data collection in the school.

Overall, the sample size collected was in accordance with the methodology, with an even split of male and females and an age distribution which is a reasonable representation of the population within Sheffield. More non-users and bus users interviewed were from within the pilot corridor (S1 – S10) than outside the corridor. The majority of bus users interviewed were frequent users with the main journey purpose for bus users being for work and these participants tended to travel daily. The other main reasons for bus users were for education and shopping, however these participants tend to travel less frequently.
The majority of train users interviewed were from outside the pilot corridor and were infrequent users. The main journey purpose for train uses was for visiting family and friends and these participants tended to travel less than once a week.
Analysis has been carried out to establish the user and non-user opinion of public transport and ticketing. A summary of these results as presented in the report are below.

Public Transport Appeal
The results from the Public Transport Appeal section relate directly to a number of the Yorcard objectives including: reducing barriers to travel; reducing delays and improving reliability; enhancing the image of public transport; improving sales channels; and informing the business case. They also relate to the DfT objective of analysing the customer reaction and the customer experience throughout the pilot. A summary of the results from this section are presented below:

- The most popular reason for using a mode other than train and bus was convenience, followed by speed and cost savings respectively.
- For the statement 'I find it easy to buy tickets' most participants agreed with this; however, there are statistically significant differences between bus and train users and more bus users responded strongly agree than train users.
- For the statement 'I find it convenient to buy tickets' most participants agreed with this; however, there are statistically significant differences between bus and train users and more bus users responded strongly agree than train users.
- For the statement 'the tickets available are easy to use' most participants agreed with this; however, there are statistically significant differences between users and non-users where users are more likely to state that they agree or strongly agree with this statement.
- For the statement 'If it were easier to pay for tickets' most participants stated that this definitely would not encourage them to use public transport more or they had no view. There are statistically significant differences between users and non-users where non-users are more likely to state that this definitely would not encourage them to use public transport more. There are also statistically significant differences between bus and train users. Train users are more likely to respond more positively to this question.
- For the statement 'If the tickets were more secure' most participants stated that this definitely would not encourage them to use public transport more or they had no view. There are statistically significant differences between the type of tickets bought by users and their response to this question. Customers who buy return or day tickets and monthly passes are more likely to respond positively to this question.
- For the statement 'If there was a ticket available to suit your needs' most participants stated that they had no view. There are statistically significant differences between users and non-users where users are more likely to respond more positively to this question.
- When participants were asked what was the most frequent cause of delay the most frequent cause was seen as passengers not having their money ready followed by lots of people boarding

4.1 Limitations

Ticket Types and Purchasing
The section Ticket Types and Purchasing presents the results of the types of tickets purchased and the ways in which passengers obtain ticket information. This section also feeds into a number of the objectives including both of the DfT objectives mentioned above and also the Yorcard objectives, in particular 'improving the sales channels'. The summary of the results from this section are presented below:

- Most bus users surveyed buy single tickets on board the bus TIC because they see it as the most convenient and best value ticket.
- Most train users surveyed buy return tickets from the railway station, however a significant proportion also buy their tickets online and state that they do so as they see this as being the best value.
- Most participants obtain information about tickets from the TIC, online or at the railway station. The majority of participants found that this information was accurate.

It is recommended that the methodology and data collected are robust and, in order to keep the data consistent throughout the research, it is recommended that this methodology is re-used in Phases 3 and 4 when this Consumer Survey is scheduled for repeat, thus this report meets one of the research objectives of this Phase 1 Consumer Survey.

Limitations have been identified and therefore, further discussion and work may be required to elicit certain responses in later phases:

- Section 2 asked participants about their reasons for using a mode other than train or bus, which is useful for baselining user opinion, however, this question may have less benefit, and therefore use up valuable time, in later phases as there is no question relating to ticketing.
- It was evident through the responses to section 4 (Ticketing and Purchasing) that some of the participants were not answering the questions for their main public transport mode. It must be ensured that in future phases it is made clear to the participants that all questions now refer to their main mode of travel by public transport.
- As indicated above, some of the questionnaire wording may have been open to different interpretation by concessionary respondents. Therefore, prior to the next round of consumer research, the questionnaire should be fully reviewed and tested to ensure that any ambiguity is removed.
- Question 5(d) asks respondents what day they tend to travel. This question seemed superfluous especially since it is asked again slightly differently in 5(e). It is recommended that this question is removed both in this section and section 6 (which repeats the question but for train users).
- Question 5(f) asked participants if they use any of the routes affected by the Yorcard pilot. It must be reiterated to the participants that this question relates only to their most frequent journey.
- Overall the questionnaire was very long, which had a negative effect on the participants and therefore, the quality of the answers towards the end of the questionnaire could have been compromised.

4.2 Objectives

This study has met the objectives of the stakeholders involved in the Yorcard project. In particular, a number of existing performance measures have been taken prior to the introduction of smartcard ticketing. It is important that the measurements and information contained within this report are carefully monitored in future phases to establish if there are any key components driving any changes to customer perceptions and opinion of public transport. In addition, this report has provided some guidance as to what measurements can be used within business case models.

It is also important that this report is not taken in isolation and that the data from other research tasks are used to help support these findings wherever possible. This process will begin with the end of phase report for Phase 1.

This study has set out to meet the objectives of the stakeholders involved in the Yorcard project. In particular, this report documents the existing performance measures which have been taken prior to the introduction of smartcard ticketing. It is important that the measurements and information captured and reported by this study are carefully monitored in future phases to establish if there are key components driving any changes to the overall customer opinion.

In terms of meeting the objectives of this study it can be seen that this has been achieved as the analysis has identified and baselined the key measurements for comparison throughout this research project. The methodology developed has been demonstrated as robust, as it was developed based upon informing the following business case models identified in the Yorcard Pilot Acceptance Criteria, and is it recommended that it is used as a basis for repetition of measurements:

- The perception of boarding and journey times
- Ease of product purchase
- Customer support
- Public transport appeal; and
- To obtain results that will feed into the business case.

There are also elements of the Pilot Acceptance Criteria which will be introduced through the later phases as they relate directly to smartcards, such as, to monitor the ease of use of the new technology for customers and the customer acceptance of the smartcards. These elements will be elicited through direct questioning in Phases 3 and 4. It is also important that this report is not taken in isolation and that the data from other research tasks are used to help support these findings wherever possible.

The effects that smartcard technology could have in the future have been identified in this report and should be monitored throughout the later phases. The elements that have been identified could certainly have an effect on the following Yorcard objectives:

- Reducing the barriers to the use of public transport
- Reducing delays and improving reliability
- Enhance the image of public transport;
- Improve sales channels; and
- Informing the business case

This reporting process also informs the following DfT objectives and will be elaborated during the reporting process for Phases 3 and 4:

- Analysing the passenger reaction (b(3))
- An assessment of the Customer Experience (c)

The third DfT objective; to understand the value of new innovative ticketing products (d) will form part of the evaluation in future phases.

These Yorcard and DfT objectives are studied in more detail below in light of the results from this study.

Reducing Barriers to the Use of Public Transport
There could be a number of ways that the new technology could have an impact upon the barriers to using public transport. In terms of this study, it is important to analyse the reasons why non-bus and non-train users use other modes. However, in this study it is also important to analyse the perceptions of travelling by public transport, particularly in relation to the purchasing and use of tickets and passes as this is the area in which smartcards will have the largest impact and may be able to reduce the barriers to travel. The questionnaire asked specific questions which have been used to understand the customer opinion of the ease and convenience of using and buying tickets currently.

Further questions were also asked to determine whether certain changes would encourage customers to increase their use of either the bus or train, and thus reduce the barriers to travel. For example, a significant minority of users, and in particular train users, stated they would be more likely to travel by public transport if it were easier to pay for tickets. In the later phases questions will be used to gain more information about the participants' opinions of public transport ticketing, particularly the ease of use of Yorcard and how smartcards could reduce barriers to travelling by bus or train. The results for this objective could also potentially inform the DfT strategic objective to improve the accessibility of public transport.

Reducing Delays and Improving Reliability
This objective relates closely to the main DfT strategic objective to improve the punctuality and reliability of public transport. A question was used to determine the customer opinion of delays as a result of the boarding procedure. It was felt that the main cause of delays were passengers not having their money ready. Questions will be used in later phases to determine if this opinion of delays relating to boarding changes as a result of the introduction of smartcards, and also to determine if their overall perception of delays and reliability has improved.

Enhance the Image of Public Transport
This objective is very similar to the first objective, reducing barriers to the use of public transport. As with the first objective, questions will be included in the questionnaire and the focus groups in the later phases to determine if smartcards have improved the image of public transport. This may be as a result of the marketing campaign or otherwise.

