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Enhancing transport technologies to support personal security in travel by public transport: Scenarios for 2040 Work Package 1 Report



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Contents

Contents	2
List of Figures	3
Cover Picture	3
Acknowledgements	3
Introduction	4
Overall Project Objectives.....	4
Work Programme	4
Work Package 1.....	4
Methodology	6
Literature review	6
SWOT analysis.....	6
STEEP analysis	6
Scenario Planning.....	7
Expert interviews.....	7
Workshop 1: Provision for public transport traveller information	7
Organisation and participation	7
Proceedings	8
Brainstorm and scoping of current issues.....	8
Scoping of current issues.....	14
Exploration of key factors and perspectives.....	26
Identification of future key driving forces – STEEP(L) analysis.....	32
Discussion of Driving Forces	32
The Scenarios	39
The Workshop Activity	41
Conclusion	46
Outputs	47
Next Steps	47
References	48
ANNEXES	51
Workshop Agenda	52
List of Workshop Participants	53
Workshop Slide Presentation	54
Raw comments from brainstorming: current issues	59
Raw comments from brainstorming: temporal spatial and demographic factors	62

Raw comments from brainstorming:current consideration of personal security	65
Raw comments on brainstorming: stakeholder perspectives	68
Raw comments from future driving forces exercise.....	70

List of Figures

Figure 1 Conceptual framework for exploring personal security	9
Figure 2 Crime and fear of crime.....	10
Figure 3 Confidence and fear of accidents	11
Figure 4 Safety and perceived risks to safety	12
Figure 5 Creating the ambience for personal safety: quality environments and information provision	13
Figure 6 Personal security in the round	14
Figure 7 Strengths and Weaknesses in Current Provision	15
Figure 8 Key Quotes: Strengths.....	15
Figure 9 Key Quotes: Weaknesses	15
Figure 10 Opportunities and Threats	21
Figure 11 Key Quotes: Opportunities	21
Figure 12 Key Quotes: Threats	21
Figure 13 Screenshot from Fix My Transport	24
Figure 14 The Four Scenario Framework (Source: Berkhout and Hertin 2002)	39

Cover Picture

Cover picture taken by Kate Pangbourne in 2010. It shows an entrance to Leeds Station, with several features relevant to the project, including a CCTV warning sign, logos for the networks accessible via the station, no smoking signs, and a yellow ‘caution wet floor’ sign.

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Introduction

Clearly, there are many facets that can be covered under the umbrella of personal security on public transport. This project is focused on the role of technology and its interaction with user needs and perceptions in supporting personal security in travel on public transport. Therefore, the key aim is to develop fundamental understandings relating to this interaction and as a consequence to enable transport technologies to better support personal security (both perceived and actual) in travel by public transport.

Overall Project Objectives

- 1 Assess the extent to which personal security issues are currently effectively addressed in a set of five specific application areas.
- 2 Identify potential future personal security issues and assess how they might be effectively addressed in a set of five specific application areas.
- 3 Examine how spatial, temporal and demographic factors influence the nature of both current and potential future personal security issues.
- 4 Develop policy recommendations to support decision makers regarding the application of transport technologies to support travel by public transport.

Work Programme

The project has been divided up into to focus of five application areas:

- 1 Provision for public transport traveller information
- 2 Provision for contingency planning to support travel by public transport
- 3 Automated public transport services
- 4 Demand responsive transport services
- 5 Secondary, unintended effects of security (anti-terror, crime and antisocial behaviour prevention) technologies in the travel environments

The research programme is structured into 6 individual work packages, one for each of the five application areas, undertaken in sequence. The sixth work package will collate the individual reports from WPs 1-5 into a final project report, including policy recommendations and overall conclusions which will be presented at a Key Findings seminar. This report deals with the conduct and findings of Work Package 1.

Work Package 1

In Work Package 1 of this project, the focus of research is on the application area “Facilitating decisions by individual travellers: the provision for public transport traveller information”. A key objective is to gain an understanding of how personal security considerations are incorporated within public transport traveller information services. The project will assess how far personal security is considered in the current provision of public transport information. It will then explore enhanced future services that could be anticipated to support personal security through public transport information. For example, this may involve bespoke services based on individual personal security requirements, something that is more

easily achievable as location-aware personal mobile devices, and the data needed to underpin personalisable information provision, become more widespread and relatively cheaper. The role user generated content in future information services will also be considered.

Information is a major source of confidence and reassurance when travelling and can greatly support perceptions of personal security in travel. As highlighted by Lyons (2006), information has several important roles, from informing an individual intending to travel of the options available to them (such as the different modes or ticket variants), enabling them to use their judgement in selecting which option best meets their requirements, to assisting in route-planning, journey stages and timing, ticket purchase and successfully completing the chosen journey. The information required for all this is found in various places and forms: route maps, timetable and ticketing information is found in traditional printed form, either as pocket timetables or on posters at boarding points, on-line, over the phone or in person at ticket outlets (ticket offices, drivers/conductors, agencies), on electronic information boards, sometimes using real-time information (RTI), and in way-finding signage to help passengers move efficiently through interchanges when changing between vehicles/modes. Relevant information is also provided by different agencies, public and provided, with multiple channels offering different versions of the same underlying data.

Information provision constitutes the sharp end where technology and users interact. There have been significant advances in recent years in the quantity of information available (including the advent of Open Data) and in the delivery mechanisms, particularly via mobile platforms. However, significant issues remain, particularly in terms of the quality of information and its ability to support certain types of users such as the elderly, disabled and rural dwellers. When we consider travel by public transport we must recognise that we are not operating in closed environments. The travel environments in which we engage involve transition between different public and private vehicles, services and spaces. Hence the information to support personal security, safety and confidence is multi-faceted and multi-agency.

One of the most dynamic environments in which issues of information provision are currently being considered is that of social media. Transport operators and service providers increasingly recognise its influence and are seeking to engage in these arenas. It is largely unclear how effective this engagement is either for them or the end users. Social media influences social practice in ways that are relevant to personal security in travel by public transport, not least because of the unpredictable, and potentially perverse outcomes arising from user-generated content and mobilisation. This can range from flash mobs indulging in performance art in public spaces such as underground and rail stations, such that the British Transport Police have had to intervene to deal with safety and congestion issues, through to the role of Blackberry Messenger (BBM) as the tool of choice for coordinating and inciting the 2011 summer riots. This contrasts with the proactive use of BBM in the riots with Twitter and Facebook, which were used primarily as reactive tools to generate positive social responses e.g. 'tidy-up' activities.

Methodology

The project is divided into a number of workpackages. The initial research design structures each Work Package in a similar way, using a combination of literature review, participatory workshops using SWOT analysis, STEEPL analysis and scenario planning, and expert interviews. This combination of approaches establishes the current picture (literature review and SWOT analysis), and the links from the current situation to plausible future contexts is established through STEEPL analysis leading on to scenario planning. Expert interviews are incorporated to add additional breadth and specialist knowledge to supplement the range of perspectives from the workshops, but are reported on separately (see below).

Literature review

Conducting a literature review is a standard research practice for collating existing knowledge and contextualising the research in question. For Work Package 1 a number of different areas of literature were surveyed, including information technology, transport policy, behavioural sciences, and scenarios literature. Both academic and ‘grey’ literature sources were consulted. An annotated bibliography is available separately.

SWOT analysis

SWOT analysis originated in the 1960s as a tool to support organisational strategic planning in the business community (Learned *et al*, 1965). It is structured in order to enable groups and organisations to identify important strategic factors, and to characterise them as the Strengths and Weaknesses of an organisation (or in this case sector), and the Opportunities or Threats in the environment, hence the acronym SWOT (Dyson, 2004). As an approach that has been widely used for group work in business communities and non-academic settings for many years, it is an appropriate method to use in the workshop contexts, as it can be undertaken speedily, with very little explanation. Though it is sometimes regarded as a little static and old-fashioned, it has the key strength of “keeping internal and external factors in focus simultaneously” (Dyson, 2004: p 638). In the context of the workshop approach being adopted in this project, this enables a swift move from the categorising of current issues to identifying key drivers that will affect the future development of the identified issues.

STEEP analysis

STEEP analysis provides a framework for considering what key external forces will drive future developments in the sector under consideration. The approach requires that these are categorised as far as possible into Social, Technological, Environmental, Economic, Political and Legislative drivers (hence the acronym). Other versions of the same basic technique produce various different acronyms according to the names and ordering of the factors (e.g. PEST, STEEPLE, SLEPT, PESTEL, or STEER (where Regulatory replaces Political and Legislative)). The boundaries between these categories can be somewhat fuzzy, nevertheless it provides a useful framework for ordering contributions in a participatory setting. It is a useful tool for shifting thinking about Opportunities and Threats identified in the SWOT analysis into a more future oriented mode in order to think strategically about addressing current

issues. STEEP analysis is included in the DfT's Scenario Planning Toolkit. In Work Package 1 we added a Legislative driver, to create a STEEPL analysis.

Scenario Planning

The methodological approach for scenario planning in this project sits within the 'Intuitive Logics School' (Bradfield *et al*, 2005), in that the focus is on the insights and learning that arise from the process, and developing scenarios as qualitative narratives rather than quantifiable matrices of future conditions that could be retrospectively verified. Scenario planning is adopted for the research because of the complexity of the research context (the interactions between technology and user needs in relation to personal security in travel by public transport) and the wide range of potential future developments in this area. Scenario planning is a forward oriented approach where alternative scenarios are developed for a desired time horizon from the present situation. The aim is to develop distinctive, divergent depictions of the future.

Given time constraints developing scenarios from scratch was not considered feasible. Instead, a wide range of existing scenarios have been reviewed and the following framework developed by Berkhout and Hertin (2002) for the UK Foresight Programme has been selected. Their generic framework was intended to be adaptable to different sectors and areas of application. The agenda given to the participants and used in the workshop is attached at Annex 1.

Expert interviews

The contributions from each workshop are supplemented by expert interviews, returning to selected participants as well as a wider field as appropriate. Expert interviews are an appropriate technique for accessing specialist technical, processual and explanatory knowledge. However, there are only a few sources of literature on the methodological aspects of expert interviewing as a distinct form of qualitative research (Bognor *et al* 2009). The intention is for interviews to reflect the workshop structure regarding revealing current issues, in order to fill gaps and develop and elaborate on the workshop findings. Rather than attempt to brief interviewees on the scenario elements of workshops, expert interviewees are asked to give their opinion on future directions within their area of expertise. Once the project was underway, and initial interviews carried out, it was apparent that the expert interviews form a coherent body of data that stands related to but separate from the Scenario Workshops. Therefore they have been separated from the individual workshops and will be carried out throughout the empirical period of the project and will have a stand-alone report.

Workshop 1: Provision for public transport traveller information

Organisation and participation

Workshop One of the project "Enhancing transport technologies to support personal security in travel by public transport: scenarios for 2040", was held on Tuesday 10th July 2012. The venue was The Innovation Space at the Department of Business, Innovation and Skills in London. The workshop was organised by Dr Mark Beecroft and Dr Kate Pangbourne of the

Centre for Transport Research at the University of Aberdeen, and the facilitator was Jane Dowsett of The Innovation Space. The first workshop focuses on the incorporation of personal security considerations within public transport traveller information systems and services.



There were 14 participants in the workshop, including the organisers, drawn from public transport authorities and operators, airport operators, user groups, information and technology providers, academics and consultants. The list of participants is included in Annex 2.

This report of proceedings at the workshop is not in full chronological order, but is presented in the order which makes narrative sense in the context of the Work Package report. In the first part of the day participants considered how far personal security, safety and confidence are considered in the current provision of public transport information, both to draw out problems and highlight good examples. In the second part of the day, participants considered the key driving forces that will influence future provision of traveller information and its treatment of these issues. This led on to consideration of potential enhanced future services that could emerge to support personal security through public transport information such as the development of bespoke and individualised services or the role of user-generated information content (e.g. crowd-sourcing). These possibilities for the application area were then narrated within the framework of a set of pre-defined scenarios.

Proceedings

Participants were welcomed by Jane Dowsett, who introduced the operation of the software tool used at The Innovation Space to help capture and organise the thoughts of participants. Dr Mark Beecroft introduced the project aims and objectives. The slides presented during the course of the workshop are included in Annex 3.

Brainstorm and scoping of current issues

Issues relevant to utilising technology to enhance personal security when travelling on public transport can be conceptualised in a number of different ways. As this is the first workshop in a series exploring different application areas of public transport, it was necessary to include what was essentially a rapid SWOT analysis of current information provision, and to explore how different stakeholders might perceive the phrase ‘personal security’ in the public transport context. A disaggregation of the content of the concept ‘personal security’ in the context of public transport was also undertaken. These stages are considered less necessary in future workshops, as insights from this, and subsequent workshops, can be taken forward in an additive fashion.

What does 'personal security' mean to the workshop participants?

"Personal security" is usually interpreted as related to fear or apprehension about possibility of encountering crime or anti-social behaviour. However, there are likely to be other aspects to the term, depending on the perspective taken. Therefore, we draw out the issue here from the comments made by participants during the course of the morning session, in order to uncover the various connotations of the term 'personal security'. This accommodates the varied perspectives of the participants and reveals how the term is perceived in practice. It is apparent that the concept of 'personal security' is comprised of a combination of three aspects: threat from other people (crime, including terrorism, and antisocial behaviour), safety issues (network accidents, slips and trips), and personal affective issues (confidence and attitude), even though the dominant view is that it is related to crime or fear of crime.

Each aspect affects the issue in different ways, but the relative importance of each aspect varies according to stakeholder perspective. Nevertheless, each forms a part of the overall concept 'personal security' as it needs to be considered in the context of this project. This is illustrated by the Venn diagram below, which draws on some of the verbatim material generated in the course of the workshop.



Figure 1 Conceptual framework for exploring personal security

This Venn diagram centres on the over-arching concept of Personal Security. However, analysis of the comments from the workshop suggest that this incorporates several distinct aspects, which are themselves also overlapping. Thus, we have crime (and antisocial behaviour) as one factor (1), which overlaps both with physical safety (actual risks to health and safety arising from the consequences of crime and antisocial behaviour, such as risks from broken glass caused through vandalism (C), but also the more subjective personal impacts from discomfort that arises from transport and public environments affected by crime and antisocial behaviour), and with individual confidence (arising from knowledge of actual

risk, but also perceived risks as a fear of crime will impact on a traveller’s sense of personal security (A)). Similarly, safety (3) and confidence (2) also overlap through the impact on a traveller’s sense of personal security of a fear of accidents (B). The verbatim comments below are organised according to where on this concept diagram they would fit. All comments are in the workshop segment included at Annex 6 unless otherwise stated.

Crime (1)	Fear of Crime (A)
<p>“Terrorist activity is a passing issue and people resume normal activity very quickly. e.g. 7/7 and 22/7 bombings in London. Ridership returned to normal levels very quickly”</p> <p>“Reality of crime/personal safety is minimal however fear of crime/personal safety is endemic”</p> <p>“Encountering anti-social behaviour can be as bad as encountering crime” (Annex 5)</p>	<p>“‘personal security’ usually interpreted as related to fear or apprehension about possibility of encountering crime or anti-social behaviour”.</p> <p>“Fear of a lack of personal security is intertwined with personal confidence to use PT, but how can technology help? Sometimes information about actual crime hotspots (for example) might create more fear.”</p> <p>“Older people often perceive the risk of crime as being more significant than it is in reality, but it does impact on their confidence in using public transport”</p> <p>“Too many announcements re safety issues and security can cause confidence issues.”</p> <p>“Apprehension greatest in remote low use locations where investment can rarely be warranted” (Annex 4)</p> <p>“Will my bike be stolen if I leave it at that station?” (Annex 5)</p> <p>“Fear of crime during late evenings in urban journeys” (Annex 5)</p> <p>“Whole journey needs to be considered – walk at end often perceived as most insecure” (Annex 4)</p> <p>“Unlit rural bus stops may feel extremely unsafe compared to more urban areas – particularly if no information provided” (Annex 5)</p>

Figure 2 Crime and fear of crime

Confidence (3)	Fear of Accidents (B)
<p>“If you know the area you know where to avoid - confidence extends to known boundaries”</p> <p>“If you don’t know the area then you are unaware of where the boundaries are – so less likely to ‘test the water’. Often seen to be easier to take an alternative mode.”</p> <p>“Do people want to be reminded of security issues or should they be discreet?” (Annex 4)</p> <p>“Night services can be daunting to use in some areas” (Annex 5)</p> <p>“From non-users the perception is very negative, but regular PT users have a more realistic view of the situation”</p> <p>“No public confidence in CCTV as deterrent – who is watching, would anyone intervene?”</p>	<p>“Older people, who have a bad experience on public transport, e.g. falling on a bus, will be much less likely to use it in the future. The consequences for them are more severe” (Annex 5)</p> <p>“Research suggests older people do not perceive safety on buses as a significant issue, at least not until they experience a safety related incident, such as a fall. The impact on future behaviour then becomes significant.” (Annex 6)</p> <p>“Congestion levels affect perception of safety, especially for fragile passengers - information could be available in planning and in real-time” (Annex 6)</p> <p>“Do older people have concern for their personal safety (from slips, falls, etc) imposed on them by well-meaning relatives or carers?” (Annex 6)</p> <p>“Urban myths about certain bus operators having ‘bad’ drivers who don’t give passengers time to sit down” (Annex 6)</p>

Figure 3 Confidence and fear of accidents

Safety (2)	Perceived risks to safety (C)
<p>“Safety from slips and trips in interchanges” (Annex 4)</p> <p>“Falls on buses are a major cause of injuries and undermines travellers confidence - alternative travel options or not at all. Elderly find themselves stranded and isolated unless using private transport”</p> <p>“I believe older people do not always want to 'make a fuss' when there is an issue - a story I heard this week of an elderly lady whose arm was broken when the driver closed the door too quickly on her - she did not report it there and then” (Annex 6)</p> <p>“Risk of sudden starts or stops on vehicle leading to falls” (Annex 6)</p>	<p>“Don’t forget multi-storey car parks. One of the worst I saw (several years ago) was that provided for Tyne and Wear metro users – dank, dark, graffiti and an appalling smell in the stairwells!”</p>

Figure 4 Safety and perceived risks to safety

In amongst the comments that speak directly to the nature of ‘personal security’, as listed above, there are a number of comments which relate to the role of information, and of operators more generally, in addressing some of these issues. These are set out in Figure 5 below.

Some of these observations are very difficult to categorise as one factor or another, a symptom that the concept of personal security does comprise a number of closely related factors. For example, whilst the comment about driver training has been included in the above matrix under (B), it could equally well appear under (A) or (C) as better driving skills could reduce passenger falls, as well as passenger perceptions of risk of falling, and driver training in dealing with anti-social behaviour would also improve actual risks to safety and perceived risks to security from crime. Equally, some observations seem to approach personal security in an even more holistic fashion and these are shown in Figure 6 below.

Crime (1)	Fear of Crime (A)
<p>“Apart from please keep your bags with you...I find little other presence or info regarding security on train/bus etc?” (Annex 4)</p> <p>“Airports are secure airside, but need more advance information as to what you can and can’t take through airside” (Annex 4)</p> <p>“West Yorkshire case study – good example of success of cameras and monitoring shared with the police, etc.” (Annex 4)</p>	<p>“Depends on customer group as to what reassurance passenger needs regarding confirmation that there is ... little crime”</p> <p>“Need to make sure passengers are aware of crime statistics if going down, however will need to be able to counteract specific incidents that they will have experienced/heard about, which they may associate with journeys generally”</p> <p>“Credibility of performance levels of operator affects perception of whether one will be stranded, or exposed to long waits in a dangerous area”</p>
Confidence (2)	Fear of Accidents (B)
<p>“Appropriate equipment to assist people with disabilities, elderly, small children”</p>	<p>“Reassurance that drivers are well trained in both driving skills and dealing with anti-social incidents”</p>
Safety (3)	Risk to safety (C)
<p>“Maintenance and cleanliness are important clues as to whether location is supervised, cared for and hence safe and secure” (Annex 5)</p>	<p>“Must tackle maintenance and cleanliness – if poor creates atmosphere of lack of care where antisocial incident might happen” (Annex 4)</p> <p>“Notices should be kept up to date – advert for an event that has passed indicates lack of care and supervision” (Annex 5)</p>

Figure 5 Creating the ambience for personal safety: quality environments and information provision

Personal Security (1+2+3+A+B+C)

“If you were going to tackle personal security issues, you wouldn’t start with information technology. Solutions to this issue must incorporate staffing, environmental design – whole journey, and how to integrate” (Annex 4)

“Must tackled perceptions [of risk to personal security] whether ‘justified’ or not” (Annex 4)

“What is the consequence of missing my journey? Journey resilience should be a planning criteria” (Annex 5)

“Information on alternative systems/services if last option gone, along with how to keep safe whilst finding alternative transport” (Annex 5)

“Travellers unfamiliar with an area prefer those modes (e.g. tube, buses with next stop indicator) with clear visuals that make use simple”

“Quality of staff training critical in building confidence – relationships”

Figure 6 Personal security in the round

Scoping of current issues

The SWOT tables below have been developed from the comments of the first brainstorm session, as well as verbal comments noted by the organisers. The participants were given two questions (‘What are the strengths in current provision?’ and ‘What are the weaknesses in current provision?’) and a place to put any other comments. The raw comments captured by the software can be found in Annex 4.

Strengths and Weaknesses

The main points from the morning sessions that can be interpreted as Strengths or Weaknesses are summarised in the table below, followed by some analysis exploring the implications of the comments, and elaborating the key themes.

Strengths	Weaknesses
<ul style="list-style-type: none"> • High quality, innovative RTI already exists • Provision of RTI is reassuring • Cost-benefit of RTI is being demonstrated • Education and crime prevention initiatives do work • Successful innovations with social media 	<ul style="list-style-type: none"> • Cross-modal RTI is lacking • Accessibility of RTI and other forms of travel information • Geographic variability in provision and consistency of RTI • Fares and networks are complex, making RTI provision similarly complex • Adapting journeys on the move • Many potential sources of data are not integrated or not coordinated • Responsive technology wholly feasible but the police response /enforcement is weak because of cost • Ability to change perceptions and counter urban myths

Figure 7 Strengths and Weaknesses in Current Provision

“I love real-time! Let's have more like this”

“Information is available within modes that allows travellers to obtain 'real-time' info re their journey - however cross-modal information is not good”

“Great advances in provision of information have already been made - but only the 'clued-in' are fully aware of how to use/understand it.”

“Mobile social media is being used to give very rapid detection and cooperation on problems and could be used further” (Annex 4)

Figure 8 Key Quotes: Strengths

“Mixed messages – e.g. when there is an incident, no clear message sent to commuters” (Annex 4)

“When an incident occurs travellers are often the last to know what is going on. This heightens frustration, creates traveller antagonism and diverts resources away from resolving whatever has caused the incident in the first place, rapid identification of the incident nature, the potential delay and alternatives (from a bank of prepared options) will enable travellers to make their own alternative independent travel plans” (Annex 4)

Figure 9 Key Quotes: Weaknesses

Post-workshop Analysis of Strengths and Weaknesses

In this section we analysis the material from the SWOT analysis, and include supporting evidence from literature. Some specific issues are expanded through the use of information boxes.

There are already many examples of operators providing high quality, innovative information which utilises technology to enable travellers to get good real-time information (RTI) for journeys on single modes. However, RTI that enables inter-modal journey planning is less well developed, not only between modes, but at interchanges and other public spaces, between public and private travel, and between active travel and public transport. One comment related to an over emphasis on modal, rather than journey information, and that the focus is on times, departure points and destination points when other types of information is also needed, for example how to find or navigate interchanges and access points.

The reassurance derived from RTI builds confidence in travel by public transport, underpinning an overall sense of personal security. Provision of RTI in metropolitan areas is generally seen as good. However, experience of RTI in other areas, particularly rural areas, is very different. It was not felt that there was a direct correlation between quality and population density or size of PT network, but that the variability in standards was a real problem. Users could not expect consistent standards and this impacted on confidence in use, particularly during long distance or regional level journeys. There are also questions surrounding the accessibility of RTI for different societal groups, who have an uneven ability to access and understand information provided via the internet or on mobile devices for example.

Participants stated that the cost-benefit ratio of RTI is already being demonstrated, but this does raise the question that, whilst we know that travellers want and value such information, is it being evaluated in a consistent and reasonable manner?

In spite of the generally good view of RTI in metropolitan areas, there is still much room for improvement, as the number of operators, and the general complexity of fares structures and service provision inhibits confidence about using public transport. Simplifying fares across multiple operators would allow people to focus on planning the journey rather than needing information about fares as well. One example of the difficulty is that of Greater Manchester, where the multiple operators within the PTE has given rise to 43 different fare structures, which is confusing for passengers.

There is a general feeling that travel by PT can be unnecessarily complex and this could impact on convenience and ultimately personal security in that users do not feel confident about their journey by PT if they perceive it as complex. Related to this is the lack of effective brokerage of services across modes, for example integrating different types of service, such as DRT with PT, and different operators. Such brokerage is dependent on information in order to function, but also needs to present that information coherently to travellers.

A number of comments are related through the idea that RTI needs to support adapting journeys on the move, when travellers are in unfamiliar places, particularly interchanges, or

when various types of disruption occur, that might require a traveller to switch services, modes or even destination in mid-journey.

The primary message that emerges from the comments elicited about weaknesses is that current information provision is rarely simple or clear, whether delivered by high or low tech means. For example, disruption generally results in mixed messages: when there is an incident, no clear message sent to commuters or general information is sporadic and inconsistent, undermining traveller confidence and acceptance. Lack of knowledge about a situation creates a sense of powerlessness, heightening frustration, creating traveller antagonism and diverting resources away from resolving whatever has caused the incident in the first place. Operator response to this issue is one of the principal foci for Work Package 2, where this issue will be subjected to a broader discussion. However, weaknesses of the current situation in relation to the user experience are relevant here. The sense is that incomplete/inconsistent information in a complex environment could leave users in a vulnerable position.

The SAVEME project at Newcastle University is relevant here (URL: <http://www.saveme.eu>) This project aims to develop an automated system for detecting disaster events in public transport terminals, vehicles and critical infrastructures such as bridges and tunnels. Furthermore the system is intended to support rapid and optimised mass evacuation guidance, to save lives of the public and rescuers, with particular emphasis on supporting the most vulnerable travellers.

Available sources of data are not being fully or consistently utilised, as they have emerged for different reasons and are not integrated. For example, data on CCTV coverage, lighting, staffing, accessibility etc. are not routinely collected and available. Similarly data on crime and accidents is not readily available. However, there is an important distinction that needs to be made between general information on public transport as discussed above, and information and technologies that relate directly to security in the operational sense. Participants are talking here about information for the responsible authorities and operators. They are highlighting a lack of an overview of information about surveillance and design technologies and approaches, as well as a lack of quantified basic information on the public transport environment on issues that are relevant to understanding how particular attributes, such as staffing levels and accessibility, contribute to the quality of that environment. Better, and more coordinated, data in these areas could have a role to play here for operators, which might be of indirect benefit to travellers through supporting the creation of an ambience in the travel environment that engenders confidence about personal security.

In relation to the impact of such technologies on passenger perceptions, participants expressed the view that public confidence in CCTV as a deterrent is low – ‘who is watching’, ‘would anyone intervene?’, yet fear of crime and anti-social behaviour is endemic. Other factors, such as staffing (for example, knowing that drivers are well trained in both driving skills and dealing with anti-social incidents, or having visible station staffing) and informal surveillance by other passengers or passers-by (social norms) is thought to be more important in

establishing confidence, though not enough is known about the scale of the problem of anti-social behaviour on buses.

CCTV: there is little data on how many CCTV cameras there are in the UK, both public and private, as this recent report in the Guardian newspaper highlights (<http://www.guardian.co.uk/uk/2011/mar/02/cctv-cameras-watching-surveillance>). CCTV systems in public spaces are covered by a code of practice introduced by the Data Protection Act 1998, and many systems have to be registered with the Information Commissioner (ICO 2008). A report by Passenger Focus noted that the lack of integration between CCTV systems within the railway environment and those in the street environment operated by local authorities diminished public confidence in the effectiveness of the technology in pursuing criminals (Passenger Focus, 2009).

Lighting: There is evidence that street lighting reduces crime (cf Farrington and Welsh, 2002). Whilst Atkins *et al* (1991) found no objective impact on crime, they reported positive perceptions in relation to public reassurance. The 2002 review study by Farrington and Welsh found that street lighting does have a measurable impact on crime, though curiously night-time crime decreases were not statistically different from day-time crime decreases, and the authors theorise that the presence of street lighting acts by increasing community pride and informal social control rather than through surveillance and deterrence. No trace of any database of street lighting in the UK could be found, though local authorities and councils appear to have inventories of their street lighting stock. At least some of these inventories are in digital form, but are not generally publicly accessible. Councils are likely to have street lighting policies, e.g. Hampshire County Council (<http://www3.hants.gov.uk/street-lighting-policy-100930.pdf>), in which the provision of lighting is normatively regarded as contributing to individual well-being, safety, security and quality of place/built environment. In the current economic climate there are examples around the UK of local authorities and highway authorities switching street-lighting off for a few hours after midnight, in order to save money.