Improve Sales Channels
Participants were asked in this study about the ease and convenience of buying tickets currently. In most cases, the response was agreed or strongly agreed that it was easy and convenient to buy tickets, however, this is not in comparison to buying and/or uploading products onto a smartcard. In later phases this question can be extended to specifically relate to paper ticket and Yorcard in order to compare the opinions of the payment process and determine if there are any improvements to the sales channels.

Business Case
At this stage the business case for Yorcard is yet to be defined and will become more apparent as the comparisons are carried out between this study, and the other Phase 1 studies, with the repeat studies carried out in the other phases. However, it is possible to make some predictions about how Yorcard could have an impact on the business case in light of this consumer survey study. For example, each of the objectives above could certainly feed into a business case for Yorcard, particularly if there is evidence of increased customer satisfaction.

Analysing the Passenger Reaction (DfT b.(3))
The study documented in this report and the process which will be followed during the following phases will feed into the analysis of the passenger reaction to this new media as questions monitoring passenger opinions of ticketing will be monitored through out each of the phases (Phases 1, 3 and 4) and will inform this analysis.

An Assessment of the Customer Experience (DfT c.)
The information from this study which will feed into this objective will be similar to the objective above; however, it will be more than just an assessment of the new media, it will include the customer (bus, train and non-users) opinion of the overall experience of the pilot both on and off the public transport. The monitoring of the public transport opinion allows the impact of smartcard ticketing to be assessed and observed. This will essentially allow the overall impact that Yorcard could have on customers to feed into an assessment of the customer experience.

Advice for the Business Case

At this stage, this study has enabled the baseline of customer opinions, both non-users and users, to be identified for comparison throughout the future phases. However, the business case is at its early stages of development and thus, the recommendations for rollout and deployment will be much more obvious as the results for the later phases are analysed. This will enable the identification of which factors Yorcard is likely to be able to influence.

The report explains how other factors can affect the data collected and thus, it is important to also monitor the other measurements which are highlighted as key for comparison through out the subsequent phases and are detailed in the Recommendations section.

Recommendations

This recommendations section is designed to highlight the lessons learned from this Phase 1 Baselining Consumer Survey. Any recommendations will feed into the subsequent phases of this research programme.

It was noted in the limitations section above that section 2 was useful for baselining the reasons why non-users use modes other than bus or train; however because this section is not directly related to smartcard ticketing and the main focus of this study, it is suggested that this section could be removed in later phases if the length of the questionnaire is an issue.

The questions in section 3 identified areas essential to the Pilot Acceptance Criteria, Yorcard and DfT objectives relating public transport appeal. In order to fully understand the customer response to these questions, it is suggested that in Phases 3 and 4, questions may be included which allow for more insight. In order to do this, the questionnaire must be analysed to determine where it would be possible to remove questions to avoid causing the time for completion to increase as it is already a long questionnaire. It is also recommended that the questions 'I have a ticket or pass to suit my needs' is discussed and reflected upon when developing the questionnaire in later phases.

The response to section 4 of the questionnaire suggests that some of the respondents were confused about the mode of transport they were answering the questions about. It must be ensured that in the subsequent phases the interviewers make it clear for the participants. Some of the questionnaire wording may also have been open to different interpretation by concessionary respondents and this will need to be reviewed prior to the next round of consumer research.

Sections 5 and 6 enable a lot of detail to be obtained about each of the users which is useful for the baseline. However, as this study specifically focuses on ticketing and public transport appeal it is suggested that these sections are significantly reduced in order to focus more upon passenger opinions of smartcards use, purchase and public transport appeal, including the ways in which to reduce the barrier to travelling by public transport.

Appendix

The following tables relate back to the figures presented in the Results and Analysis section.

Q5a. How many bus journeys do you usually make every week?	Q5b. The most frequent purpose for travelling by bus							Total
	Travelling to and from work	Shopping	Leisure	Visiting friends and family	Education	Travel to and from medical appointments	Other	
<1journey a week	4	9	7	6	5	2	1	34
1-3 Journeys per week	15	38	14	11	15	0	0	93
4-6 Journeys per week	24	18	7	7	22	1	0	79
7-10 Journeys per week	16	12	4	2	38	0	0	72
11 Or more journeys per week	42	14	15	4	31	0	0	106
Total	101	91	47	30	111	3	1	384

Table 1: Bus users, number of journeys per week against the purpose (see Figure 2)

Q5a. How many train journeys do you usually make every week?	Q5b. The most frequent purpose for travelling by train							Total
	Travelling to and from work	Shopping	Leisure	Visiting friends and family	Education	Travel to and from medical appointments	Other	
<1journey a week	5	8	13	46	5	4	1	82
1-3 journeys per week	12	8	16	12	3	0	0	51
4-6 journeys per week	8	1	5	4	0	2	1	21
7-10 journeys per week	4	0	4	0	2	0	0	10
11 or more journeys per week	1	0	1	0	1	0	0	3
total	30	17	39	62	11	6	2	167

Table 2: Train users, number of journeys per week against the purpose (see Figure 3)

	bus user		train user	
strongly disagree	2	1%	2	1%
disagree	9	2%	8	5%
no view	88	23%	57	35%
agree	136	35%	56	34%
strongly agree	153	39%	41	25%
Total	388	100%	164	100%

Table 3: Train and Bus users, 'I find it easy to pay for tickets' (see Figure 4)

	Bus user	Bus user	Train user	Train user
Strongly disagree	4	1%	3	2%
Disagree	22	6%	10	6%
No view	96	25%	59	36%
Agree	147	38%	63	38%
Strongly agree	118	30%	30	18%
Total	387		165	100%

Table 4: Train and Bus users, 'I find it convenient to pay for tickets' (see Figure 5)

	non user	non user	bus or train user	bus or train user
strongly disagree	5	1%	8	1%
disagree	1	0%	7	1%
no view	106	30%	50	9%
agree	108	30%	216	39%
strongly agree	139	39%	270	49%
Total	359	100%	551	100%

Table 5: Non users and Train and Bus users, 'The tickets available are easy to use' (see Figure 6)

	non user	non user	bus or train user	bus or train user
definitely not	167	44%	127	24%
probably not	57	15%	77	14%
no view	86	23%	190	35%
probably would	33	9%	78	14%
definitely would	34	9%	67	12%
Total	377	100%	539	100%

Table 6: Non users and Train and Bus users, 'If it were easier to pay for tickets' (see Figure 7)

	bus user	bus user	train user	train user
definitely not	106	28%	21	13%
probably not	54	14%	23	14%
no view	116	31%	74	45%
probably would	48	13%	30	18%
definitely would	52	14%	15	9%
Total	376	100%	163	100%

Table 7: Train and Bus users, 'If it were easier to pay for tickets' (see Figure 8)

Non user	Non user	Bus or train user	Bus or train user	Train user
Definitely not	96	26%	60	11%
Probably not	26	7%	33	6%
No view	102	27%	191	36%
Probably would	70	19%	116	22%
Definitely would	79	21%	132	25%
Total	373	100%	532	100%

Table 8: Non users and Train and Bus users, 'If there was a ticket available to suit my needs' (see Figure 9)

	live in Sheffield	live in Sheffield	live outside Sheffield	live outside Sheffield
single	67	29%	40	16%
free concessionary pass	46	20%	88	34%
40p concessionary pass	26	11%	13	5%
return or day ticket	63	27%	67	26%
weekly, monthly or longer period ticket	29	13%	50	19%
Total	231	100%	258	100%

Table 9: Cross tabulation of type of ticket usually used by participant origin (see Figure 10)

Glossary

Bus-user - A participant who predominantly uses bus transport

Train-user - A participant who predominantly uses train transport

Non-User - A participant who is neither a predominant bus or train user

Pilot Acceptance Criteria - A number of targets and measurements that have been set prior to the collection of data that will inform business cases and future development of the Yorcard project

Statistical Significant (P=0) - Statistical tests have been used to determine statistical differences in opinion and are presented in this report. A p value has been generated from each test. When $p<0.05$, it indicates that the result is statistically significant at the 5% level and the null hypothesis is rejected. When $p>0.05$, it indicates that the result is not statistically significant at the 5% level and the null hypothesis is accepted. P is short for probability, the term 'statistically significant' means probably true and not due to change.

For a full glossary please refer to the Yorcard General Reference Document (reference YC-IGO-RES-902).

RES704 Phase 1: Baselining - End of Phase Report

Contents

1.0 Introduction

2.0 Methodology & Planning Review

3.0 Analysis of Phase 1 Data

This report has been produced by Newcastle University for South Yorkshire Passenger Transport Executive under a contract with the Department for Transport. Any views expressed in this report are not necessarily those of the Department for Transport.

4.0 Summary & Review of Objectives

5.0 Appendices

Executive Summary

The Yorcard Project is intended to deliver a multi-modal, multi-operator public transport smartcard scheme to be trialled on certain buses in Sheffield and on the local train service between Sheffield and Doncaster and intermediate stations.

This report presents:

- A summary of the deliverables forming the contract between DfT and SYPTE
- How each deliverable was completed, and how progress was made throughout Phase 1
- A review of DfT and Yorcard objectives and how objectives have been met
- A review of the methodologies used including the limitations, risks and issues that arose during the Phase 1 work
- The findings from Phase 1 that are common across different studies
- Recommendations for the future delivery of the Yorcard research programme

Introduction

1.1 Background

The Yorcard Project is intended to deliver a multi-modal, multi-operator public transport smartcard scheme to be trialled in part of the South Yorkshire area during 2008. The scheme is intended to offer certain commercial and concessionary ticket products in 'Smart' format and is built to the ITSO standard (ITSO.co.uk, 2008). Yorcard Limited has procured all the hardware, software and services required to enable the successful implementation of a Pilot scheme. The Pilot is being trialled on the services of three bus operators in the S10 area of Sheffield and on Doncaster to Sheffield rail services including intermediate stations. The Yorcard Pilot aims to issue up to 30,000 smartcards for use on these services.

This Yorcard Phase 1 End of Phase Report sets down the outputs forming part of a research contract between the South Yorkshire Passenger Transport Executive (SYPTE) and the Department for Transport (DfT), Transport Technology and Standards Division. An overview of the tender can also be found in the General Reference Document.

The purpose of this report is therefore to provide an evaluation of the results from the first three Phase 1 reports and determine any cross-over between the findings. It is also the purpose to review the delivery of the Phase and identify any lessons learned from a practical perspective regarding the management of the Phase and how this could be improved in the future.

1.2 Summary of Deliverables

The intention of Phase 1 was to baseline measurements that would be tracked throughout the life of the Yorcard Pilot to enable monitoring of change and evaluation of the scheme. There were 4 primary deliverables in Phase 1:

- A boarding time study
- An equipment user study:
  - With Travel Information Centres (TICs)
  - With bus drivers
- A bus and train consumer (passenger) and non-user survey
- And this end of stage report

1.3 Review of Progress of Deliverables

The requirement of data collection was that all data must have been collected before any part of the Yorcard Pilot was installed and preferably before any training was undertaken by equipment users. The original Stage Plan was that all operators would have been live before the end of October 2007, and therefore the majority of data collection was planned between May and September 2007.

However, there was a significant delay in implementation. The project moved from a 'big bang' implementation, with all operators live at the same time, to staggered implementation dates with all operators having different start dates. Although this meant that resources had to be deployed differently, there were some real benefits:

- It allowed more time to refine methodologies and ensure data collection was robust
- It allowed more time to go through a formal approvals process

All primary data were collected within the stated timescales to collect before implementation and therefore the study objective has been met. With the exception of not conducting a focus group for MASS drivers[1], all data were collected within the stated timescales in the approved methodology statements.

[1] *This was because planned dates for data collection fell in the academic holidays when MASS drivers were not easily accessible.*

1.4 Review Against Budget

The costs were within acceptable limits for the Phase. To ensure that sufficient data quality was obtained, it was necessary to add incentives to bus drivers of £50 per bus operator (£150 total) by means of a prize draw for all completed questionnaires returned.

1.5 Meeting DfT Objectives

The DfT have stipulated the following objectives as part of the tender specification:

a. All elements of the pilot scheme shall be fully compliant to the prevailing ITSO documentation.
b. Conduct a robust analysis of (1) bus boarding times, (2) Systems performance and (3) passenger reaction to address the concerns of all key stakeholders involved in the rollout of smartcard technologies within a deregulated transport industry. This should provide a comparison of existing performance measures prior to the introduction of smartcards to the pilot area.
c. The research shall assess the Customer Experience and the Operator and PTE expectations and provide recommendations for rollout. Included within this analyses shall be a study of the business case for deployment of similar regional schemes.
d. To understand the value of new innovative ticketing products to the key stakeholders
e. To understand the value of using Citizen cards as an alternative to transport only smartcards.
f. To ensure that all deliverables are clear, concise, accurate, thorough, of a high technical quality and well written.
g. The research shall complement the Yorcard pilot timetable.

This report must therefore evaluate how the relevant objectives will be met.

1.6 Meeting Yorcard Objectives

It is also important to consider the objectives of Yorcard and its stakeholders. This report will consider how the 6 most relevant objectives are likely to be influenced by Yorcard:

- Reduce barriers to the use of public transport;
- Reduce delays and improving reliability;
- Reduce fraud of all types;
- Enhance the image of public transport;
- Improve sales channels; and
- Inform business cases.

The remaining objectives are predominantly technical and will be evaluated in other phases of this research work. Please refer to the General Reference Document for the full list.

Methodology & Planning Review

2.1 Introduction

This section reviews the methodology used for each deliverable in this phase and explores how the processes for delivery of future phases of this research project can be improved.

2.2 Supply of Data by Participant Operators

It is acknowledged that the supply of data to support the boarding time study has taken time to specify, collect and evaluate the usefulness of this data. This has resulted in the requirement to undertake a control group study to baseline boarding time by ticket type. The results of this exercise should be available in April 2009 and in time to be able to compare against the data collected in other Phases.

2.3 Risks & Issues

The following risks were identified as relevant to Phase 1:

- The SYPTE framework agreement does not support the research timelines or budget.

  Local researchers were planned to be employed through framework agreements in place with SYPTE. The lead times were long in some cases and may not have supported work at short notice. It was resolved by Newcastle University taking ownership of local resources - CLOSED.

- Newcastle University does not have an agreed plan for delivery of the research and there is no contract in place

  Newcastle University are a subcontractor of S&B. It took time for a formal agreement to be put in place and some work was undertaken at risk by Newcastle University. Ways of Working have been discussed and arrangements put in place – CLOSED.

- Primary data for the baselining phase could not be collected.

  This was a result of the contract issue – CLOSED.

The following Issues were identified as relevant to Phase 1:

- The project does not currently have an agreed PID to inform of measurements to be taken and internal controls

  PID was agreed and controls put in place - CLOSED

- The Customer Experience Group (CEG) is currently not re-established

  The CEG was not reformed. A Yorcard Working Group was established to oversee the work and approve documentation - CLOSED

- The tasks during the baselining phases are conducted during the summer months where school children and students will not be travelling or accessible for focus group work.

  Boarding time data collection was staggered and included term time activity. Focus groups were run in schools - CLOSED

- The terms of the Data Share Agreement make it difficult to practically present data obtained through this research project.

  The format of the Data Book has been approved, and work is progressing to supply the data required.

2.4 Lessons Learned

Project based lessons learned relating to the delivery of the Yorcard project in general will be presented in a Pilot Evaluation Report as part of this research work. Research based lessons learned relating to planning and delivery were:

- The research documentation did not always have adequate quality checks in place. This resulted in the first report released not meeting requirements. This was addressed by putting a checklist in place for document review and by developing standard templates.

- Research outputs must always be referred to the study objectives and the wider objectives of the DfT (in terms of the research contract) and Yorcard. The evidence provided in the reports should support each relevant objective.

Analysis of Phase 1 Data

3.1 Summary of Analysis

The results presented in this section are relating to the findings in Phase 1 reports that reference any impact to other studies, or report common results found in other studies. This is analysed below, and should be monitored in future phases. Summary tables of the key findings relative to the Yorcard and DfT objectives are shown at Appendices 1 and 2.

3.2 Bus Stop Dwell Time

Bus Stop Dwell Time is the total time that the bus is at a particular stop and, in terms of the analysis, the effect of Yorcard on this time could have the greatest impact for the operator. The equipment user report identified that there are 3 processes of using the ETM that may impact on Boarding Time and therefore Dwell Time:

- Un-jamming ticket rolls
- Changing ticket rolls
- Issuing paper tickets with wallets

These are all factors that should be monitored in the future with regards to both the changing equipment and any difference in the elements comprising Dwell Time, because these factors could be affected by introducing smartcard technology on buses.

3.3 Perceptions of Delay

There was an agreement in both the bus driver survey and the consumer survey that passengers not having their fare ready is perceived as being the main cause of delay on the bus. Passengers paying with notes was also high on the ranking scale being 2nd for passengers and 3rd for bus drivers. This requires careful monitoring in both studies in future phases and could have a positive impact on Bus Stop Dwell Times in future. It should also be noted that the implementation of smartcards may not be the catalyst for changing this, but could help in certain circumstances.

Summary & Review of Objectives

4.1 Introduction

The analysis carried out for this report has enabled the identification of the important calculations to compare throughout this research project. Each of the measurements identified in this report will be taken in turn to highlight and summarise the important findings in relation to the objectives. This will also identify which measurements are important for comparison in future phases of this research programme.