Staffing: The prevalent perception amongst the public that a physically present member of staff is the best assurance of personal security when using public transport, and there is an important gender-related facet to the issue (cf Desai *et al* 2009 and Hamilton, 2005). Therefore technological measures, particularly CCTV, are regarded cynically as a sub-standard, cost-saving measure intended to enable a reduction in staffing costs rather than enhancing personal security (c.f. Beecroft *et al* 2007). The DfT/British Transport Police Secure Stations accreditation scheme highlights that staffing should be visible and accessible, and actively monitoring and patrolling stations.

Accessibility: the Core Accessibility Indicators (National Indicator 175) formerly provided a comprehensive set of data about the accessibility of key destinations in England, with local authorities required under the Local Area Agreement to provide a return on the indicators. . However, a change in the local performance framework in 2010 means that providing the CAI is no longer a statutory duty for local authorities, and the DfT no longer had to publish data on access to employment (National Indicator 176), though that information is still being published (<http://assets.dft.gov.uk/statistics/series/accessibility/accessibility-statistics-guidance.pdf>).

Crime data: whilst the British Transport Police collect and report data regarding crime on the UK's railways, there is no nationally coordinated collection of data on bus-related crime. Estimates have been made in order to calculate the cost to society of crime on public transport (Department for Transport 2010).

Accident data: detailed data on passenger injuries on buses and trains was difficult to find. However, some relatively dated academic literature which interprets the DfT data, for example Tyler *et al* (1995) and Kirk *et al* (2003), suggests that whilst public transport is a relatively safe form of transport, and adjusting for the composition and geography of demand, older age groups suffer double the average rate of injury, and nearly 80% of casualties are female (though 65% of passengers are female), suggesting that these demographics are more physically vulnerable than other groups on public transport. Looking at the context within which the accidents occur, more than half occur to non-seated passengers, and that 64% of the injuries were the result of non-collision incidents (i.e. slips, trips and falls).

There are a few examples of transport organisations working proactively to counter young potential criminals, generally partnerships between operators, local authorities and the police.

Proactive public transport anti-crime initiatives

For information on the **Safer Transport in West Yorkshire** initiative see:

<http://www.arrivabus.co.uk/content.aspx?id=13057> and
<http://www.wymetro.com/news/releases/archive/2012/120202safertravel>

This initiative has a dedicated police officer (the Transport Liaison Officer) who works full time, coordinating with 47 neighbourhood policing teams, and is able to share information with Metro and the 40 local bus companies through the support of a dedicated analyst.

Other examples include the: **West Midlands Safer Travel Partnership**

(<http://www.safertravel.info/>) and the **London Transport Community Safety Partnership**
(<http://www.tfl.gov.uk/corporate/about-tfl/19369.aspx> and
<http://www.tfl.gov.uk/assets/downloads/corporate/the-right-direction.pdf>)

How wider security and safety-related issues relate to personal security in general on public transport is not fully understood, but it seems likely that data about these issues could be utilised in a more intelligent way to influence traveller perceptions about the public transport environment, going beyond the traditional warning and information posters in vehicles and at interchanges, which potentially might raise anxiety as much as allay fear, as was mentioned by a number of participants. Distinguishing between crime versus intimidating behaviour or situation can be informed by a better understanding of the demographic elements that affect passenger perceptions. This is expanded on in the next section.

In relation to higher-level security issues, there were also comments relating to the interface between all land-based transport modes and air travel, where the level of security awareness and control is much higher than on trains and buses. Here, information for passengers has a key role in preventing passengers from attempting to take forbidden items airside, where security is already very good, but there is tension between too much and too little information about security as passengers do not have homogenous reactions to such information. This tension regarding security also exists at other interchanges and on buses and trains themselves, though is presently at a much lower level.

Opportunities and Threats

A number of opportunities were identified, which are summarised in Figure 10 below, and expanded upon in the discussion. Some of the threats that were identified lead on from the Weaknesses identified above, or are the corollary of opportunities.

Opportunities	Threats
<ul style="list-style-type: none"> • Learn from existing good practice and from other sectors, such as tourism • Think of the whole journey from the customer perspective • Open data • Social media and crowd-sourcing • Complement improved RTI with higher design standards for interchange and public spaces linked to public transport. • Improving management and provision of information when disruption occurs. • Educating children about acceptable standards of behaviour on public transport. 	<ul style="list-style-type: none"> • High tech innovation could threaten continuing provision of low tech information measures, when many customer groups will continue to need them. • Lack of clarity in ownership of data, and who pays • High back-office staffing requirements for social media monitoring and feedback could be costly • Intrusive securitisation of transport as a result of extreme incidents • Raised expectations about RTI that cannot be funded • Social inequities from increase in cost of travel by public transport reduces personal security • Failure to address customer perceptions of risk that are at odds with reality • Impact of increased disruption

Figure 10 Opportunities and Threats

“Need to think of the journey view from the perspective of the customer”

“Need all angles covered to provide for all customers, so still need the low tech measures”

“Mobile social media is being used to give very rapid detection and cooperation on problems and could be used further, e.g. London Midland uses it - but not all operators”

“[Mobile social media] Important but need to put staff in place - lot of potential”

Figure 11 Key Quotes: Opportunities

“Will workers who cannot be time flexible be priced off public transport-or forced to travel earlier/later where they may feel less secure?”

“Winter travel potentially more prone to disruption (though summer flooding suggests otherwise!)”

“How do you manage passenger perceptions if crime or safety statistics get worse?” (Annex 6)

“safety of surrounding public realm” (Annex 5)

“Perception change is always going to be difficult to overcome and is largely based on experience or word of mouth.” (Annex 6)

Figure 12 Key Quotes: Threats

Post workshop analysis of Opportunities and Threats

There are good opportunities to learn from existing good practice. One good example mentioned by participants is the West Yorkshire initiative in which CCTV is utilised along with information sharing with the police (see box above). Some participants also considered that there are opportunities to utilise 'way finding' in transport information innovations, as is done in tourism for example in which maps and guides assist tourists with information about easily recognised landmarks rather than route stage numbers or street names. Technological developments have resulted in the emergence of navigation services that are available on mobile devices.

Way-finding

From the perspective of an individual, way-finding is a process that is made up of three things: 'Knowing where you are', 'Knowing where you want to go to', and 'Knowing how to navigate between the two points' (see URL <http://www.transport.vic.gov.au/projects/cycling/publications/pedestrian> way-finding guide). When a new route needs to be traced, the traditional method is to ask for directions, or to consult a paper map. Both approaches are likely to lead to the traveller utilising visible landmarks as an aid to navigation. In the digital age, there are numerous gadgets and apps that are emerging offering navigation services aimed at individuals. In car or hand-held SatNav has been criticised for divorcing people from the context of their environment (i.e. landmarks), as it has tended to focus on route numbers, distances and intersections (e.g. Axon *et al* 2012). However, increasingly there are systems which attempt to mimic the more naturalistic style of human navigation. Such digital and interactive way finding systems rely on databases with geocoded Points of Interest (POI) or Way Points (WP). Digital navigation can also be assisted by the use of beacons along routes which communicate electronically with the way finding device. However, this type of Way Point is 'invisible' to the human agent, though obviously is likely to be useful for individuals with visual impairments who cannot rely on visual cues from landmarks (see Raubal and Winter, 2002).

Meeting the design and layout challenge of improving way-finding through consistent and clear signage, well-designed safe pedestrian routes around interchanges and to PT access points, and balancing commercial/social interaction and operational efficiency in interchanges and public spaces linked to PT are all aspects that are related to this as well as to addressing some of the issues raised by the complexity of the PT environment.

Way-finding is also linked to personal security through passenger confidence. If you know an area, you know where to avoid, i.e. your confidence extends to known boundaries. Local knowledge is an important component in your geographic comfort zone and when journeys are made it links to a personal mobility comfort zone. If you don't know where you are then you are unaware of where the 'safe' boundaries are - so less likely 'to test the water' by using an unfamiliar mode or route. Thus, it often seems to be easier to take an alternative, familiar, mode in the absence of reliable and well-designed information.

These opportunities show that high technology forms only a part of the mix of improving a sense of personal security in public transport. Over-reliance on technological information solutions is also a threat. Tackling personal security issues doesn't start with information

technology. Solutions must incorporate staffing (including drivers where they interact with passengers, such as on buses), environmental design, and take a whole journey perspective, and how to integrate different modes and activities more seamlessly. Part of an individual's perception of their personal security also comes from confidence about their physical safety, which can extend to fear of slips or trips in public spaces or within vehicles. Maintaining a quality environment, and attending to staff training also have a role to play. Well maintained, clean and bright transport infrastructure also supports positive perceptions that anti-social behaviour is unlikely. Fear of anti-social behaviour and crime is an important factor for certain groups of passengers in different contexts. For example, in remote areas, where there are low passenger numbers, travellers can experience quite high levels of anxiety about their personal security, but these locations are expensive to equip with technology for safety or RTI.

There are a number of technology-fuelled developments from beyond ITS that have the potential to make a major contribution to the field. Two which are particularly important are the move towards making governmental data open access, a 'top down' development, but one which encourages 'bottom up' utilisation of the data, and the rapid growth in social media which connects people very directly in new ways, enabling peer to peer exchange of real-time information.

Open Data

Open Data is data that meets three criteria:

1. It is accessible, ideally via the internet, at no more than the cost of reproduction, without limitations on the basis of identity or intent;
2. It is in digital *and* machine readable format for interoperation with other data; and
3. It is free of restriction on use and redistribution in its licensing conditions.

In the UK, the government is increasingly endeavouring to meet the appetite for transparency and availability of publicly-funded data via an Open Data strategy, seeing it also as an opportunity for innovation in pursuit of the digital economy (HM Government, 2012)

Access to data is key for RTI, and information provision is already an important element in the regulatory framework for public transport. Responsibility for information provision is clearly set out in the legislative and regulatory framework, but this is opaque to the public. Whilst the local transport authority has the legal responsibility, private providers, and other stakeholders, also produce information about the same services, often in different ways, which links back to the complexity discussion above. The increasing availability of open data raises new questions about who ultimately pays for the provision of data, develops applications based on it and benefits from new services based on it.

Social Media

Social media is a fast moving area of technology development. Social media enable flexible and more or less immediate interaction with other people and with organisations across time and space, and generally have very visual and engaging interfaces, whether through computers or mobile devices. We have already mentioned that transport operators are using Facebook and Twitter to communicate with customers, as a marketing tool, as a travel information tool (when there is disruption for example), as a customer feedback tool but also to get information on transport problems direct from customers. Social media principles (peer-to-peer evaluation sharing for example) underpin many applications and websites in the tourist travel domain (such as TripAdvisor), and there is increasing convergence in that applications such as TripAdvisor can be used through Facebook, so that the wider social network can get feedback and information on a Facebook/TripAdvisor's movements and reactions to tourist experiences. Privacy and data ownership concerns aside, there is a great deal of useful data on travel wrapped up in these networks. There are also other less well known, socially useful applications of social media, such as Fix My Transport (www.fixmytransport.com), a MySociety product which aims to streamline the process of complaining about service problems by providing an interface for a customer to complain right away, with the right geolocation, and for the appropriate responsible body to be informed, no matter where the customer is and without them needing to know which body to complain to. The screenshot below shows how simple the concept is.

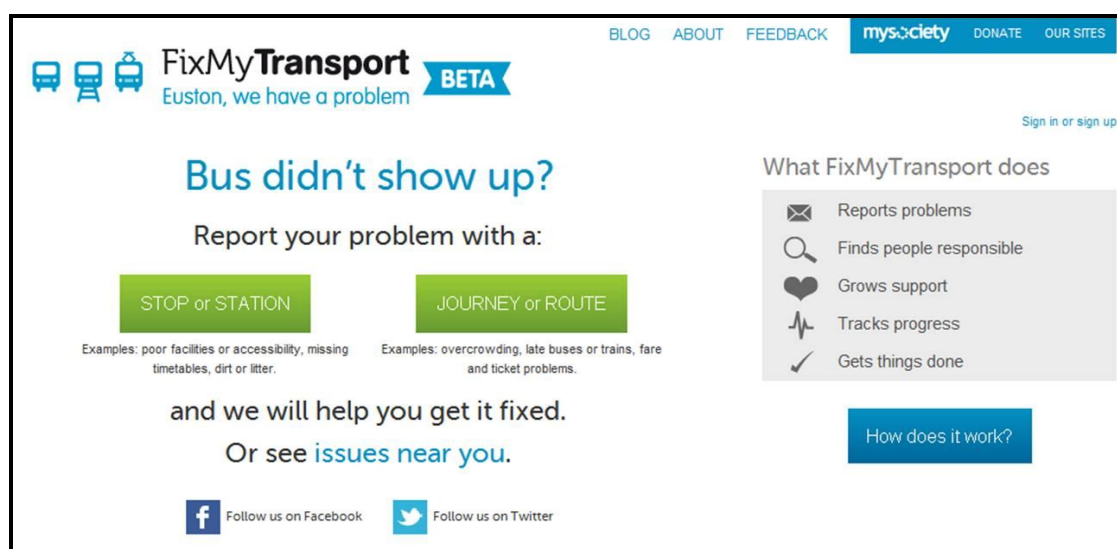


Figure 13 Screenshot from Fix My Transport

There are also other sources of data, about which ownership issues are less clear, such as personal data about individuals, their locations and activities. At present users of social media services such as Facebook are more or less willingly allowing the service provider to utilise information about them in return for a free service. However, as this field develops, attitudes may harden.

Peer-to-peer and peer-to-operator direct information exchange about real-time transport service status has the potential to disrupt ‘official’ sources and applications of information, but offers exciting opportunities for innovation. However, it requires new ways of thinking and a willingness to experiment and there are only a few examples of transport information providers and operators making comprehensive use of social media, such as the use of mobile social media to give very rapid detection and cooperation on problems e.g. London Midland uses it - but not all operators use it yet even though it shows a lot of potential.

Using Twitter for transport and travel information

London Midland’s use of social media won the ‘Putting Passengers First’ category at the 2011 National Rail Awards. The company was praised for its innovative use of a Twitter account (@londonmidland), launched in April 2010. (see <http://twitter.com/LondonMidland> accessed 22 August 2012)

A number of other train companies have also been using Twitter, for example:

Chiltern Trains, which has been recognized in the Social Brands 100 for two years running (see <http://www.chilternrailways.co.uk/news/chiltern-railways-shortlisted-social-brands-100> and <http://twitter.com/chilternrailway> both accessed 22 August 2012).

Virgin Trains (see <http://twitter.com/VirginTrains> accessed 22 August 2012)

If the use of social media and two-way direct communications with customers are not properly supported in terms of staffing, then attempts to innovate in this area could be a threat, either at individual operator level or more systemically. The use of social media is currently poorly understood (see introductory comments) and clearly much is still to be determined, but it can also be seen as an opportunity in terms of operator/user relationships, one innovative use of two-way information support for travel comes from the National Rail Enquiries Twitter team.