4.2 Limitations

Limitations have been identified and therefore, further work may be required to continue to deliver high data quality in later phases. The limitations are as follows:

- It was noted after the completion of the data collection that a figure for the alighting time (from when the first passenger alights to when the last) needed to be calculated. Additional data were collected and the results annexed to the Boarding Time Report.
- At present ticket type information, which will enable the calculation of the average Boarding Time for passengers using a smartcard, is unavailable. The methodology is to be changed in the future and a baseline drawn using a control group. This data is planned to be available for reporting in Phase 3.
- Certain questions from the consumer questionnaire were ambiguous and open to different interpretation by some respondents. Although the questionnaire was tested and reviewed by Yorcard stakeholders, this issue was not foreseen and therefore limits the quality of data obtained. The questions in future phases are to be amended to rectify this issue.

4.3 Objectives

It is important that this report is not taken in isolation and that the data from other research tasks are used to help support these findings wherever possible. This process will begin with this end of phase report for Phase 1.

This study has set out to meet the objectives of the stakeholders involved in the Yorcard project including DfT. In particular, this report documents the existing performance measures which have been taken prior to the introduction of smartcard ticketing. It is important that the measurements and information captured and reported by this study are carefully monitored in future phases to establish if there are key components driving any changes to the overall Bus Stop Dwell Time.

Reducing Barriers to the Use of Public Transport
There could be a number of ways that the new technology could have an impact upon the barriers to using public transport. Many suggestions were presented in the consumer survey report including ascertaining differences between non-public transport users and bus and train users and the purchase and use of tickets. For future phases, it is also important to understand the barriers to travel and how using smartcards may or may not have made this easier.

Reducing Delays and Improving Reliability
This objective relates closely to the main DfT strategic objective to improve the punctuality and reliability of public transport. As with the previous objective, if there are reductions in Bus Stop Dwell Time as a result of the introduction of smartcard ticketing, then this could have a positive impact upon the reduction in delays and improving the overall reliability of journey times. It was found that the foremost perception of delays at the point of boarding is because of passengers not having their money ready, and this could change with smartcard use.

Business Case
At this stage the business case for Yorcard rollout is yet to be defined and will become more apparent as the comparisons are carried out between this study and the other phase 1 studies with the other repeat studies carried out in the other phases. However, it is possible to make some predictions about how Yorcard could have an impact on the business case in light of the equipment user study. For example, each of the objectives above could certainly feed into a business case for Yorcard, particularly if there is evidence of time savings and increased customer satisfaction.

Analysing the Bus Boarding Time (DfT b.(1))
A full analysis of the components of Bus Stop Dwell Time, including Bus Boarding Time, have been fully documented and the same processes will be followed in future Phases. It is not entirely clear at this stage which of the different measurements presented in the Boarding Time Report are key to developing the business case. Phase 1 included the calculation of 6 different measurements of Bus Dwell Time and its components, and the key measurements should become more apparent in Phases 3 and 4.

Analysing the Passenger Reaction (DfT b.(3))
The passenger reaction was measured in Phase 1 and will provide the baseline to which reactions to smartcard technology can be compared. The data collected enabled a baseline to be captured relative to their reaction of using the then current paper based ticket regime, and will be used to monitor the passenger reaction in future phases. In total, 946 people were interviewed and included a mix of bus users, train users and non-public transport users.

An assessment of the Customer Experience (DfT c.)
The customer experience has been baselined in the same way as the passenger reaction, and will be assessed further in future phases. This assessment focussed more on the customer perceptions and can tie in with the passenger reaction and operator expectations in developing recommendations for the roll out of a large regional smartcard scheme.

An assessment of the Operator expectations (DfT c.)
The monitoring of the Bus Stop Dwell Time, and its component parts, allows the impact of smartcard ticketing to be assessed and observed. This will essentially allow the overall impact that Yorcard could have on bus operation to feed into an assessment of the operator expectations. Using the results of the bus driver survey could help to support any changes in these times, and will help to understand other business case benefits such as an estimation of the level of fraud. It has already been noted that the consumer survey could also support what has been presented in other reports in terms of what causes delays on the bus.

4.4 Advice for the Business Case

At this stage, this task has enabled the identification of the measurements to compare throughout the future phases, an example being the Average Dwell Time (34.25sec). However, the business case is at its early stages of development and thus, the recommendations for rollout and deployment will be much more obvious as the results for the later phases are analysed. This will enable the identification of which factors Yorcard is likely to be able to influence.

The studies undertaken during Phase 1 have captured a number of baseline measurements as part of the passenger and operator perceptions and expectations that can be monitored in the future phases. This will enable the impact on the business case(s) to be evaluated for both the touch on and the touch on/touch off environments on bus, and subsequently provide the basis to provide recommendations for a wider scheme roll out.

4.5 Recommendations

The data collection and evaluation for Phase 1 has been completed. The analysis presented in the Phase 1 reports has provided robust results suggesting that the data collected are reliable.

Recommendations appropriate to each deliverable have been made in each respective report. Moreover, it has been noted in this report that there have been some findings in both the equipment user and consumer surveys that there is a perception that people not having their money ready is the biggest cause of delay on the bus. It is recommended that this is carefully monitored in future Phases, and if any change to these perceptions are as a direct result of the use of smartcard technology.

It is also recommended that there is a more detailed evaluation regarding the impact of the results on a regional scheme roll out once the key measurements have been identified. This may require more involvement from the Yorcard Stakeholders regarding the impact, but will enable a full and balanced evaluation for the Best Practice Final Report.

Appendices

Appendix 1 - Summary of the analysis of Yorcard Objectives

		Study Deliverable		
	Objective	Boarding Time	Equipment User	Consumer
1	Reduce barriers to the use of public transport	Important to measure in the future in terms of dwell time and monitor in terms of journey time. A perception of faster dwell times through faster boarding times may be more appealing to consumers.	If equipment is difficult to use, it could impact on the customer experience. Potential benefit is less driver to passenger interaction time.	More secure tickets and being easier to pay for tickets were cited as being key reasons for increasing journeys for regular users, particularly rail users.
2	Reduce delays and improving reliability	As (1) above.	As (1) above and that most time consuming tasks were related to paper based tickets and passengers not having their money ready.	Passengers not having their money ready was the most common perception of on-bus delays and supports the findings of the equipment user survey.
3	Reduce fraud of all types	N/A	Smartcard ticketing is potentially a more reliable way of validating tickets.	N/A
4	Enhance the image of public transport	N/A	N/A	Will be understood in future phases.
5	Reduce administrative costs	N/A	N/A	N/A
6	Improve sales channels	N/A	N/A	Will be understood in future Phases.
7	Improve MTC revenue distribution by providing more accurate information on journey lengths	N/A	N/A	N/A
8	Prove ITSO compliant equipment and operational protocols in a major scheme	N/A	N/A	N/A
9	Integrate with Real Time Information	N/A	N/A	N/A
10	Inform Business Cases	To be discussed in later Phases.		

N/A in this context (and for the next table) means not applicable in terms of this Phase and study output.
The full research programme will deliver against each objective for the Best Practice Final Report in Phase 7.

Appendix 2 - Summary of the analysis of DfT Objectives

		Study Deliverable		
	Objective	Boarding Time	Equipment User	Consumer
a	All elements of the pilot scheme shall be fully compliant to the prevailing ITSO documentation.	N/A	N/A	N/A
b	Conduct a robust analysis of (1) bus boarding times, (2) Systems performance and (3) passenger reaction to address the concerns of all key stakeholders involved in the rollout of smartcard technologies within a deregulated transport industry. This should provide a comparison of existing performance measures prior to the introduction of smartcards to the pilot area.	A robust baseline has been provided, resulting in the calculation of 6 different times that are components of Dwell Time (including several calculations of bus Boarding Times). Therefore, the performance measures prior to the introduction of smartcards have been taken.	The surveys undertaken have enabled the bus operators and SYPTE understand some of the concerns relating to staff operations. Further evaluation, and some different data collection, is to be undertaken in future Phases.	Passenger reactions and perceptions of the paper based ticketing regime have been captured, including some ideas about what ticketing improvements would be required to increase passenger journeys, and perceptions of delays.
c	The research shall assess the Customer Experience and the Operator and PTE expectations and provide recommendations for rollout. Included within this analyses shall be a study of the business case for deployment of similar regional schemes.	Similar to (b) above. It is not yet clear exactly what should be included in the business case evaluation however, a number of measurements have been taken to enable a full and detailed evaluation.	Some key findings have been presented in the report, particularly regarding time consumption of certain tasks and perceptions of delays, fraud and security that can be monitored in future Phases and will help to provide recommendations for the roll out of similar regional schemes.	Similar to (b) above. The customer experience of the paper ticket regime has been captured. The experience will be monitored and compared in future Phases, and relevant costs, benefits and recommendations will be presented in the Best Practice Final Report in Phase 7.
d	To understand the value of new innovative ticketing products to the key stakeholders.	To be discussed in later Phases.		
e	To understand the value of using Citizen cards as an alternative to transport only smartcards.	To be discussed as part of Phases 6 and 7.		
f	To ensure that all deliverables are clear, concise, accurate, thorough, of a high technical quality and well written.	Clear reports have been written based on a template agreed by research stakeholders.		
g	The research shall complement the Yorcard pilot timetable.	All data were collected prior to smartcard technology being installed on bus enabling the baseline to be accurately defined.		

RES801 The Yorcard Data Book: **Phase 1**

Contents

This report has been produced by Newcastle University for South Yorkshire Passenger Transport Executive under a contract with the Department for Transport. Any views expressed in this report are not necessarily those of the Department for Transport.

3.0 Calenday of Events

4.0 Results

1.1 Additions to this version of the Data Book

This is the first Data Book for the Yorcard project, and includes a summary of the data collected during the Phase 1 surveys (boarding time, consumers, drivers and TIC staff).

The Data Book also includes an incident report and calendar of events, information on patronage figures for the pilot routes used in this Yorcard project on local trains between Sheffield-Doncaster, and monthly weather reports from July 2007 to April 2008.

Executive Summary

1.2 Summary of Data Interpretation

The data collected during Phase 1 has been used to establish a baseline scenario against which the results of future phases will be compared, in order to measure and monitor the impact of the introduction of the Yorcard smartcards.

1.3 Effects of the Calendar of Events

There does not appear to be any significant impact of the events included in the Calendar of Events upon the data collected or on patronage levels throughout Phase 1. Comparisons will be made between Phases as the Yorcard project progresses to ascertain whether there are any external events which could have had an impact upon operational performance, patronage and thus influence the results of any data collection exercises.

An analysis of the operational conditions (location, time of day and weather) can be found in the respective Phase 1 Boarding Time Study (reference YC-IGO-RES-701).

1.4 Content of the Next Data Book

The following Data Book will contain similar reports and analysis derived from the data collected during the respective Phase 2 studies.

Smartcards were only introduced to a limited number (69) of school children on 19th February 2008 (approximately halfway through the duration of Phase 2). Therefore it is not possible to infer any impacts of the introduction of Smartcards at this early stage. Data collected in future phases will allow for a comparison of the operational impacts and benefits of the introduction of Smartcards to be measured and monitored, and a greater discussion will be included in future Editions.

The Data Book – Background & Introduction

2.1 Scope of the Data Book

The Yorcard Project was intended to deliver a multi-modal, multi operator public transport smartcard scheme to be trialled in part of the South Yorkshire area during 2008. The scheme is intended to offer certain commercial and concessionary ticket products in 'Smart' format and is built to the ITSO standard. Yorcard Limited has procured all the hardware, software and services required to enable the successful implementation of a Pilot scheme. The Pilot is being mounted on the services of three bus operators in the S10 area of Sheffield and on Doncaster to Sheffield rail services. Details of the Yorcard project and the research programme can be found in the research General Reference document.

This Yorcard Data Book is the document that sets out detail results of the outputs of the Pilot for use by Yorcard Project Stakeholders and other public and private sector participants. It is also available for use by any organisation that is considering implementing either a new ITSO compliant public transport smartcard scheme, or those considering the extension or upgrade of an existing smartcard scheme, in accordance with the conditions for circulation set down from time to time.

The Yorcard Data Book sets down the consolidated outputs of a research contract between the South Yorkshire Passenger Transport Executive (SYPTE) and the Department for Transport (DfT) Transport Technology and Standards Division.

The scope of the Data Book is to facilitate:

- Evaluation of the success of Yorcard Pilot by individual stakeholders on both technical and commercial grounds and thus to:

- Inform both public and private sector business cases for the expansion of the system to full roll out in South and West Yorkshire across all modes of transport.

- Informed discussions with potential funding organisations.
- Negotiations with Scheidt and Bachmann (primary supplier) under the terms of the Supply and Service Agreement entered into in 2007 with a view to the full roll out.

The Data Book is prepared in such a manner that:

- It complies with the terms set out in the Yorcard 'Participation Agreements';
- It enables commercially confidential data to be protected; and
- It complies with all current competition legislation at the time of initial preparation and that it can be adapted during the currency of the Pilot period should there be any change to or judicial interpretation of such legislation howsoever arising.

Calendar of Events

3.1 DataCollection Methodologies

The Calendar of Events started in June 2007 and shows occurrences of any and all of the following so far as information is available. Primary events listed in the Calendar include the following:

- Major road incidents (roadworks, accidents, exceptional traffic levels and congestion);
- Delays to the Public Transport networks (engineering works, route diversions);
- Alterations to Public Transport services (timetable changes, route revisions, ticketing, ENCTS introduction, marketing, information and associated promotions);
- Special calendar dates (public holidays, school and university holidays, religious days, industrial action);
- Yorcard data collection dates;
- Yorcard project milestones; and
- Exceptional meteorological events (heavy rain, snow)

3.2 Calendar of Events

The following table show key events and any significant meteorological conditions which could have had an impact on services during the data collection for this Phase.

Date(s) and time(s)	Event
w/c 09 July 2007	Boarding time phase 1 data collection
21 July 2007	Schools begin summer holidays
01 August 2007	Consumer focus group phase 1 data collection
07 August 2007	Bus driver focus group data collection
08 August 2007	Consumer focus group phase 1 data collection
22 August 2007	TIC focus group phase 1 data collection
03 September 2007	New school year begins
24 September 2007	Sheffield Hallam University term starts
01 October 2007	Sheffield University term starts
w/c 22 October 2007	Boarding time phase 1 data collection. Bus driver surveys phase 1 data collection completed
27 October 2007	Schools begin half term holidays
29 October 2007	Sheffield Free City Bus service launched
11 November 2007	Stagecoach take over East Midlands rail franchise
18 November 2007 (PM)	Road closures in Sheffield city centre for city lights
w/c 03 December 2007	Boarding time phase 1 data collection. Consumer questionnaire phase 1 data collection
09 December 2007	Rail winter timetable comes into effect. National Express take over East Coast rail franchise
22 December 2007	Schools begin Christmas holidays
23 December 2007	Sheffield University begin Christmas holidays
24 December 2007	Sheffield Hallam University begin Christmas holidays
25 December 2007	Christmas day
26 December 2007	Boxing day public holiday
01 January 2008	New Years Day public holiday
05 January 2008	FirstGroup increase most fares and tickets following fares review
05 January 2008	TravelMaster prices change
22 January 2008	Sheffield University begin break
25 January 2008	Stagecoach increase frequency of service 52 to every 7 minutes (from every 10 minutes) and introduce new £1 flat single fare
27 January 2008	Stagecoach increase weekly Megarider from £9.50 to £10 and Dayrider from £2.70 to £3
28 January 2008	Stagecoach service 120 ends service at 2100
09 February 2008	Schools begin half term holidays
19 February 2008†	**Go Live with MASS services 671 and 696. 69 smartcards issued with Zero Fare Passes (using TYP16 IPE) to pupils at Notre Dame school**
21 February 2008	19-21 TravelMaster launched (county wide)
27 February 2008	Fulwood road blocked
13 March 2008	TIC Questionnaire Phase 1 data collection - questionnaires issued
13 March 2008	Sheffield Free City Bus carries 100,000 passengers
15 March 2008 (PM)	Meadowhall closed due to bomb scare – interchange evacuated
16 March 2008	Sheffield University begin Easter holidays
16 March 2008	Sheffield city centre closed 0900 until 1330 for Sport Relief fun run. Diversions in place and some stops not being used.
17 March 2008	Sheffield Hallam University begin Easter holidays
20 March 2008	Schools begin Easter holidays
21 March 2008	Good Friday public holiday
24 March 2008	Easter Monday public holiday
25 March 2008	Diversion (2 weeks) of service 52 due to temporary closure of Woodhouse terminus
26 March 2008	Delays on Leeds – Sheffield rail lines for most of the day caused by signalling problems and a vehicle hitting a bridge
28 March 2008	Improved park and ride service launched serving hospitals and Sheffield University
30 March 2008	Implementation of new ticket range at Stagecoach
30 March 2008	(AM - overrun to early PM)
31 March 2008	Sheffield Hallam University return from Easter holidays
01 April 2008	Article in trade magazine Transport Times on smartcards and refers to Yorcard
07 April 2008	Sheffield University return from Easter holidays
w/c 21 April 2008	Phase 1 data collection – additional boarding time surveys

Table 1 – Calendar of Events occurring during Phase 1

1. Data collection dates have w/c and the first Monday to avoid any issues regarding reporting of sensitive data and if data collection was multiple days in a week.
2. Yorcard project milestone dates in bold italics.
† Stagecoach went live with smartcards on 28 April 2008 (services 52 and 120)
† First went live with smartcards on 01 September 2008 (service 52)

3.3 Summary of Monthly Weather Reports

A daily weather report was obtained from Weston Park weather station, the official climatological station in Sheffield. The following tables present a monthly summary of the weather conditions throughout the data collection for this Phase, with more detailed data and discussion occurring in other reports.