National Rail Enquiries

National Rail Enquiries has used Twitter since 2009, but it also has Facebook interaction with customers during office hours Monday to Friday. The NRE Facebook page had more than 18,000 ‘likes’ as at 22 August 2012. NRE also has an automated assistant called ‘Ask Lisa’. NRE explains its various Twitter accounts at http://www.nationalrail.co.uk/times_fares/info_on_the_move/social_media.html (accessed 22 August 2012)

Changing perceptions is always going to be difficult to achieve and is largely based on experience or word of mouth. Technology could mean passengers can interact and feel safer by getting to know other passengers through social media, but it can be deployed in many

other ways, such as influencing passenger perceptions about crime or safety, though how this is managed if the statistics worsen is a moot point.

Any increase in securitisation of the transport environment to incorporate some of the measures employed in airports in response to extreme incidents could have a negative impact on customer confidence. Though experience of the impact of the events such as '7/7' on travel habits suggests that passenger confidence in using transport services quickly returns to normal levels, there is some suggestion that increasing security information messages does cause some segments of the population to regard the environment as more, rather than less, risky.

Personal security and disruption

Management of passengers and information when disruption occurs is important. On the operator side, there are opportunities to utilise new technologies to more rapidly identify the nature of any incident and to draw on the experience of operators to estimate potential delays. This is the type of issue that will be covered in Workshop 2. However, there is also a customer-facing element to information about disruption. Speedy peer-to-peer propagation of 'information' using mobile devices and services such as Twitter and Facebook can raise customer expectations about what is possible to know from operators. Information sharing through social media can also result in mis-information, raising questions of trust about who has the right information, and who ought to know detailed information. It is possible to imagine cases where safety considerations mean that passengers should not be alarmed, and hence full information should be withheld. However, operator experience and data about previous incidents could be utilised to develop a bank of options for giving information to passengers about likely delays and alternative travel strategies offers an opportunity to use new information technologies to manage customer perceptions and expectations. Given the growth in social media, it is important that operators attempt to do this.

One of the consequences of crime, anti-social behaviour or accidents is disruption to transport services. Disruption occurs at the point of an incident, but has ripples which spread around the network. The impact on travellers has both physical and perceptual impacts which can fall under the heading of 'personal security'. A number of comments made by participants refer to impacts on personal security arising from disruptive events in the transport network. These are more pertinent to Work Package 2 and are not analysed here.

Exploration of key factors and perspectives

In this section we pull out and discuss particular factors that impact on the current experience of personal security and explore three key perspectives on the issue: users, operators and information providers.

Three factors: temporal, spatial, and demographic

Many of the issues highlighted above vary across space and time, as well as affecting or being affected by, different demographic groups. Understanding the impact of these variables on personal security in public transport is a key objective of the overall project. In this brainstorm, we asked participants to think about the impact of temporal, spatial and

demographic factors on current personal security issues. The verbatim comments captured by the software are in Annex 5.

Temporal: Considering perceptions and experiences of personal security from a temporal perspective elicited many examples relating to time of day, though time of year is also an issue, as some of the feelings of insecurity in travel come about simply because it is dark, rather than ‘night time’.

Temporality and latitude

This is likely to be more of an issue in the northern parts of the UK, where day length is substantially shorter in winter. There is some statistical evidence to support the views of participants: whilst 91% of adult (16+) bus users in Scotland report feeling ‘personally safe and secure’ on the bus during the day, this figure drops to 59% during the evening (Transport Scotland, 2012).

Information was seen as particularly important in relation to last services of the day, when there were few fellow travellers around to ask ‘Has the last bus gone?’ Similarly, night services are less frequent, and also tend to be low occupancy, or patronised by inebriates, which makes people feel more insecure, particularly in some areas. For example, ScotRail has recently introduced a ban on drunkenness and visible alcohol on all its services after 9pm (except the Caledonian Sleeper), in response to difficulties on some routes with drunken and antisocial behaviour.

Another periodic factor that might reduce a sense of personal security in some groups is travelling at peak times. Congestion levels affect perception of safety, especially for fragile passengers – available information both at journey planning stage and in real-time could guide such passengers to services that will be more comfortable for them.

A planning criterion that should be considered is journey resilience – what are the consequences for an individual if they miss their connection, and how this varies at different times of day? Promoting a change in the characteristic of networks to enable a shift at low use times of day to demand responsive services, including shared taxis might be a rational solution, as well as improving information on such alternative services and where to keep safe while waiting (way-finding is also a significant factor in the dark – ‘Where will I end up on the night bus?’). Shift workers and those with jobs in the increasing night-time economy tend to rely on cars and taxis, as public transport is not flexible enough to provide them with safe and convenient services. Similarly, in rural areas, services designed for commuters may not suit people travelling to healthcare appointments.

In relation to winter travel, services may be more prone to disruption as a result of winter storms, and the ‘first and last mile’ on foot on icy surfaces becomes a consideration for many people who might otherwise use public transport. Timely information about which pedestrian routes need to be/have been treated might be a useful innovation.

Demographic: Demographic factors relate to cultural groups, age, income, gender and disability status. These characteristics can combine in different ways for different individuals

at different times, affecting willingness or ability to use public transport. It depends on customer group as to what reassurance a passenger needs regarding actual crime levels, and from non-users perceptions regarding personal security on PT can be very negative whereas regular PT users have a more realistic view of the situation. More individualised information could provide more support to travellers in these groups.

Feeling vulnerable was considered to be particularly felt by young women, the elderly and disabled, though it was acknowledged that anybody could find themselves feeling vulnerable from time to time. For example, threatening/anti social behaviour means different things to different people - for some it might be listening to music loudly, while for others it might be smoking/being drunk.

A sense of personal vulnerability can be entwined with safety issues. The risk of sudden starts or stops on vehicles leading to falls can influence passenger perceptions. Research suggests older people do not perceive safety on buses as a significant issue until they experience a safety related incident, such as a fall. The impact on future behaviour then becomes significant.

In relation to non-routine occurrences, the consequences of disruption are much more significant for disabled or elderly travellers, and there is a very important role for information in these instances. Technology can also be used to help less mobile users feel more welcome on public transport, encourage elderly users who have lost confidence as the result of a negative experience and provide tailored support to people making their first solo PT journeys.

A varied collection of other examples were contributed by participants include way-finding or feeling pressured when travelling with children, finding ways to keep teenagers on public transport, allaying concerns regarding interchanges, such as feeling lost, or worry about the security of bicycle storage, cultural or language blocks to using public transport. There is some evidence that some groups have cultural or language barriers to using public transport (evidence from TfL needed). There is also a discernible difference in attitudes to 'ridership' between large conurbations and other areas. Whereas a broad spectrum of society uses public transport in conurbations, in smaller towns/cities/villages public transport is generally only used by the socially disadvantaged, disabled and elderly (certain categories in each instance). Better RTI could become a useful element in improving the image of PT in those cases, and the perspective of marketing professionals working for operators might be useful.

Spatial issues (e.g. rural/urban): Fear of crime varies according to location as well as time of day – for example, urban journeys are more worrisome than rural journeys, where few concerns are raised apart from rural residents find urban bus interchanges intimidating late at night. Conversely, urbanites would tend to find unlit rural bus stops with no, or out of date, information extremely unsafe compared to their own environment. Rural areas have fewer late evening/night services, and may need alternative forms of transport provision (as mentioned elsewhere).

This kind of spatial variation is also related to commercial viability – operators need to be profitable, but social inclusion considerations need to be funded in some way, as not everyone has a suitable or affordable alternative, and community viability is threatened if services are lost. There is a major opportunity to improve the mix of DRT and scheduled services. Rural areas often have major gaps in frequency, better information would enable travellers to plan for this, or alternatively technology could support the use of alternative modes to fill the gap (DRT, taxis, car sharing).

The accumulated consequences of spatial planning decisions, and decisions made in other policy sectors (such as education and healthcare) have resulted in considerable changes in the location of key destinations over time. Public transport sometimes struggles to adjust to these in a commercial environment, and consequently the facilities are not readily accessible by PT. For example, some destinations such as hospitals generate highly important but irregular journeys, often at off-peak times. Lack of confidence about reliability can result in default use of cars.

When designing information provision, it needs to be contextualised and considered along with the design of the environment in which it is to be located. However, information about transport networks would benefit from consistent types of presentation even in different regions, e.g. overground maps broadly in the style of the classic London Underground map are useful, but are not universally used. Travellers unfamiliar with an area prefer those modes (e.g. tube, buses with next stop indicator) with clear visuals that make use simple.

Three perspectives: users, operators and information service providers

We have already touched on how the perspective of participants influences their perception of the content of the term ‘personal security’. There are other relevant differences in the way workshop participants frame their discourse in considering the workshop topic. This section contains post-workshop analysis stimulated by key quotes from the workshop (given in italics). The raw comments that underpin this section are found in Annex 7.

User perspective:

Key Quote:

“Travelling is about the people, not about the technical system of managing the movement of inanimate objects.”

For users, it is important that information is available for the ‘lowest common denominator’ in terms of accessibility. User acceptance testing should be used to ensure that all demographics can get what they need from information provision. Systems also need to be reliable. This is vital to gain user confidence. Whilst there seems to be a lot of good work being done, a single incident can set things back in customers’ minds.

Whilst it has been proven (at least in the London context) that users can be willing to pay for information services, is this general? One participant commented that LT/TfL research has not been made generally available though we have been unable to confirm this, as our information suggests that data is available when asked for.

Willingness to Pay for Information Services

There have not been many studies of traveller willingness to pay for information services. A UWE literature review study for the DfT (Lyons *et al* 2007) cites seven studies that consider (to a greater or lesser extent) willingness to pay. However, they conclude that the evidence is mixed, and where a willingness to pay is indicated, there are many caveats relating to the cultural and travel contexts. What does seem clear is that if a charge for information is made, then this would raise traveller expectations about the reliability and usefulness of the information. At the present time, it is mainly SMS services which carry a charge, and unwillingness to pay seems to be a relatively minor factor in not using SMS-based RTI services (TfL, 2012).

As discussed in the previous section, new technology is enabling passengers to talk to train companies, to report problems and get answers, in real-time. This helps operators to know the impact of particular decisions and find out about problems quickly.

Users will also perceive supporting infrastructure as something that is an intrinsic part of their PT experience. For example, multi-storey car parks (such as one provided for Tyne and Wear metro users and experienced by a participant) can be dank, dark, graffitied and permeated by appalling smells, particularly in the stairwells! Such facilities are often not under the control of PT operators, flagging up the relevance of partnership approaches to upholding the quality of often forgotten aspects of the public realm.

Transport operator perspective:

Key Quote

“Linking (low tech) culture of network management to technological opportunities”

The operator perspective is generally focused on the bottom line, and whilst sophisticated high technology systems might be nice to have, they will not necessarily be supported, as the traditional working culture is low tech, and thus not attuned to technological opportunity. This is compounded by the lack of quantified and demonstrable links between investment in information provision and a financial or social return. The ownership model is key, as public transport deregulation has created issues for transport information providers. This hampers efforts to improve the passenger experience in a number of ways. For example, some operators refuse to use purpose-built bus stations, with their RTI infrastructure and information kiosks, if they have to pay small fees, even though these provide better facilities for passengers. Similarly, if information provision is not built in to construction contracts at the start, the restrictive nature and lengthy periods that are typical of DCM¹ contracts makes it very hard to introduce beneficial changes.

From the operator perspective, all information provision that they have a financial stake in providing should increase ridership and income. For transport authorities, their expectations of the impact of information provision relate to their policies, particularly for congestion

¹ Design, Construct, Manage

management, air quality improvement and climate change obligations through promoting modal shift, but also in terms of supporting accessibility and social inclusion by means of public transport services. However, social media and ‘crowd-sourcing’ information by passengers by-passes the ‘control’ of information by transport operators/authorities. Social media will force operators to continually inform users, particularly during disruption. If they don't then users will (mis)inform each other – raising significant questions about brand image, customer service, quality and provenance.

Participants believed that most operators have not retained historic data that would enable them to predict the outcomes of disruption in ways that would help them keep users meaningfully informed. The priorities of resolving incidents and managing the network can compete with the information needs of customers. In all situations, drivers and other front-line staff also need to be trained regarding information for passengers: this is not just about customer service but has operational benefits.

Information provider perspective:

Key Quote

“Data management to collect and maintain the required data is expensive - difficult to establish viable business models.”

The providers of information are not always the same as the transport operators. There are multiple suppliers of information and services, with varying levels of coordination between them. There are commercial companies that produce hardware, software and services to deliver information, and some of these also hold contracts to provide and manage complete systems. There are also public bodies which provide information to the public about transport in a number of forms, such as Transport Direct. Operators also provide information directly, possibly from a different business unit to network management. From the perspective of information providers, data management (collecting and maintaining the required data) is expensive, and it has been difficult to establish viable business models. Operators also need to provide fundamental PT information properly, i.e. schedules and real time data, before personal security issues can be addressed.

There are a number of gaps in knowledge/ability to deliver. For example, information providers need to understand how users access information, and not assume that all travellers have the latest technology, nor are they all likely to have it in the near future, making it necessary to continue to deliver information via multiple platforms (high and low tech). Second, during periods of disruption, the demand for and utility of information is highest, yet certainty about the information that can be provided is lowest. 24/7 robustness and flexible scalability to meet increases in demand for information services is necessary but challenging.

There are opportunities to learn from technologies and techniques that are used in other sectors utilising large data in real-time, such as financial broker services. Similarly, the move towards open data offers big opportunities to allow the developer community to innovate and provide data and information that is more relevant and developed more quickly than previously.

Identification of future key driving forces – STEEP(L) analysis

In this session participants considered what key forces would drive future societal developments, categorising these as far as possible into Social, Technological, Environmental, Economic, Politic and Legislative drivers. There were many strong and varied comments, which have been summarised under each heading below. In the time available, and having regard to the mix of participants, not every category has received equal treatment. For example, the Environmental driver would undoubtedly look very different if environmental expertise had been more strongly represented at the workshop. Not everything identified was directly used in the scenario development stage, but the exercise provided a good ‘warm-up’ session to enable participants to move to forward thinking, having explored the current situation. The raw comments, under the headings originally utilised by participants, can be found in Annex 8.

Discussion of Driving Forces

In the Driving Forces session, many points were made that expand on the key driving forces included in the table above. We use these points as the basis for this discussion of the driving forces identified.

Key Social Driving Forces

A key social driving force will be whether or not people will travel more or less. For example, there is a growing body of evidence that car use is falling in developed economies, rather than continuing to grow (c.f. Goodwin, 2010a, 2010b, 2010c, 2010d and 2011 for the ‘peak car’ hypothesis). There could be associated changes in car ownership and the prevailing model of car access, favouring car share schemes.