July 2007 Summary	Temperature (Max.)	Temperature (Min.)	Temperature (Max. & Min.)	Rain (mm)	Sunshine (Hours)
Monthly Total	-	-	-	113.0	178.5
Monthly Average	18.8	12.2	15.5	3.6	5.8
Long Term Trend	20.8	12.4	16.6	51	195

August 2007 Summary	Temperature (Max.)	Temperature (Min.)	Temperature (Max. & Min.)	Rain (mm)	Sunshine (Hours)
Monthly Total	-	-	-	27.1	221.8
Monthly Average	19.6	12.2	15.9	0.9	7.2
Long Term Trend	20.5	12.1	16.3	63	183

September 2007 Summary	Temperature (Max.)	Temperature (Min.)	Temperature (Max. & Min.)	Rain (mm)	Sunshine (Hours)
Monthly Total	-	-	-	28.1	158.5
Monthly Average	17.6	10.5	14.0	0.9	5.3
Long Term Trend	17.3	10.1	13.7	64	131

October 2007 Summary	Temperature (Max.)	Temperature (Min.)	Temperature (Max. & Min.)	Rain (mm)	Sunshine (Hours)
Monthly Total	-	-	-	23.3	109.4
Monthly Average	14.0	8.1	11.0	0.8	3.5
Long Term Trend	13.3	7.1	10.2	74	87

November 2007 Summary	Temperature (Max.)	Temperature (Min.)	Temperature (Max. & Min.)	Rain (mm)	Sunshine (Hours)
Monthly Total	-	-	-	58.3	75.6
Monthly Average	10.3	5.0	7.7	1.9	2.5
Long Term Trend	9.2	4.2	6.7	78	53

December 2007 Summary	Temperature (Max.)	Temperature (Min.)	Temperature (Max. & Min.)	Rain (mm)	Sunshine (Hours)
Monthly Total	-	-	-	74.9	39.4
Monthly Average	7.2	2.4	4.8	1.3	2.4
Long Term Trend	7.2	2.6	4.9	93	35

January 2008 Summary	Temperature (Max.)	Temperature (Min.)	Temperature (Max. & Min.)	Rain (mm)	Sunshine (Hours)
Monthly Total	-	-	-	154.0	43.6
Monthly Average	9.0	3.9	6.5	5.0	1.4
Long Term Trend	6.5	1.6	4.1	87	43

Results

4.1 Bus Patronage

Bus patronage is not included in this Edition of the Yorcard Data Book. At the time of writing there is an issue regarding the transfer of data between devices in the operating environment. As a result, bus patronage will be provided following supplier resolution of the issue.

4.2 Rail Patronage

Figures represent the scaled number of tickets sold per month for travel between stations on the pilot route which are fitted with Yorcard equipment (Sheffield, Meadowhall, Rotherham Central, Swinton, Mexborough, Conisborough and Doncaster) only. Figures are based upon a sample of less than 1% of journeys which are then scaled up to estimate the total numbers.

Passengers travelling on this line as part of a through journey (e.g. Leicester to Grimsby via Sheffield) are not included.

Source: SYPTE monitoring origin and destination surveys.

2007

Ticket Type	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07
Adult Return	-	-	-	39,166	34,817	21,172	35,362	48,675	34,185	34,981	41,118	39,425
Adult Single	-	-	-	15,379	17,410	9,613	14,808	24,516	17,137	14,075	15,985	17,281
Child Concessions	-	-	-	7,321	9,804	6,019	8,068	10,659	9,556	6,048	7,791	8,440
Child Non Concessions	-	-	-	25,594	23,863	17,382	31,841	34,432	28,021	24,213	26,664	18,791
Other	-	-	-	0	0	0	300	0	0	190	0	0
Pre-Paid (Other)	-	-	-	18,212	17,372	10,215	10,717	20,192	9,784	13,275	9,670	11,383
Pre-Paid (PTE)	-	-	-	43,066	40,101	22,175	35,066	61,058	37,871	39,248	57,575	34,773
Unknown	-	-	-	772	237	964	67	264	609	189	1,618	5,517

2008

Ticket Type	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08
Adult Return	33,916	39,988	33,448									
Adult Single	14,999	15,712	16,478									
Child Concessions	10,197	10,153	7,796									
Child Non Concessions	20,563	27,907	30,393									
Other	603	174	639									
Pre-Paid (Other)	11,560	13,938	14,030									
Pre-Paid (PTE)	38,835	49,429	48,865									
Unknown	803	242	1,249									

4.3 Service Performance Outputs

This section will report on the research outputs.

Boarding Time

	Boarding Time Measurement (see below)	Average (Mean) (Sec.)	Standard Deviation (Sec.)	Buses Observed (no.)	Minimum (Sec.)	Q1 (Sec.)	Median (Sec.)	Q3 (Sec.)	Maximum (Sec.)
With Other Factors	A	34.25	72.52	1049	2.66	10.9	18.71	34.07	1884.03
Data without Other Factors	A	28.66	68.06	965	2.66	10.19	17.95	29.34	1884.03
	B	23.78	34.95	965	0.4	8	14.67	26.01	596.66
	C	5.76	9.22	965	0.4	2.47	4.16	6.6	241.98
	D	10.47	23.82	254	0.6	3.83	6.07	9.92	268.35
	E	9.51	19.21	128	0.6	3.52	6	10.69	212.48
	F	19.79	37.63	448	0.47	3.35	8.01	22.32	568.6
	G	2.91	2.37	254	0.24	1.21	2.25	3.8	15.3
	H	9.34	6.32	34	3.31	4.75	6.55	11.57	24.4
	I	7.57	1.83	16	5	6.12	7.01	9.4	10.94
	J	18.95	10.76	161	3.79	11.66	17.56	23.9	62.43
	K	2.44	0.76	94	1.42	1.89	2.27	2.94	5.56

Boarding Time Measurements

A	Dwell Time	G	Boarding Time (2) per boarding passenger (no alighters)
B	Average Bus Stop B/A time	H	Average Alighting Time (1)
C	Bus Stop B/A time per B/A passenger	I	Alighting Time (1) (no boarders)
D	Average Boarding Time (1)	J	Average Alighting Time (2)
E	Boarding Time (1) (no alighters)	K	Alighting Time (2) per alighting passenger (no boarders)

Consumer Survey

Section 1 – About You

Base = All Respondents. Phase 1 = 946

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
5a	Putting aside traffic delays, do you find it easy to keep to the bus timetable?	Yes	133	80%						
		No	34	20%						

Q'n No	Question	Answer	Phase 1	Phase 2	Phase 3	Phase 4
			Mean	Mean	Mean	Mean
			Median	Median	Median	Median
			Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.
5b	Which of the following do you think delays the bus?	Customers not having fare ready	2.31			
			1			
			2.5			
		Customers paying with notes	3.05			
			2			
			2.48			
		Lots of people boarding	4.54			
			4			
			2.56			
		Issuing paper tickets	7.13			
			8			
			2.61			
		Issuing paper tickets with wallet	4.79			
			4			
			2.97			
		Being unable to read passes or tickets	3.74			
			3			
			2.74			
		Finding the correct ticket on ETM	6.88			
			8			
			2.65			
		Passengers disputing fares or documents	4.9			
			5			
			2.83			
		Discussions with people about fares etc.	5.1			
			5			
			2.9			

Section 2 – Non-Bus Users

(Base = Respondents who didn't use Bus or Train in Q1. Phase 1 = 383)

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
2a	What type of transport do you use most frequently?	Tram	161	42%						
		Car	143	37%						
		Taxi	2	1%						
		Motorcycle	2	1%						
		Pedal cycle	2	1%						
		Walking	60	16%						
		Park and tram	1	0%						
		Other	2	1%						
		Missing/No Answer	10	3%						
2b	Why do you prefer to use this mode of transport rather than bus or train?	It is convenient	212	55%						
		It costs less than using other modes	52	14%						
		I can travel alone - it's peaceful/ quieter	16	4%						
		It's quicker than other modes	74	19%						
		I can exercise at the same time	25	7%						
		I don't know how to use public transport	1	0%						
		Other	107	28%						

Section 3 – Public Transport Appeal

(Base = All Respondents. Phase 1 = 946)

Q'n No	Question	Answer	Phase 1		Phase 2		Phase 3		Phase 4	
			Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
			Median	Median	Median	Median	Median	Median	Median	Median
			Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.
3a	Please tell me how strongly you agree or disagree with the following statements	I find it easy to buy tickets	4							
			4							
			0.92							
		I find it convenient to buy tickets	3.8							
			4							
			0.97							
		The tickets available are easy to use	4.2							
			4							
			0.86							
		I have a ticket or pass to suit my travel needs	3.9							
			4							
			1.25							
3b	Which of the following would encourage you to use public transport more?	If it were easier to pay for tickets	2.6							
			3							
			1.34							
		The tickets were more secure	2.9							
			3							
			1.41							
		If there was a ticket available to suit needs	3.3							
			3							
			1.35							
3c	Please rank the following statements regarding thoughts to causing delays to public transport journeys	People paying with notes	2.5							
			2							
			0.5							
		Lots of people boarding	2.2							
			2							
			1.06							
		Not having money ready	2							
			2							
			0.98							
		Long conversations with the driver	3.2							
			4							
			1.03							
			2							
			0.98							
		Long conversations with the driver	3.2							
			4							
			1.03							

YORCARD Awareness

(Non-users, Phase 1 = 383)

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
-	Yorcard is a public transport smartcard for storing tickets and passes.	Yes	25	7%						
		No	347	91%						
	Have you heard of it?	Missing/No Answer	11	3%						

Section 4 – Purchasing Tickets

(Base = Respondents who used Bus or Train in Q1. Phase 1 = 563)

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
4a	Which type of public transport do you use most often?	Bus	383	68%						
		Train	171	30%						
		Missing/No Answer	9	2%						
4b	What type of ticket do you usually use?	Single ticket	122	22%						
		Free concess'ry pass	159	28%						
		40p concess'ry pass	41	7%						
		Return or day ticket	142	25%						
		Period ticket (of any length)	90	16%						
		Missing/No Answer	9	2%						
4c	What type of period ticket do you usually use?	Not to be reported (Commercial Sensitivity)								
4d	Where do you usually buy your ticket from?	On the bus	244	43%						
		Railway station	76	13%						
		Online	35	6%						
		TIC	146	26%						
		On train	8	1%						
		Local shop or Paypoint store	2	0%						
		Other	25	4%						
		Missing/No Answer	27	5%						
4e	How do you decide which ticket to buy?	Convenience	131	23%						
		Unsure when returning	39	7%						
		Best value for the travelling I do	229	41%						
		I don't know what other tickets are available	6	1%						
		I use more than one operator	7	1%						
		I use a concessionary pass	198	35%						
		Other	8	1%						
4f	Where do you usually find information about public transport fares and tickets?	Traveline	22	4%						
		On the bus	99	18%						
		Online	187	33%						
		Railway station	51	9%						
		TIC	94	17%						
		On the train	1	0%						
		At the bus stop	32	6%						
		Word of mouth	21	4%						
		Other	11	2%						
		Missing/No Answer	45	8%						
4g	Do you usually find the information accurate?	Yes	485	86%						
		No	44	8%						
		Missing/No Answer	34	6%						
4h	How would you like to get more information about fares and tickets?	At the bus stop	245	44%						
		Posters in public places	143	25%						
		Leaflets through door	117	21%						
		Adverts on bus	146	26%						
		Other	46	8%						

Section 5 – Journeys by Bus

(Base = Those who answered 'Bus' to Q4a. P1 = 383)

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
5a	How many bus journeys do you usually make every week?	<1	31	8%						
		1-Mar	92	24%						
		4-Jun	81	21%						
		7-Oct	72	19%						
		11+	101	26%						
		Missing/No Answer	6	2%						
5b	Which is your most frequent purpose for travelling by bus?	To/from Work	95	25%						
		Shopping	90	23%						
		Leisure	46	12%						
		Visiting friends and family	29	8%						
		Education	109	28%						
		To/from Medical appointments	3	1%						
		Other	1	0%						
		Missing/No Answer	10	3%						
5c	Is your most frequent journey a single or return?	Single	141	37%						
		Return	229	60%						
		Missing/No Answer	13	3%						
5d	For your most frequent journey which day/s do you travel in a typical week?	All weekdays	283	74%						
		Monday	36	9%						
		Tuesday	31	8%						
		Wednesday	39	10%						
		Thursday	30	8%						
		Friday	42	11%						
		Saturday	117	31%						
		Sunday	86	22%						
5e	For your most frequent journey, what time do you normally travel?	Single Journey								
		M-F bef. 0900	121	32%						
		M-F 0900-1530	90	23%						
		M-F 1530-1830	11	3%						
		M-F after 1830	5	1%						
		Sat bef. 1830	7	2%						
		Sat after 1830	5	1%						
		Sun bef. 1830	1	0%						
		Sun after 1830	1	0%						
		No fixed time	120	31%						
		Missing/No Answer	22	6%						
		Return Journey								
		M-F bef. 0900	2	1%						
		M-F 0900-1530	44	11%						
		M-F 1530-1830	113	30%						
		M-F after 1830	19	5%						
		Sat bef. 1830	6	2%						
		Sat after 1830	1	0%						
		Sun bef. 1830	5	1%						
		Sun after 1830	0	0%						
		No fixed time	83	22%						
		Missing/No Answer	110	29%						
5f	For your most frequent journey what routes do you normally use?	Not to be reported (Commercial Sensitivity)								
-	Yorcard is a public transport smartcard for storing tickets and passes. Have you heard of it?	Yes	24	6%						
		No	347	91%						
		Missing/No Answer	12	3%						

Section 6 – Journeys by Train

(Base = Those who answered 'Train' to Q4a. P1 = 171)

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
6a	How many train journeys do you usually make every week?	<1	80	47%						
		1-Mar	51	30%						
		4-Jun	21	12%						
		7-Oct	10	6%						
		11+	3	2%						
		Missing/No Answer	6	4%						
6b	Which is your most frequent purpose for travelling by train?	To/from Work	30	18%						
		Shopping	18	11%						
		Leisure	38	22%						
		Visiting friends and family	61	36%						
		Education	11	6%						
		To/from Medical appointments	5	3%						
		Other	2	1%						
		Missing/No Answer	6	4%						
6c	Is your most frequent journey a single or return?	Single	18	11%						
		Return	144	84%						
		Missing/No Answer	9	5%						
6d	For your most frequent journey which day/s do you travel in a typical week?	All weekdays	50	29%						
		Monday	27	16%						
		Tuesday	39	23%						
		Wednesday	36	21%						
		Thursday	29	17%						
		Friday	68	40%						
		Saturday	46	27%						
		Sunday	44	26%						
6e	For your most frequent journey, what time do you normally travel?	Single Journey								
		M-F bef. 0900	22	13%						
		M-F 0900-1530	27	16%						
		M-F 1530-1830	15	9%						
		M-F after 1830	6	4%						
		Sat bef. 1830	10	6%						
		Sat after 1830	0	0%						
		Sun bef. 1830	0	0%						
		Sun after 1830	0	0%						
		No fixed time	74	43%						
		Missing/No Answer	17	10%						
		Return Journey								
		M-F bef. 0900	1	1%						
		M-F 0900-1530	5	3%						
		M-F 1530-1830	26	15%						
		M-F after 1830	13	8%						
		Sat bef. 1830	2	1%						
		Sat after 1830	3	2%						
		Sun bef. 1830	13	8%						
		Sun after 1830	9	5%						
		No fixed time	69	40%						
		Missing/No Answer	30	18%						
6f	Do you travel on local train service between Doncaster and Sheffield? If so which stations do you use?	Sheffield	66	39%						
		Meadowhall	39	23%						
		Rotherham Cen	22	13%						
		Swinton	22	13%						
		Mexborough	21	12%						
		Conisbrough	20	12%						
		Doncaster	52	30%						
		Don't travel on this line	96	56%						

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4			
			n	%	n	%	n	%	n	%		
-	Yorcard is a public transport smartcard for storing tickets and passes. Have you heard of it?	Yes	3	2%								
		No	160	94%								
		Missing/No Answer	8	5%								

Driver Survey

Section 1 – About You

Base = All Respondents. Phase 1 = 946

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
1a	Age	18-24	4	4%						
		25-34	18	18%						
		35-44	31	32%						
		45-59	33	34%						
		60+	12	12%						
1b	Gender	Male	95	97%						
		Female	3	3%						

Section 2 – Employment

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
2a	How many years experience do you have?	0<2	18	17%						
		2<4	19	18%						
		4<6	10	10%						
		6<8	12	11%						
		8 or more	46	44%						
2b	Do you work full or part time?	Not to be reported (Commercial Sensitivity)								

Section 3 – Shift Patterns and Routes

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
3a	Do you usually work a fixed shift?	Not to be reported (Commercial Sensitivity)								
3b	What hours do you usually work?	Not to be reported (Commercial Sensitivity)								
3c	What shift pattern do you usually work?	Not to be reported (Commercial Sensitivity)								
3d	Which bus routes do you usually work on?	Not to be reported (Commercial Sensitivity)								
3e	How often do you work on these routes?	Not to be reported (Commercial Sensitivity)								