Demographic trends will alter travel patterns. For example, an ageing population in developed economies will have substantially different travel requirements than present day patterns, and will also be more psychologically insecure. The trend for increasing single-occupancy of dwellings will continue, altering the extent and type of housing provision, with associated differences in the necessary transport infrastructure to serve residential areas. Metropolitan growth is easier to serve through integrated transport networks than fragmented developments in smaller urban settings and rural areas, so the location of house-building will be very important.

The early hope that technology could replace some travel (e.g. through teleworking) may mature into fruition. There is evidence that ways of working, and patterns of employment are changing, facilitated in part by information technologies, and this will affect transport patterns.

Increasing social polarisation between haves and have-nots, and increasing migration between regions and countries will also have an influence on travel patterns and requirements.

Social	Technological	Environmental
<ul style="list-style-type: none"> • Reduced car use, but will people travel more, or less? • More older and single person households needing more dwellings will potentially result in urban sprawl and will require transport infrastructure/services to support them. • Commuting patterns will become less concentrated as patterns of employment and ways of working are changing and there are some signs that IT may eventually replace some travel. • Greater economic disparity between ‘haves’ and ‘have-nots’. • Migration. • More fear of crime. 	<ul style="list-style-type: none"> • Physical transport networks will develop much more slowly than information, operational and control systems. • Ubiquitous and pervasive location and ‘push’ technologies coupled with personalised augmented reality devices will be normal, enabling much more sophisticated delivery and interfaces more supportive of elderly, disabled • Internet of things. Digitisation will have created high definition representations of everything. There will be ubiquitous sensing of vehicles, passengers, environment etc., allowing more efficient management, coupled with universal ‘always on’ two-way connectivity and video, increasing a sense of personal security. • Improvements to computing power will enable true ITS at viable cost. Managing very large data and information in real time will change the ability to inform. • Contactless technology (e.g. biometrics, facial recognition) will be used to deter crime as well as speed customers through processes such as security checks and passport control, though there will be privacy trade-offs. • Electric vehicles and re-charging infrastructure continues to develop. Emphasis could switch from electric cars to electric bikes and motorcycles. 	<ul style="list-style-type: none"> • More environmental tax will drive change • ‘Perfect storm’ of environmental issues, for example climate change adaption plus peak oil plus other resource constraints • Environmental restraints imposed by government(s). • New oil reserves coming on stream as oil prices allow economic production from marginal fields that have environmental disadvantages- peak oil still some way off. • Public develops a better understanding of environmental issues as the current cohort of children receiving environmental education at school grows up (timescale - 10 years minimum). • Air quality and impact on people's life styles and travel.

Economic	Political	Legal/Regulatory
<ul style="list-style-type: none"> • Energy costs will rise. • Low carbon vehicle market stimulated through greater investment. • Greater subsidies for public transport. • Real value of time will increase. • Managing the transition from oil to (other) energy economy will have transport and PT impacts. • New ways to pay (e.g. Smartcards and mobile phones) will be controlled and hence driven by banks. 	<ul style="list-style-type: none"> • Degree of political will. • International political cooperation over global environmental issues to ensure equity. • Short-term electoral cycle thinking affects other drivers, e.g. political acceptability of subsidy depends on ideology of party in power, this could change 6 times before 2040 • The emergence of champions for issues will influence change. • Greater emphasis on ‘homeland’ security. • Greater financial devolution to city regions. 	<ul style="list-style-type: none"> • Regulation of personal and commercial carbon emissions. • Key barrier to change - legislation very slow to change. • Legislation will gradually include representation of stakeholder (e.g. passenger) perceptions and user ratings as part of performance monitoring. • Increased role for regulation to enable improved integration, at least at regional level. • Open data directive from EU will make more data available to others.

Key Technological Driving Forces

Whilst the technological changes won't occur as rapidly as we might imagine, and physical transport networks will develop much more slowly than information technology networks for operational and control systems there will undoubtedly be considerable technological change by 2040. A key trend will be the development of sophisticated delivery of information and support through personal augmented reality devices, with user interfaces individualised for the elderly or disabled. Near-Field Communication technology should overcome many accessibility barriers, particularly for the elderly and disabled. It could also be linked to facial recognition developments in CCTV to deliver personalised text messages, such as warning known trouble-makers that they are under surveillance.

Near Field Communication (NFC)

NFC is a short range wireless technology in which two items need to be brought within 1 cm of one another. A NFC mobile phone is the 'initiator' (and provider of power) which reads information on a 'tag', which can be something as small as a sticker. Companies are already providing transport related services which utilise this technology (e.g. www.track4services.com), with 'tags' on buses and bus stops, enabling bus users to access targeted up to date information about services for their current location. A user's language, or visual impairments, are catered for automatically through one simple 'tag' (on a poster for example), and through the same poster, multiple information delivery methods can be used: calls, texts, web, QR codes or NFC.

The 'Internet of Things' concept will have linked many physical objects into the World Wide Web, and everything will be representable in digital form². There will be ubiquitous sensing of vehicles, passengers and the environment, contributing to more efficient management. Continued improvement in computer power will enable affordable 'true' ITS. Managing the very large data sets of transport information in real-time will deliver a quantum change in the ability to inform. For example, according to one participant, a typical car generates 1GB of data every day. This data could be harnessed for various applications, including traffic management, safety and environmental protection. Whilst we could not verify the figure of 1GB, it is clear from the internet that there is a great deal of interest in 'connected cars', 'intelligent vehicles' or 'smart cars', and that cars, with onboard electronic control units managing everything from anti-lock breaking systems to fuel injection, are already generating isolated quantities of data. Effort is being expended by car manufacturers on product and safety enhancement that connects potentially connects some or all of this data, as well as positioning data, to the outside world (for example, General Motor's OnStar subscription service for vehicle owners that offers hands-free calling, navigation, and emergency assistance services, with developments in peer-to-peer

² For more information about the Internet of Things concept see <http://www.theinternetofthings.eu/internet-of-things-what-is-it%3F> accessed 6th November 2012.

car-sharing also appearing³). Some commentators highlight that cars and other vehicles are significant near future sources of so-called Big Data (Mathai, P., 2011).

The ‘always on’ universal two-way connectivity of audio and video communications supports an increased sense of personal security. Facial recognition and ‘big brother’ technology will improve capability to catch offenders but there will be privacy trade-offs, which are perhaps compensated for by the benefits delivered by the ubiquitous and pervasive use of technologies to ‘push’ location aware information to personal devices, and become normal. Technology can also be used to speed customers through processes such as security checks and passport control without stopping (similar to gateless toll systems).

Some of what is possible in terms of technological developments is closely connected to the identified economic drivers. For example, a rise in the cost of energy will drive technological development to optimize routing and service availability. Similarly, developments in the banking system will control smartcard and mobile phone payment/ticketing developments, as well as enabling the incorporation of biometric data, that can transform security on transport, acting as an access control.

Key Environmental Driving Forces

The key environmental driving force for transport was identified by participants as climate change and comments related to the impacts of this for transport. There are many other environmental issues that could impact on the economy, regulation, society and politics, but the participants did not mention these.

The climate is changing. Whether this is driven by human activity is not really the issue for adaptation to increased global average temperatures and the impact of this on sea level and weather patterns. Adaptation will be required, whether or not mitigation is possible. The impact of climate change will be combined with natural resource constraints – whilst demand raises prices enabling marginal (i.e. expensive) fields to be exploited, ‘peak oil’ will eventually drive exploration into environmentally sensitive areas, such as the Arctic or Antarctica, and to non-conventional sources of oil and gas that are environmentally damaging to extract (such as tar sands or fracking).

Public understanding of a range of environmental issues will mature over the next decade as the current cohort of children receiving environmental education at school grows up, and this will affect societal attitudes towards the acceptability of certain transport behaviours and environmental taxes. Societal attitudes may prevent the exploitation of marginal and non-conventional oil reserves, driving carbon rationing and less mundane travel, but increasing long-distance leisure travel for the ‘trip of a lifetime’. However, developments in energy efficient aeroplane technology mean that

³ <http://gigaom.com/cleantech/gm-opens-up-onstar-with-peer-to-peer-car-sharing-service/> accessed 6th November 2012.

air travel is increasingly favoured over high speed rail for medium range travel. Carbon rationing, and other centrally imposed environmental restrictions would necessitate greater funding for public transport to enable growth in provision of flexible, but affordable, services offering different standards and to provide mobility for the increasing numbers of 'have-nots'.

Any increase in environmental taxes will drive change towards electric vehicles to reduce GHG and particulate emissions, as air quality issues as well as carbon emissions need to be addressed. An emphasis on electric cars does not solve congestion, and doesn't promote modal shift to public transport and EV will only account for 20% of fleet so other low carbon power trains are needed. Infrastructure for charging points also needs to be developed. Electric bikes and motorcycles could also develop, and local low carbon journeys would be more important.

The internet/cloud based computing uses energy: Will the growth in energy use by internet/cloud based services (that could underpin teleworking/ flexible working) be lower than the growth in energy use in other sectors, or is the internet just as power hungry as existing forms of mobility?

Key Economic Driving Forces

Greater disparity between rich and poor, and a corresponding increase in the real value of time for those in the higher economic brackets. Thus, a key driving force will be the increase in the real value of time. This means that the time-saving benefits delivered by RTI will increase to those who can afford them. Similarly, mobile devices which enable travellers to utilise time when travelling will be valuable.

Higher value of data and the ownership of data, both about the travel network, and about the traveller, will be important. Approach to these issues will be influenced by cultural values, but some groups will pay for bespoke journey planning, others would benefit from it but may not be able to afford it. However, they may be able to derive value from the data that they control.

Smart payment methods, as referred to above, will transform methods of buying and using transport services, and could combine with reward systems to influence behaviour. Such a development will also link transport systems to the banking system in new ways, as banks will be key drivers in the development of smart payment technologies.

The economy will shift from an oil economy to an alternative energy economy. This will have transport impacts and will also alter the national relationship with other economies. For example, Germany and Sweden are investing heavily in the transition to oil independence, whereas the UK has been weaker in this area. One result could be increasing foreign ownership of UK transport assets.

At the same time, employment patterns and modes will change towards more flexibility, impacting on public transport use, and the environmental performance of the transport system.

Key Political Driving Forces

International political cooperation, particularly with the US, is needed to tackle environmental issues. Responding to environmental crises will continue to be hampered by political weakness resulting from the short-term electoral cycle and a continuing ideology opposed to regulation.

The political acceptability of transport subsidy depends on the ideology of the party in power, but this could change six times before 2040. The current trajectory is anti-subsidy for public transport, though investment is being announced in infrastructure projects, including rail. The long lead times for transport infrastructure development means that this investment is needed now to be effective in 10-20 years time. Political will to go further is lacking at present, and a true champion, for a more integrated transport system at any scale is not apparent at the present time.

Political responses to terrorism and cyber-attack are key to understanding how security might develop. A technocratic approach could spread airport-style security to major train interchanges, which would have far-reaching impacts on the nature of travel.

Further city-regional devolution through the localism agenda will enable PTEs to innovate, especially if they are given more power to integrate services and to raise funds (as is now being seen with the City Deals Initiative for the 8 Core English Cities of Birmingham, Bristol, Leeds, Liverpool, Newcastle, Nottingham, Manchester and Sheffield (see below)).

Key Legal and Regulatory Driving Forces

Legislation is slow to change, and that will continue though there will be a gradual shift to better represent passenger perceptions and performance monitoring in transport regulation because technology enables more direct and transparent customer feedback (e.g. the eBay (<http://pages.ebay.com/help/feedback/howitworks.html>) system for customers to rate the quality of service they received from on-line sellers) on operator performance in service delivery.

Current competition laws are a barrier to wholly integrated systems and services, except in outstanding cases such as TfL, but the success of some 'earn back' mechanisms such as that in Greater Manchester has resulted in greater Treasury flexibility. This trend could increase, and support arguments for regulation to support integration of systems and services at the regional level if not national.

The City Deals Initiative

The current Coalition Government has been pursuing a ‘localism’ agenda. One outcome of this is the new ability for reaching revenue sharing agreements with Treasury, so-called ‘earn back’ mechanisms, through the City Deals Initiative. The first such deal to be agreed sees Greater Manchester setting up a £1.2 bn infrastructure fund. This fund will enable the Greater Manchester to deliver future infrastructure investment, expected to deliver extra growth. The key innovation is the willingness of the Treasury to allow Greater Manchester to keep up to £30 million in additional tax revenue that is so generated (payment by results).

(<http://www.communities.gov.uk/news/corporate/2110432> accessed 18th September 2012).

EU regulations are driving some important relevant developments, such as the Open Data Strategy, which is proposing to revise Directive 2003/98/EC on the re-use of public sector information by the end of 2013⁴.

The Scenarios

The four scenarios developed in this framework result from alternative assumptions regarding the interplay of key driving forces relating to values (contemporary tastes, beliefs and norms) and governance (the way in which authority and control is exercised in societies – whether local, national or global). The brief summaries outlined below were derived from Berkhout and Hertin (2002) and were given to participants as a starting point.

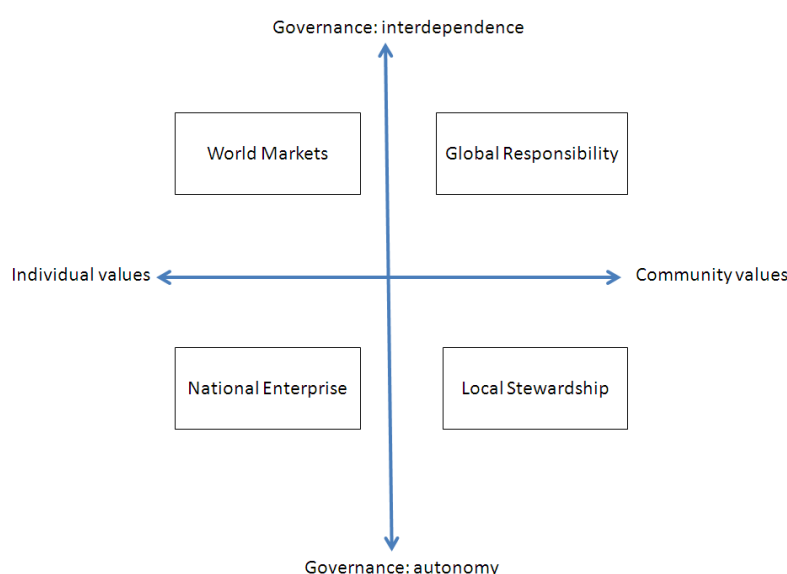


Figure 14 The Four Scenario Framework (Source: Berkhout and Hertin 2002)

⁴See http://europa.eu/rapid/press-release_MEMO-11-891_en.htm accessed 6th November 2012.

World Markets is a world in which individual aspirations can thrive in a global economy sustained by international cooperation.

- People aspire to personal independence, material wealth and mobility to the exclusion of wider social goals.
- Integrated global markets are presumed to best deliver these goals.
- Internationally co-ordinated policy sets framework conditions for the efficient functioning of markets.
- The provision of goods and services is privatised wherever possible under a principle of ‘minimal government’.
- Rights of individuals to personal freedoms are emphasised.

Global Responsibility is a world where individuals value the community and look to government to implement policies for welfare and sustainability.

- People aspire to high levels of welfare within communities with shared values, more equally distributed opportunities and a sound environment.
- There is a belief that these objectives are best achieved through active public policy and international co-operation within the European Union and at a global level.
- Social objectives met through public provision, increasingly at an international level.
- Control of markets and people is achieved through a mixture of regulatory and norm-based mechanisms.

Under **Local Stewardship** individuals seek sustainable levels of welfare within federal and networked regional and local communities and a high quality local environment.

- People aspire to sustainable levels of welfare in local communities.
- Markets are subject to social regulation to ensure more equally distributed opportunities and a high-quality local environment.
- Active public policy aims to promote economic activities that are small-scale and regional in scope and acts to constrain large-scale markets and technologies.
- Local communities are strengthened to ensure participative and transparent governance in a complex world.

Under **National Enterprise** both individuals and governments seek autonomy and independence

- People aspire to personal independence and material wealth within a nationally rooted cultural identity.

- Liberalised markets together with a commitment to build capabilities and resources to secure a high degree of national self-reliance and security are believed to best deliver these goals.
- Political and cultural institutions are strengthened to buttress national autonomy in a more fragmented world.

The Workshop Activity

The task undertaken in the workshop scenario planning activity was to consider how provision for public transport traveller information (with particular reference to issues of personal security) might develop within the context of the four alternative scenarios as described above. Questions considered in developing each scenario narrative included:

- How will provision of public transport traveller information ‘work’ under this scenario?
- What will be the threats to personal security in travel under this scenario?
- What will be the solutions to these threats generated under this scenario?
- What opportunities will there be to better support security, safety and confidence in travel under this scenario?

Participants were divided into two groups. Group A considered two contrasting scenarios (World Markets/Local Stewardship) and Group B considered the other two contrasting scenarios (Global Responsibility/National Enterprise). They used whiteboards and a laptop with The Innovation Space software to record their discussion. Digital photographs were taken of the whiteboards, and we have used these and notes taken on the day to develop four narrative scenarios. The digital photographs are available as a separate digital annex.

Scenario Group A World Markets/Local Stewardship

Steve Atkins, Peter White, Greg Lewis, Anne Murphy, Tony Holland, David Hytch

Scenario Group B Global Responsibility/National Enterprise

Taku Fujiyama, Laura Mason, Peter Warman, Jeremy Bennett, Nick Knowles

Scenario Narrative - World Markets

In a society where individuals ignore national and regional barriers as they strive for material wealth and mobility there is a significant increase in international travel and long distance domestic travel for those who can afford it. In this context, there will be significant growth in the demand for complex journey planning services and advances in the quality and quantity of information provided will be market driven. This will initially be spurred by the sharing of international best practice, but commercial imperatives will lead to a small number of global players, multi-national corporations, dominating provision of these services. The emphasis will be on bespoke services to support individual decision making. People will value such services highly and this will be evidenced by a willingness to pay for high quality

products such as multi-lingual automatic translation to aid navigation in unfamiliar environments.

The car will be the mode of choice to access long distance travel by public transport for those who can afford it. This will lead to increasing emphasis upon infrastructure, facilities and services which support car access to public transport interchanges. Equally, provision for traveller information will place a high degree of emphasis on supporting car access. The private car will also be the preferred means of travel for local journeys for those who can afford it.

For those without the means to exploit these opportunities travel horizons will narrow and information to support travel will be more limited in scope and quality. As the provision of information and services will be market-driven; if a business model cannot be identified for conventional public transport services they will not be provided. Equally provision of information will be minimal or non-existent where there is no clear commercial benefit to be derived. This will result in highly fragmented information provision. For those wishing to travel beyond the locale they will depend upon infrastructure and service providers to join-up this fragmented picture at a cost. For those who cannot afford such services gaps in information to support journey planning will decrease confidence in travel and thus narrow travel horizons as people place their faith in familiar environments and trusted services.

The desire to maintain independence in travel will see the growth and development of alternative models of car ownership and use such as car clubs, car sharing and on-street car hire. Hire services will be underpinned by secure access and use technologies (biometrics and PIN data). Services involving shared/co-operative use of cars (clubs and sharing) will be less 'open' than in the past, with membership oriented around rigorous profiling and/or pragmatic relationships between trusted peers with shared interests e.g. work colleagues.

As public transport services reduce in scale and quality there will be an increasing role for demand responsive transport services to bridge the gap. Again, most of these services will be commercially driven, with trusted service providers facilitating access to key travel generators such as business parks, industrial estates, airports, or shopping malls. These services will be valued by employees and employers alike and will be largely funded by these groups.

In such a fragmented and socially polarised society gaps in information will make ubiquitous, everyday travel less convenient and will represent significant threats to confidence and ultimately personal security in travel. The bespoke information and journey planning services which emerge in this scenario will require the collection of sensitive personal data and issues regarding who holds that data and how securely it can be stored are significant concerns, particularly in the light of high profile instances when information security is compromised resulting in criminality.

The role of social media and open data in this society will be more limited than previously envisaged. Given the prevailing distrust of notions of community, individuals will be reluctant to see benefit in the open sharing and accessing of

information. Indeed, they will be suspicious of such practices. The role of social media will be limited to closed communities of interest managed by trusted service providers, who tightly control access. The high monetary value of traveller information means that commercial imperatives rather than open access to data prevail. This is reflected in the role played by multi-national corporations in the ownership and regulation of access to data.

Target hardening will be an issue of increasing concern. Cars and mobile phones (which incorporate personal navigation services) will be increasingly secure with access and use controlled by biometric data at the high end and PIN systems more commonly. The ability to remotely locate and disable these technologies will also provide a deterrent to theft. However, in this context the vulnerability has shifted from the technology to the owner, such that speculative thefts are reduced, but incidences of violence and intimidation against owners to access biometric and PIN data increase.

Scenario Narrative - Global Responsibility

This society is more communitarian than the world portrayed in World Markets. It bears some similarities with the current Scandinavian socio-governmental model, with a high degree of social cohesion and community-oriented consensus approaches. Government will facilitate standardisation, the population would be highly educated, feel secure and socially trusting of one another and with a high level of cooperation between universities and industry, and across sectors, in sharing intellectual property. Citizens and businesses will be highly taxed, as the social value of public goods, including public transport, is recognised and well funded. Costs of providing services and information will be shared between parties to give economies of scale.

The high value placed on social responsibility and the generally high level of community homogeneity rather than individualism means that disruptive radicals would be comparatively rare. However, this could make them more dangerous, because of the high levels of social trust around them. Extreme criminality or terrorist acts would deeply shocking to society, but the response would not be to impose draconian security controls – airport-style security on other transport modes would be resisted. The openness of society, and its reliance on open data will raise the threat from cyber attacks, or physical attacks on infrastructure, as those with a determination to disrupt will have no barriers to accessing the information that they need.

Public authorities and commercial data holders alike will be committed to making their data available, and work collaboratively, utilising public feedback. Community-oriented travel behaviour will be a feature – the use of open data and the cooperative nature of society will emphasise the development of shared services. The interests of minorities, or groups who tend to feel more vulnerable at present (such as women or older people) will be well-provided for in service and information provision, and will feel safe and confident in using public transport. There will be very little emphasis on the use of cars for local journeys – community values will favour high air quality

standards and low noise, healthy environments, with active travel modes used for leisure or for accessing leisure which will be focused around clubs. Access to employment will be by active travel or public transport.

The well-integrated and multi-modal transport networks will be very data heavy, to support operations and traveller information. Augmented Reality Technology will be used to find fellow passengers with common interests, because people are open about themselves, or to find empty seats on crowded trains, or find carriages that aren't deserted, so people can gain comfort from not being alone. Direct information about the immediate travel environment is available through community-led social media, e.g. people at one end of a train use mobile devices to tell others where there are empty seats.

Policing functions are highly computerised and ubiquitous, with technologies such as CCTV and facial recognition developing to a level at which the cost has reduced. Antisocial behaviour and crime is reported immediately using social media (developments of the Fix My Street, or Fix My Transport models), enabling fast and accurate response and reporting, enabling accurate public perceptions about safety and security in the travel environment.

Scenario narrative - National Enterprise

In a society motivated by national and individual self-reliance the operation of public transport and related information services is characterised by fragmentation, but with clear infrastructure and service priorities oriented around 'homeland' security. In this context, the major investment priorities are upon key national infrastructure such as the motorway and national rail networks and major interchanges. This investment is designed to link the major metropolitan centres as engines of economic growth. There will be a parallel emphasis upon the protection of borders and international gateways such as ports and airports. These priorities will result in clear disparity in the level of investment and services (and supportive technologies) between these priority areas and other places e.g. rural areas and smaller provincial centres.

The information technologies which underpin traveller information services will be developed at the national level and innovation will be retarded by this insular approach as international best practice is given little consideration and the absence of global players in the market mean that competition does not drive forward innovation and economies of scale are not achieved. In this context, there will be problematic system development of closed systems akin to the Minitel experience in France.

In the absence of economies of scale brought through global coverage to achieve critical mass, an alternative economic model emerges for information services. Public transport and related information services that are not economically viable decline and even disappear. Those that remain provide information beyond minimal standards only when there is clear commercial benefit e.g. to support ticketing or advertising.

Given the fragmentation of service provision there will be a market for systems and services that join-up and co-ordinate to support travellers. A high degree of differentiation in services will be available, regulated by pricing. Privilege passes for access to first class facilities on public transport will be popular with those who can afford them. Brokering systems and services will play an important role in supporting travel and commercial demand responsive transport services will play a key role in filling the gaps caused by the decline in public transport provision. DRT will also be notable for the high degree of differentiation in service quality available and regulated by pricing. However, the private car will be the most common travel option of choice for those who can afford it. Infrastructure, services and information to support access to and egress from public transport by car will be high investment priorities.

The high degree of social polarity means that crime and anti-social behaviour pose very significant threats to personal security in travel in this society. Access to information and services is not equitable and investment in infrastructure and services is motivated primarily by national and not local priorities, leaving those at the geographical margins most vulnerable. The de-regulated nature of service provision also affords very limited protection for the vulnerable.

Information provides a critical role in supporting personal security and the quality of information is also subject to significant variation in quality according to the user's ability to pay for it. There is a particular premium on dynamic information as transport services deploy highly dynamic fare systems to regulate access. Information systems are particularly important as there is little sense of community support when in the public realm. Mobile technologies play a critical role as 'travel buddies' and systems and services become increasingly sophisticated and bespoke. The digital divide is stark and significantly contributes to wider social polarity.

People will also derive their sense of security in travel and in the public realm in urban areas from the high degree of surveillance which prevails. This is predicated on the importance of maintaining homeland security, but also provides reassurance for local travel and day-to-day living. All citizens will carry a National Identity Card incorporating biometric and location tracking data. This card will also be the means of accessing and paying for public transport systems and services.

The role of social media and open data will significantly diminish in this society due to a lack of trust in notions of community and sharing data for the common good. Instead trust is placed more commonly in national political and cultural institutions and this is reflected in the small number of official providers of traveller information.

Scenario Narrative - Local Stewardship

In a community-oriented localist society, most powers are devolved to local and regional authorities, leading to fragmentation of approaches across national space. Although there will be a high level of environmental awareness, it is locally or regionally oriented. There will be a high level of active travel for health and environmental reasons, with most journeys being highly localised. This has changed

the nature of public transport provision, which adapts around a fitter general population, who have different journey patterns based around using a mix of owned and shared bikes. There will be a growth in local bike hire schemes that are integrated with public transport access points.

The resultant network will be simpler and easier to understand, making the provision of real-time information also easier. However, the model of a mix of commercial and subsidised services will be much the same as in the present, though much more based on contracts between the operator and the funder. The services will be differentiated to cater for diversity of need, and information provision will be similarly fragmented. For example, the growth in the numbers of elderly will lead to significant numbers of mobility-impaired citizens who cannot cycle or walk, and will have been disadvantaged by the shrinking of local bus networks, making them reliant on bespoke services to access healthcare. Similarly, distinct communities such as students will be more dependent on public transport for specific activities, such as accessing leisure and returning safely from nights out.

Conversely travel environments will be more age-friendly, with better pedestrian routing and better lighting, supporting confidence in independent travel. Information provision will make allowances for the walking and cycling segments of journeys. Technology will be increasingly used to support home-working, reducing the need for face-to-face meetings, and for commuting. There will be a reduction in longer, non-routine trips, but those that are undertaken will need to be supported with good information provision that enables people to cross local and regional boundaries between services and standards with confidence. Local broadcast media will be increasingly providing real-time information about travel conditions in the locality, and DAB will push localised travel information to geo-located mobile devices, enabling travellers to remain up to date and able to adapt journeys, regardless of mode. Public transport provision will also provide more space for bicycles, and have better bike storage facilities at interchanges.

The community oriented and local lifestyles reduce threats to personal security, though there will be a potential for an increase in cycle crime.

Conclusion

The workshop was attempting to cover a lot of ground, as the breadth of material created demonstrates. The focus of the day was centred on information provision and how it supports personal security, rather than the relationships of transport provision with personal security. However, in practice this is not an entirely straightforward division. Similarly, it was necessary to ask participants to try to clarify what they thought of when asked to consider 'personal security'. This revealed that most people implicitly or explicitly connected certain specific factors that together made up something that could be described as an objective individual security (provision of effective security arrangements; a safe operating environment with low accident rates; and accurate, relevant and timely information and directions) as well as a

subjective sense of personal security (low perceived risk of crime, intimidation, vehicle or personal accidents; lack of uncertainty about the journey; and knowledge of how to access information and support).

A number of Strengths, Weaknesses, Opportunities and Threats were identified by participants, and these have been discussed in the relevant sections above. The participants were then asked to build on the picture of the present day that they had constructed by conducting a STEEP(L) analysis to identify key driving forces that would influence the kind of world that travel information and transport would be evolving in, so as to understand the types of issues that might impact on a sense of personal security. This acted as a bridge into the afternoon session on Scenario Development. The four scenarios that have been developed are all plausible (though extreme) as the data developed in the workshop demonstrates that precursors of all the posited developments exist in the present day.

Outputs

At the time of writing, findings from Work Package 1 have been incorporated into two presentations. The first is a co-authored paper to be presented by Dr Mark Beecroft at the Transport Security Expo industry conference to be held in London on 15th November 2012. The second, a co-authored paper is to be presented by Dr Kate Pangbourne at the UTSG Annual Conference to be held in Oxford in January 2013.

Next Steps

It is not the purpose of this Work Package to decide whether any of these possible futures are desirable, and future directions of research arising from this project cannot be fully formed until all Work Packages are complete. However, one key question asked at the workshop suggests a possible focus for further investigation that builds on this work and has industry relevance:

“If you haven't used public transport for a long time, due to a bad experience, what would bring you back?”