Section 4 – Electronic Ticket Machine

Q'n No	Question	Answer	Phase 1		Phase 2		Phase 3		Phase 4	
			Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
			Median	Median	Median	Median	Median	Median	Median	Median
			Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.
4a	Thinking of the ETM you use, how difficult or easy do you find each of the following tasks? (1 = 'Very Difficult', through to 10 = 'Very Easy')	Logging on	9.08							
			10							
			2.03							
		Updating the fare stage	9.22							
			10							
			2.11							
		Reading the ETM display	8.33							
			10							
			2.5							
		Pressing the buttons	8.61							
			10							
			2.17							
		Memorising what the buttons do	7.84							
			8							
			2.46							
		Issuing paper tickets	8.83							
			10							
			2.31							
		Issuing paper tickets with wallet	8.19							
			9							
			2.66							
		Changing ticket rolls	8.09							
			10							
			2.57							
		Unjamming the ticket roll	7.03							
			8							
			3.22							
		Scrolling menus or selecting tickets	7.86							
			8							
			2.53							
4b	Are there any other ETM tasks you find difficult or easy to do?	Open Question	No answers given							
4c	Are there any ETM tasks you find time consuming? (1 = 'Very', through to 10 = 'Not at all')	Logging on	7.54							
			9							
			3.17							
		Updating the fare stage	9.2							
			10							
			1.91							
		Reading the ETM display	8.72							
			10							
			2.28							
		Pressing the buttons	8.67							
			10							
			2.2							
		Memorising what the buttons do	7.66							
			8							
			2.49							
		Issuing paper tickets	8.23							
			10							
			2.6							
		Issuing paper tickets with wallet	7							
			8							
			3.2							
		Changing ticket rolls	6.78							
			8							
			3.02							
		Unjamming the ticket roll	6.14							
			6							
			3.2							
		Scrolling menus or selecting tickets	7.97							
			8							
			2.53							

Section 5 – Keeping to Time

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
5a	Putting aside traffic delays, do you find it easy to keep to the bus timetable?	Yes	133	80%						
		No	34	20%						

Q'n No	Question	Answer	Phase 1	Phase 2	Phase 3	Phase 4
			Mean	Mean	Mean	Mean
			Median	Median	Median	Median
			Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.
5b	Which of the following do you think delays the bus?	Customers not having fare ready	2.31			
			1			
			2.5			
		Customers paying with notes	3.05			
			2			
			2.48			
		Lots of people boarding	4.54			
			4			
			2.56			
		Issuing paper tickets	7.13			
			8			
			2.61			
		Issuing paper tickets with wallet	4.79			
			4			
			2.97			
		Being unable to read passes or tickets	3.74			
			3			
			2.74			
		Finding the correct ticket on ETM	6.88			
			8			
			2.65			
		Passengers disputing fares or documents	4.9			
			5			
			2.83			
		Discussions with people about fares etc.	5.1			
			5			
			2.9			

Section 6 – Safety and Security

Q'n No	Question	Answer	Phase 1	Phase 2	Phase 3	Phase 4
			Mean	Mean	Mean	Mean
			Median	Median	Median	Median
			Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.
6a	Please rank the following from 1 to 4, where 1 in your opinion is the greatest security risk	Carrying cash on the bus	1.58			
			1			
			0.91			
		Carrying cash to the depot	2.21			
			2			
			1.09			
		Carrying cash on a Monday or Tuesday	2.4			
			2			
			1.17			
		Passenger confrontation	2.91			
			3			
			1.05			
6b	Please rank the importance of the following improvements to safety and security, from 1 to 3	Less cash handling	1.31			
			1			
			0.63			
		Reliable way to validate a ticket or pass	2.11			
			2			
			0.84			
		Not accepting payment from large notes	1.97			
			2			
			0.8			

Section 7 – Fraud

Q'n No	Question	Answer	Phase 1	Phase 2	Phase 3	Phase 4
			Mean	Mean	Mean	Mean
			Median	Median	Median	Median
			Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.
7a	How often do you encounter expired or fake tickets and passes?	0-2	57	58%		
		3-4	25	25%		
		5-6	12	12%		
		7+	5	5%		
7b	What do you think is the most common method of passenger fraud?	Out of date tickets	46	62%		
		Copied or fake tickets	3	4%		
		Passing tickets back to others	1	1%		
		Tickets from other operators	0	0%		
		Over-riding	14	19%		
		Rushing past the driver or hiding behind other boarders	10	14%		

Travel Information Centre Survey

Section 1 – Employment

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
1a	How many years experience do you have?	0 - <2	2	33%						
		2 - <4	0	0%						
		4 - <6	0	0%						
		6 - <8	0	0%						
		8 or more	4	67%						
1b	Do you work full or part time?	Full Time	4	67%						
		Part Time	2	33%						
1c	Is your role Clerical or Supervisory?	Clerical	4	67%						
		Supervisory	2	33%						

Section 2 – About You

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
2a	Age	18-24	0	0%						
		25-34	2	33%						
		35-44	1	17%						
		45-59	2	33%						
		60+	1	17%						
2b	Gender	Male	0	0%						
		Female	6	100						

Section 3 – Selling Tickets

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
3a	Do you understand the ticket range used in Yorcard area?	Yes	4	67%						
		Nearly all	0	0%						
		Some	1	17%						
		No	1	17%						

Q'n No	Question	Answer	Phase 1	Phase 2	Phase 3	Phase 4
			Mean	Mean	Mean	Mean
			Median	Median	Median	Median
			Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.
3b	How much do you agree with the following statements?	I sell the customer the ticket they ask for	1			
			1			
			0			
		I discuss the tickets available and then recommend a ticket	2			
			2			
			0.58			
		I discuss the tickets available and the customer decides	2			
			2			
			0.82			

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
3c	How often do you spend time discussing tickets with customers?	Every day	5	83%						
		Once a week	1	17%						
		Less than once a week	0	0%						
		Never	0	0%						
3d	Do you find that customers are confused about tickets?	Yes	1	17%						
		No	4	67%						
3e	N/A									
3f	How often do you feel under pressure to serve customers quickly?	Often	0	0%						
		Only when there are long queues	6	100%						
		Rarely	0	0%						

Section 4 – Using the Ticket & Pass Issuing Equipment

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
4a	How time consuming do you find logging into the systems?	1	0	0%						
		2	3	50%						
		3	1	17%						
		4	2	33%						
		5	0	0%						
4b	Do you think that this process could be simplified?	Yes	0	0%						
		No	6	100%						
4c	N/A									
4d	On a scale of 1 to 5, how time consuming do you find it to enter data?	1	1	17%						
		2	2	33%						
		3	0	0%						
		4	3	50%						
		5	0	0%						

Q'n No	Question	Answer	Phase 1	Phase 2	Phase 3	Phase 4
			Mean	Mean	Mean	Mean
			Median	Median	Median	Median
			Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.
4e	Thinking about issuing concession passes, please rank the following tasks in order of which you think are the most time consuming to the least	Verifying entitlement	2			
			2			
			0.45			
		Identifying the customer in eCRM	1.75			
			2			
			0.82			
		Making the pass	2.25			
			2			
			0.72			

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
4f	Do you think any of the above (4e) processes could be simplified?	Yes	0	0%						
		No	4	100%						
4g	N/A									

Section 5 – Payments

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
5a	On a scale of 1 to 5, how time consuming do you find it to take payments for tickets and passes?	1	1	17%						
		2	1	17%						
		3	0	0%						
		4	2	33%						
		5	2	33%						

Q'n No	Question	Answer	Phase 1	Phase 2	Phase 3	Phase 4
			Mean	Mean	Mean	Mean
			Median	Median	Median	Median
			Std. Dev.	Std. Dev.	Std. Dev.	Std. Dev.
5b	Please rank the following in order of the most time consuming to the least.	People paying by chip and pin	1.8			
			2			
			0.84			
		Giving change for notes	2.6			
			3			
			0.55			
		Not having enough change	1.6			
			1			
			0.89			

Q'n No.	Question	Answer Categories	Phase 1		Phase 2		Phase 3		Phase 4	
			n	%	n	%	n	%	n	%
5c	Do you think any of the above (5b) processes could be simplified?	Yes	1	20%						
		No	4	80%						
5d	N/A									
5e	On a scale of 1 to 5, how time consuming do you find it to offer refunds or exchanges for tickets?	1	1	17%						
		2	1	17%						
		3	1	17%						
		4	2	33%						
		5	1	17%						
5f	Do you think any of the above (5e) processes could be simplified?	Yes	1	25%						
		No	3	75%						

Notes