As an area for future work beyond the life of this project, this conundrum relates to how information could be designed to overcome the negative perceptions for non-PT users to encourage them to revisit PT. ‘Out of date’ perceptions held by non-PT users affect their attitude towards using PT, and reduce their confidence in it. Through literature and empirical work we have demonstrated that perception and confidence are key elements that underpin a sense of personal security, thus designing information to address personal security issues could be an important tool for encouraging modal shift. The additional value of the work in this project is to make more explicit how some of the new digital media channels are influencing the development of transport information provision, drawing out both the opportunities and threats from the perspective of both passenger assurance and operator benefit.

The second Work Package will focus on the experience of and recovery from disruption. It is expected that this will elicit more detailed material relating to how

personal security is impacted in specific circumstances. The third Work Package will focus on the development of automation in the transport field generally, including how this could lead to changes in the definition of ‘public transport’, and how personal security may be affected. The fourth Work Package will focus on developments in flexible transport service provision in which the experience of delivering Demand Responsive Transport services to support social inclusion could increasingly influence ‘mainstream’ public transport provision. The fifth Work Package will focus on secondary and unintended effects of securitisation technologies in public transport. At the end of the project Work Package 6 will consist of developing and holding a Key Findings event to which all participants will be invited, as well as significant stakeholders and academics.

Since the commencement of the project, a stream of work involving expert interviews that was originally envisaged as being associated with each individual Work Package has been recast as a separate cross-cutting strand of work in order to avoid the potential need to re-interview the same individuals on different sub-topics. This work will continue over the coming months as a new Work Package (WP 7), but one that will be completed before Work Package 6.

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ANNEXES

Workshop Agenda

0930 – 1000 Registration

1000 – 1020 Welcome and introduction to the day

1020 – 1030 Tour de Table

1030 – 1130 Brainstorm and scoping of current issues

1130 – 1145 *Refreshments*

1145 – 1215 STEEP analysis of current issues

1215 – 1245 Identification of future key driving forces

1245 – 1330 *Lunch*

1330 – 1345 Introduction to scenario planning activity

1345 – 1515 Scenario planning breakout groups

1520 – 1550 Plenary feedback and discussion

1550 – 1600 Wrap up/next steps/thanks

Location: The Innovation Space, Department for Business, Innovation & Skills,
1 Victoria Street, London, SW1H 0ET

Organisers: Dr Mark Beecroft and Dr Kate Pangbourne, Centre for Transport
Research, University of Aberdeen

Facilitator: Jane Dowsett, Department for Business, Innovation and Skills

List of Workshop Participants

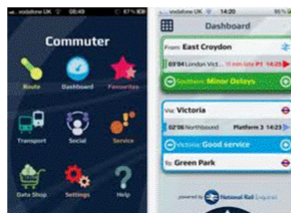
Mark Beecroft	University of Aberdeen
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Greg Lewis	Age UK
David Hytch	Transport for Greater Manchester
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Peter White	University of Westminster
Jeremy Bennett	Surface Transport Commercial Manager, Gatwick Airport
Peter Warman	Warman Consultancy
Laura Mason	Passenger Focus
Taku Fujiyama	University College London
Nick Knowles	Trapeze Group

Workshop Slide Presentation

Enhancing transport technologies to support personal security in travel by public transport: Scenarios for 2040

Workshop 1: Provision for public transport traveller information
10th July 2012

Information provision constitutes the sharp end where technology and users interact



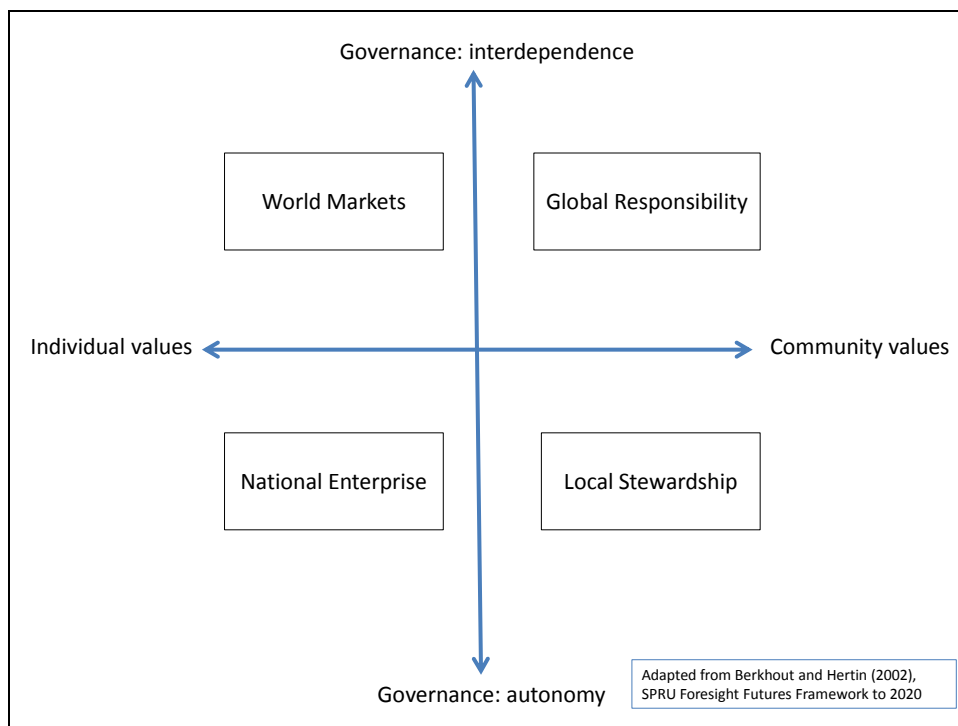
The role of social media



“Facebook riot inciters among those to get toughest jail terms”

Workshop Agenda

- 0930—1000 → Registration¶
- 1000—1020 → Welcome and introduction to the day¶
- 1020—1030 → Tour-de-Table¶
- 1030—1130 → Brainstorm and scoping of current issues¶
- 1130—1145 → Refreshments¶
- 1145—1215 → STEEP analysis of current issues¶
- 1215—1245 → Identification of future key driving forces¶
- 1245—1330 → Lunch¶
- 1330—1345 → Introduction to scenario planning activity¶
- 1345—1515 → Scenario planning breakout groups¶
- 1520—1550 → Plenary feedback and discussion¶
- 1550—1600 → Wrap-up/next steps/thanks¶



Scenario 1: World Markets is a world in which **individual aspirations** can thrive in a **global economy** sustained by **international cooperation**.

- *People aspire to personal independence, material wealth and mobility to the exclusion of wider social goals.*
- *Integrated global markets are presumed to best deliver these goals.*
- *Internationally co-ordinated policy sets framework conditions for the efficient functioning of markets.*
- *The provision of goods and services is privatised wherever possible under a principle of 'minimal government'.*
- *Rights of individuals to personal freedoms are emphasised.*

Provision for public transport traveller information

- How will provision 'work' under this scenario?
- What will be the threats to personal security in travel under this scenario?
- What will be the solutions to these threats generated under this scenario?
- What opportunities will there be to better support secure travel under this scenario?

Scenario 2: Global Responsibility is a world where individuals value the **community** and look to government to implement policies for **welfare** and **sustainability**.

- *People aspire to high levels of welfare within communities with shared values, more equally distributed opportunities and a sound environment.*
- *There is a belief that these objectives are best achieved through active public policy and international co-operation within the European Union and at a global level.*
- *Social objectives met through public provision, increasingly at an international level.*
- *Control of markets and people is achieved through a mixture of regulatory and norm-based mechanisms.*

Provision for public transport traveller information

- How will provision 'work' under this scenario?
- What will be the threats to personal security in travel under this scenario?
- What will be the solutions to these threats generated under this scenario?
- What opportunities will there be to better support secure travel under this scenario?

Scenario 3: Under National Enterprise both individuals and governments seek **autonomy** and **independence**

- *People aspire to personal independence and material wealth within a nationally rooted cultural identity.*
- *Liberalised markets together with a commitment to build capabilities and resources to secure a high degree of national self-reliance and security are believed to best deliver these goals.*
- *Political and cultural institutions are strengthened to buttress national autonomy in a more fragmented world.*

Provision for public transport traveller information

- How will provision 'work' under this scenario?
- What will be the threats to personal security in travel under this scenario?
- What will be the solutions to these threats generated under this scenario?
- What opportunities will there be to better support secure travel under this scenario?

Scenario 4: Under **Local Stewardship** individuals seek **sustainable** levels of **welfare** within federal and **networked** regional and local **communities** and a high quality local **environment**.

- *People aspire to sustainable levels of welfare in local communities.*
- *Markets are subject to social regulation to ensure more equally distributed opportunities and a high-quality local environment.*
- *Active public policy aims to promote economic activities that are small-scale and regional in scope and acts to constrain large-scale markets and technologies.*
- *Local communities are strengthened to ensure participative and transparent governance in a complex world.*

Provision for public transport traveller information

- How will provision 'work' under this scenario?
- What will be the threats to personal security in travel under this scenario?
- What will be the solutions to these threats generated under this scenario?
- What opportunities will there be to better support secure travel under this scenario?

Raw comments from brainstorming: current issues

Q: What are the strengths in current provision?

- Airports are secure airside but need more advance info as to what you can and can't take through airside.
- Some operators use hi-tech info provision.
- Apart from please keep your bags with you ... I find little other presence or info regarding security on train bus etc..?
 - West Yorkshire case study - good example of success of cameras and monitoring shared with police etc.
- Information is available within modes that allows travellers to obtain 'real-time' info re their journey - however cross-modal information is not good
 - Need to think of the journey view from the perspective of the customer
- Need all angles covered to provide for all customers, so still need the low tech measures
 - agree with this
- A lot of investment is going into 'real-time' information to give travellers the most up-to-date information about their journeys. This is helping give travellers the reassurance that their journey is the correct one - i.e. they are on the right mode, going in the right direction and know whereabouts they are and where they are due to disembark.
- Great advances in provision of information have already been made - but only the 'clued-in' are fully aware of how to use/understand it.
- New technology and in particular open data as a part of the information supply chain
- I love real-time! let's have more like this
- Mobile social media is being used to give very rapid detection and cooperation on problems and could be used further
 - e.g. London Midland uses it - but not all operators
 - Important but need to put staff in place - lot of potential

Q: What are the weaknesses in current provision?

- Variability in quality in provision geographically
- Lack of consistency in signage/info provision in public transport, particularly buses - how do you guide people where the interchanges are complex?
- Complexity of services/fares etc. inhibits use/confidence in PT use
 - making fares simpler - allow people to focus on planning the journey rather than needing information about fares as well.

- Agree
- Timeliness - getting the information at the point of need
- Getting information about/in unfamiliar places
 - agree
 - Can we help users by making them aware of landmarks to guide their journey?
- Unclear who is responsible for info provision - public authority or commercial operators - issue of legislation/regulation
 - responsibility is the local transport authority
- Mixed messages - e.g. when there is an incident, no clear message sent to commuters
- Rarely is info simple and effective whether through technology or hard copy
- Sometimes the traveller information is sporadic and/or lacks consistency that then undermines the travellers' appreciation and acceptance of what they are presented with
- Funding issues around providing information to passengers
- Networks can be over-complicated and services are not integrated e.g. Demand Responsive Transport, competing services
- Cost benefit being demonstrated
- As no. 26 states comms can be quite complicated, we need to encourage clearer messages and the first prize for goes to!
- Data on cctv coverage, lighting, staffing, accessibility etc not collected and available
- Info needs to come from or through multiple operators so becomes complex and too difficult to provide in one simple format, with little info on security or safety...
- No-one is effectively brokering services across services e.g. DRT, P, different operators
- When an incident occurs travellers are often the last to know what is going on. This heightens frustration, creates traveller antagonism and diverts resources away from resolving whatever has caused the incident in the first place. rapid identification of the incident nature, the potential delay and alternatives (from a bank of prepared options) will enable travellers to make their own alternative independent travel plans
- Too much focus on modal information not the journey
- Data on crime ,accident risks not readily available to provide feedback loop

Annex 4

- Whole journey needs to be considered - walk at end often perceived as most insecure

Other comments

- Types of information you need - not all about times, departure points and destination points
- Challenge to balance benefits of commercial/social activities in terms of confidence with need for clear way finding - issue of design/layout.
- Do people want to be reminded of security issues or should they be discreet?
- security information (what you can and can't carry - e.g. airside restrictions, or ScotRail's alcohol ban) - balance between scaring and reassuring
- Consideration of infrastructure and operator training and its impact on perceptions of safety and security.
- Perceptions of risk to personal security weighed against reality of travelling by public transport - how to overcome?
 - must tackle the perception - whether "justified" or not
- If you were going to tackle personal security issues, you wouldn't start with information technology. Solutions to this issue must incorporate staffing, environmental design - whole journey, and how to integrate.
- Safety from slips and trips in interchanges
- Apprehension greatest in remote low use locations where investment can rarely be warranted.
- Must tackle maintenance and cleanliness - if poor creates atmosphere of lack of care where antisocial incident might happen

Raw comments from brainstorming: temporal spatial and demographic factors

Q: How important are Temporal, Spatial and Demographic factors?

Temporal

- Has last bus gone? Info most important when few travellers around.
- Night services less frequent and low occupancy
- What is the consequence of missing my journey? - journey resilience should be a planning criteria
- Night services can be daunting to use in some areas
- Network changes by time of day e.g. buses by day to shared taxi by night - can we promote switchover?
- Info on alternative systems /services if last option gone , along with how to keep safe whilst finding alternative transport
- Night time economy, shift workers, perceptions of safety/knowledge of service availability lacking, so use cars or taxis
- Will workers who cannot be time flexible be priced off public transport-or forced to travel earlier/later where they may feel less secure?
- Winter travel potentially more prone to disruption (though summer flooding suggests otherwise!
- 'First and last mile' on foot in icy weather is a factor for older people
- Providing for part time workers and users needs to be more important
- Do services operate early enough to get people to where they need to go, such as to a hospital appointment, particularly in rural areas?
- Where will I end up on the 'night bus'?

Demographic

- Cultural blocks to using public transport
- Passengers with disabilities can feel more vulnerable when using public transport, which may prevent them using.
- Consequences of disruption are much more severe for disabled or elderly users
- How can technology be used to welcome less mobile users to travel?
- Threatening/anti social behaviour means different things to different people-for some it might be listening to music loudly, while for others it might be smoking/being drunk.
- young women feel/are more vulnerable in lonely locations - and their parents may also be anxious about their use of public transport at late hours

Annex 5

- Keeping teenagers on PT a challenge - fares need to be graduated
- Travelling with children - less easy to way find quickly, use hand held devices, as distracted/hands full.
- Will my bike be stolen if I leave it at that station?
- Encountering anti-social behaviour can be as bad as encountering crime.
 - not just young women!
- Non-native speakers can struggle to access PT and have confidence to use them
- Older people, who have a bad experience on public transport, e.g. falling on a bus, will be much less likely to use it in the future. The consequences for them are more severe.
- First time making a journey alone for younger people
- Young families can also find it difficult to use PT without too much pressure
- Difference in 'ridership' attitude between large conurbations and smaller towns/cities/villages. broad spectrum in conurbations whilst generally socially disadvantaged, disabled and elderly (certain categories in each instance)
- First time making a journey alone could also be relevant to over 60s, with additional accessibility issues
- Confusing interchange environments affect different age groups in different ways

Spatial issues (e.g. rural/urban)

- Fear of crime during late evenings in urban journeys
- Context is all - need to consider design of info ALONGSIDE design of environment in which it is located.
- Rural bus services - lack of provision during late evenings highlights need to use alternative modes- i.e. taxis (at a price!)
 - how can we overcome no. 15 above - operator needs to make a profit - but not everyone has a suitable or affordable alternative.
- Getting mix of DRT and Scheduled services better.
- Lengthy delays between rural bus services - often an hour plus. And what happens when one fails to arrive? No information or updates to the traveller who opts not to travel - or to repeat the expedition!
- Need for subsidisation of some rural services to provide community service - further need to use technology to promote this...
- Important, irregular journeys, sometimes off peak e.g. Hospital appointments lead to car use as PT not reliable.

Annex 5

- Some suggestion that rural dwellers don't like being at urban bus stations at night waiting to get home.
- Unlit rural bus stops may feel extremely unsafe compared to more urban areas-particularly if no information provided.
- Out of date timetables (if at all) in rural areas.
- Present transport networks consistently across different spatial contexts.
- safety of surrounding public realm.
- Free travel for older people is no use if there are no services for them to use.
- Critical infrastructure.

Other comments

- Age groups and confidence/sense of safety are linked to time of day of travel (or possibly time of year).
- Maintenance and cleanliness are important clues as to whether location is supervised, cared for and hence safe and secure.
- Need to get feedback from each age and user group re wants and needs in addition to creating products and services that may cater for perceived needs.
- Using travel training, teaching how to boil egg, as an education or re-education tool.
- Car as seen as king so any form of PT is looked down on.
- Notices should be up to date - advert for an event that has passed indicates lack of care and supervision.

Raw comments from brainstorming: current consideration of personal security

Q: How far are personal security issues currently incorporated in public transport traveller information systems and services?

(Discussion)

Crime-related - anti social behaviour?

- Depends on customer group as to what reassurance passenger needs regarding confirmation that there is no too little crime...
- from non-users the perception is very negative but regular PT users have a more realistic view of the situation
- Can CCTV give pre-recorded messages to guide behaviour, influence perception of engagement
- "personal security" usually interpreted as related to fear or apprehension about possibility of encountering crime of anti-social behaviour
- Education and crime prevention projects do work
- Understanding what constitutes crime versus intimidating behaviour or situation
- Responsive technology wholly feasible if the police response /enforcement that is the problem - (cost issue)
- No public confidence in CCTV as deterrent - who is watching, would anyone intervene? Staffing and informal surveillance by other passengers, pedestrians is more important in establishing confidence.
- Smart-card ticketing for access control e.g. interchanges/stations
- Fear of a lack of personal security is intertwined with personal confidence to use PT, but how can technology help? Sometimes information about actual crime hotspots (for example) might create more fear.
- Can potential trouble makers be sent warning texts of the consequences of anti social behaviour - perhaps via the CCTV footage & near field technology?
- Reality of crime/personal safety is minimal however fear of crime/personal safety is endemic
- Connectivity of the whole journey needs to be considered, not just the time spent 'on' public transport
- There are a few examples of transport companies working proactively to counter young potential criminals.
- Anti-social behaviour on buses a problem - research needed!

Annex 6

- Terrorist activity is a passing issue and people resume normal activity very quickly. e.g. 7/7 and 22/7 bombings in London. ridership returned to normal levels very quickly

Safety-related?

- Risk of sudden starts or stops on vehicle leading to falls
- Research suggests older people do not perceive safety on buses as a significant issue, at least not until they experience a safety related incident, such as a fall. The impact on future behaviour then becomes significant.
- Appropriate equipment to assist people with disabilities, elderly, small children
- Reassurance that drivers are well trained in both driving skills and dealing with anti social incidents
- Falls on buses are a major cause of injuries and undermines travellers confidence - alternative travel options or not at all. Elderly find themselves stranded and isolated unless using private transport
- I believe older people do not always want to 'make a fuss' when there is an issue - a story i heard this week of an elderly lady who's arm was broken when the driver closed the door too quickly on her - she did not report it there and then
- Do older people have concern for their personal safety (from slips, falls, etc) imposed on them by well-meaning relatives or carers?
- Urban myths about certain bus operators having 'bad' drivers who don't give passengers time to sit down.

Confidence-related?

- If you know the area you know where to avoid -confidence extends to known boundaries
 - a good point, local knowledge is important. Geographic comfort zones exist, as well as mobility comfort zones.
- If you don't know the area then you are unaware of where the boundaries are - so less likely 'to test the water'. Often seen to be easier to take an alternative mode
- Congestion levels affect perception of safety, especially for fragile passengers - information could be available in planning and in real-time
- Older people often perceive the risk of crime as being more significant than it is in reality, but it does impact on their confidence in using public transport.
- Credibility of performance levels of operator affect perception of whether one will be stranded or exposed to long waits in a dangerous area

Annex 6

- Travellers unfamiliar with an area prefer those modes (e.g. tube, buses with next stop indicator) with clear visuals that make use simple
- If haven't used public transport for a long time, due to a bad experience, what would bring you back?
- Too many announcements re safety issues and security can cause confidence issues.
- Standards of behaviour in public/social spaces e.g. buses
- it's difficult to get to know a driver on a city bus, see a different one each time but when you do come across a 'good' driver and one who works well with passengers then the journey is so much better
- Quality of staff training critical in building confidence - relationships
- Educating children about acceptable standards of behaviour on public transport - parental role.

Other comments

- Bus driver has a key role in helping passengers feel secure - relationship starts when the passengers board
- To what extent are passengers aware of what safety equipment is on board-e.g. cctv-if they feel it is there and working, makes a difference
- Need to make sure passengers are aware of crime statistics if going down, however will need to be able to counteract specific incidents that they will have experienced/herd about, which they may associate with journeys generally
- Perception change is always going to be difficult to overcome and is largely based on experience or word of mouth.
- Does tech mean passengers can interact and feel safer-get to know other passengers through social media
- How do you manage passenger perceptions if crime or safety statistics get worse?
- Don't forget multi-storey car parks. One of the worst I saw (several years ago) was that provided for Tyne and Wear metro users - dank, dark, graffiti and an appalling smell in the stairwells!

Raw comments on brainstorming: stakeholder perspectives

Issues and drivers: Discussion

User perspective

- Information needs to be aimed at the lowest common denominator in terms of user accessibility.
- Reliability of systems is vital to gain user confidence
- User acceptance testing is essential to ensure all demographics get what they need from the provision of information.
- Travelling is about the people, not about the technical system of managing the movement of inanimate objects.
- Willingness to pay for information services by users has been proven, at least in London context - but LT/TfL research not generally made available.(28)
- It does seem that a lot of good work is being done but it only takes one incident to set things back in the customers mind.
- Tech allows passengers to talk to train companies-get answers, report problems in real time-also shows impact of particular decisions and problems to operators.

Transport operator perspective

- Restrictive construction contracts over lengthy periods particularly with DCM
- Demonstrating link between investment and return in financial and social benefit quantified terms
- Competing priorities within operators incident resolution versus network management
- Linking (low tech) culture of network management to technological opportunities.
- Operators' perspective is focussed on bottom line and nice to have sophisticated systems will not be supported. Some operators have refused to use purpose-built bus stations, being deterred by a small fee per bus for using the facility which was much better for passengers.
- Most operators don't have historic data to predict outcomes of disruption and then inform users.
- All info provision should increase ridership and income
- Social media and 'crowd-sourcing' information by passengers is by-passing the 'control' of information by transport operators/authorities
- Social media will force operators to continually inform users, particularly during disruption. If they don't then users will - issues of customer service, quality and provenance
- Drivers need appropriate training in providing information to passengers.

Annex 7

- Ownership model is key - deregulation provides issues for providers.

Information provider perspective

- Data management to collect and maintain the required data is expensive - difficult to establish viable business models.
- It is important that providers understand the way users access information and do not assume we all have the latest technology, or are likely to have it in the near future.
- Utilising technologies and techniques from other industries i.e. financial broker services is in real time and large quantities of data.
- During periods of major disruption when info would be most useful, information as to what is actually happening and the effects on services may be least certain.
- demand for info during disruption may go up x 7 - designing flexible scalability is important
- Making constructive use of open data and the developer community to provide data and information that is more relevant and developed quicker.
- Info services need to be robust 24 x7 or they detract confidence - this is a challenge.
- Operators need to provide fundamental PT info, e.g. schedule and real time data properly before they address security, etc.

Research perspective

- Do research smarter for a genuine output not as a way for continuous employment which leads to duplication at best.
 - LOL but true
- Use social media, segmentation and GIS for smarter research insights.

Other comments

- Multiple suppliers of info and services - how do you coordinate?

Raw comments from future driving forces exercise

Identification of future key driving forces: STEEPL Exercise

Social

- Will people travel more, or less? There is some evidence that car use is not growing, but falling in developed economies.
- Evidence suggests more people will live alone in the future, requiring more dwellings and the transport infrastructure to support them.
- Will the continued growth of urban areas lead to different travel requirements?
- Will we still need to commute every day, patterns of employment changing?
- Communications technologies may eventually replace some travel - some signs that this may be happening.
- Ways of working will change as they have already started to, so car use may decrease as will car ownership?
- We will be older and more scared.
- Greater economic disparity between haves and have nots.
- Migration.

Technological

- Personal augmented reality devices, much more sophisticated delivery.
 - Interface will be much more supportive of elderly, disabled.
 - Internet of things. Digitalisation will have created high definition representations of everything. There will be ubiquitous sensing of vehicles, passengers, environment, etc, allowing more efficient management.
- Energy costs will rise increasing the need to optimize routing and availability of services.
- Universal always on connectivity with two way communications and video will increase sense of personal security.
- Ubiquitous and pervasive location and push technologies will become normal.
- Balancing technology as a driver of service/information provision with customer service.
- Facial recognition and big brother technology will improve capability to catch offenders - privacy trade-offs.
- Managing very large data and information in real time will change the ability to inform.

Annex 9

- Improvements to computing power will enable true ITS at viable cost - average car generates 1 GB of data per day - can we use this data for other applications - safety etc.
- Physical transport networks will develop much more slowly than info operational and control systems.
- Technology checks need to be used to speed customers through processes such as security checks and passport control.
- Things won't change as much or as fast as we think!

Environmental

- More environmental tax will drive change.
 - in direction of electric cars/vehicles in about 20 yrs time, but what would that mean for public transport? Electric cars might be more environmentally friendly, but they don't solve congestion.
 - All travelling in electric vehicles?.
- 'Perfect storm' of environmental issues, for example climate change adaption plus peak oil plus other resource constraints.
 - New oil reserves coming on stream as oil prices allow economic production from marginal fields - peak oil still some way off.
- As limits on amount of carbon/increased environmental awareness-less travel (e.g. commute to work only 2 days a week-remote working) but more meaningful travel-trip of a lifetime?
- The charging points for EVs need to be looked at also - cleaner energy is NB.
- Greater subsidies for public transport, improving and growing public transport with variable offerings at different standards, but affordable.
- Environmental restraints will need to be implemented by government, but timeliness important.
- Local low carbon journeys to be more important.
- Greater investment in electric bikes and motorcycles.
- Public develops a better understanding of environmental issues as the current cohort of children receiving environmental education at school grows up (timescale - 10 years minimum).
- Education is vital - starting at primary level and working through they hold the future we're discussing so let's educate them properly on the issues.
- Will the growth in energy use by internet/cloud based services (that could underpin teleworking/ flexible working) be lower than the growth in energy use

in other sectors, or is the internet just as power hungry as existing forms of mobility.

- Developments in air travel with planes being more environmentally friendly, combined with improved airport process (including time for shopping at the airport), does compete with HSR.
- EV will only account for 20% of fleet so other low carbon power trains are needed.
- Air quality and impact on people's life styles and travel.

Economic

- Real value of time will increase - time saving benefits of RTI will increase. Also invest in network level monitoring and encourage dynamic journey planning real time using mobile device.
 - but greater disparity between rich and poor.
 - ability to use the time you are travelling to best use.
- Bespoke journey planning will tailor to individual characteristics - who holds it? Location data known? - cultural values influence approach.
- How we work will change and impact PT use and eco performance of transport system - e.g. varied spatio-temporal working.
- Managing the transition from oil to (other) energy economy - transport and PT impacts.
- Other countries e.g. Germany and Sweden investing in transition to oil independence - issues of long term planning.
- Smartcard accounts may transform how we buy and use transport services - incentives to influence behaviour.
- The means to pay - smartcard, phone, will be driven by banks.

Political

- We need to have the US on side as regards environmental issues at a political level lots will follow where they will lead.
- Political weakness in responding to environmental 'crisis' is continued short-term electoral cycle thinking, because perception is that public acceptability of regulation is low (or the political ideology prevents it).
- Greater subsidies for public transport.
 - political acceptability of subsidy depends on ideology of party in power, this could change 6 times before 2040.

Annex 9

- The political will is not currently there- i.e. the indecision around austerity/the banking crisis, there will need to be another big event-environmental or economic to bring people together.
- stability is required to improve quicker - which requires all parties to align on certain aspects or one party to stay in power for longer.
- REAL champions required!!
 - what is a real champion - is it a cult of personality for someone we agree with??
- Globally will need to ensure that any environmental restraints are equitable , while allowing poorer countries to develop.
- How will SECURITY develop - more governmental fear of terrorism could spread airport style security first to train interchanges and then to bus stations.
- The work on devolution to the city regions, deal for cities shows central government is able to devolve powers and funding - GM's earn back has moved the Treasury.

Legal and regulatory

- Key barrier to change - legislation very slow to change.
- Passenger perceptions and ratings should be better represented in legislation.
- Performance monitoring stronger role (e.g. eBay example) operator performance in service delivery transparent and dynamic.
- Post-evaluation rating encouraged by technology - individual users rate services and systems.
- Can we envisage wholly integrated systems and services - will commercial imperatives always hold sway - TfL integration nationwide.
- Much of UK transport provision is falling into foreign ownership: at home they have stronger regulatory frameworks, in UK they can make more money by delivering less?
- Open data directive from EU will make more data available to others.