Complete Mobility

Providing Transport as a Service

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The RAC Foundation has commissioned a number of external experts to write a series of think pieces and occasional papers throughout the course of 2010/11. This paper is about *Achieving Complete Mobility* and is report number 10/105.

The Royal Automobile Club Foundation for Motoring Ltd is a charity which explores the economic, mobility, safety and environmental issues relating to roads and responsible road users. Independent and authoritative research, carried out for the public benefit, is central to the Foundation's activities.

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Foreword

For quite some time now there has been a trend towards increased individualisation, customisation and integration of products and services. Companies in most sectors of the economy, particularly the retail sector, have started selling bundles of products which are tailored to people's needs and preferences ever more closely.

Transport has not been part of this process—for understandable reasons. By its very nature transport policy is very different from the retail sector as its 'products', for example infrastructure, are planned for and supplied on a larger scale, and focus on the logistics of private and public fleet movements. Providers of transport services are mostly responsible for only one part of the journey experience, which does not take account of overall mobility needs. Under this approach the different transport modes tend to operate in silos, and in many cases compete against each other over many issues including government funding and priority, environmental performance, and wider economic and societal benefits.

This presents a problem, especially for users of transport services. Future growth of the population and economy, particularly in urban areas, will increase the demand for transport, yet there is only limited capacity for the road, rail and bus network to cope with this need. Continuing business as usual runs the risk of intensifying pressure on the transport network and compromising the effectiveness of transport in its ability move the population from A to B.

Developing a more integrated, service-oriented transport system could bring many benefits. For end users it would mean that transport fits more closely with their individual needs, and the service received would be more efficient. Thinking in broader terms, it can be said that transport is a means to an end rather than an end in itself: it enables people to get to and from work, visit friends and family, go shopping and perform a whole range of activities that are essential to and enhance quality of life. A service-oriented transport system would be more closely aligned with meeting this need.

For business and government, particularly local government, such a system could create new revenue streams since it is reasonable to expect that people are willing to pay for an improved or new service where none existed before. It would allow specific policy targets to be achieved, such as carbon dioxide reduction or safety policies, through targeted incentives and better management of already existing transport networks, and by improving the way existing infrastructure is managed could significantly improve economic competitiveness and quality of life.

Although an open market may bring certain benefits it is generally not desirable to leave all activity entirely up to the private market due to transport's public good characteristics and the need to avoid the formation of monopolies. In other words, some form of regulation will be necessary. In fact, the raison d'être of government could be said to lie in intervening and developing policies where the market is unable to provide a certain good or service.

Technology offers significant potential for facilitating transport service provision. Smartphones, satellite navigation systems and smart cards—to name but a few

technologies—enable the integration of transport with other sectors of the economy. From the point of view of operators, technology enables information about different transport modes, for example usage patterns, to be collected and linked with a view to making the service work more efficiently. End users can use technology to obtain real-time information about traffic and the next leg of their journeys. Overall it can make transport networks more responsive and maximise their efficiency by improved demand management, though there is an important role for government in ensuring that technology is not fragmented.

To be attractive to consumers a new system will undoubtedly need to be about more than just paying for services with a 'clever' smartcard (e.g. fuel, parking, public transport tickets, cycle hire, etc.), particularly in light of smartcards variable past success. It will instead need to be about information and services not currently available which add value and can generate a revenue stream. The ability to provide trip planning information and advice, real-time information and advice in the event of problems as well as the ability to reserve facilities/transport and pay for all components from one card or payment system is likely to be the key to any successful system.

An important issue is pricing, both in terms of the required infrastructure but also regarding the actual pricing of integrated transport services. It is clear that infrastructure must be paid for; because of its public good nature some investment, or at least regulation of it, might have to come from government, which if too costly is almost unthinkable in the current climate. But moving towards a more 'pay as you go'-type pricing system for services could free up some resources to pay for such infrastructure provision and at the same time make it fairer in the sense that 'you pay for what you use'. Besides, managing networks and demand in a better way can often be a cheaper alternative to creating new infrastructure. Going forward, it will be crucial to understand how the payment of both existing and future taxes and charges might fit in with a system which had customer value as a central tenant.

There are, however, a number of challenges facing a new approach to transport policy. One of them relates to capacity and resources available to the public sector, city authorities in particular. Although a transport services system could be designed to ease pressure on the public purse it would still require intervention and potentially a significant amount of resources, both in financial and human resource terms. Many cities might feel that they would have to 'start from scratch' if they wanted to introduce innovative technology, which is complicated by the fact that innovative schemes are difficult and complex to implement both technically and from a managerial perspective. Introducing any such scheme would therefore have to be an incremental process, one in which local authorities are given assistance and guidance, for example from central government. Another problem relates to the issue of trust. The public is generally concerned that any collected information is not secure and might be misused—this would need to be addressed.

In order to offer an alternative perspective of transport provision the RAC Foundation commissioned MRC McLean Hazel to explore in more detail the issues raised above and to develop a view on how this might be implemented. The work provides a useful first step in understanding how transport might move from a supply-oriented system to one that delivers transport as a service to its users.

Achieving Complete Mobility

transport advice, concepts and solutions for the public & private sectors

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1. Executive Summary

This report considers the value of a new vision for, and approach to, transport planning. The vision is **Complete Mobility**, an end state based on meeting the challenges of global trends on transport needs and demands; the strategy for achieving it is the **Transport Retail Model (TRM)**.

We first consider the global trends that are changing the world and our lifestyles. We use these to build the concept of Complete Mobility, based upon the three pillars of *user focus*, *seamless* and *valued* transport systems and services. This describes the ideal end state – a set of desired requirements and attributes that can also be harnessed by the public sector to meet required wider objectives for economic development, environmental improvement or improved quality of life. We then go on to consider the strategy for achieving it, summarised as the Transport Retail Model, which itself has three main elements:

- Using new technology to make transport networks more responsive (Smart and Responsive Networks)
- Using personalised ICT to understand preferences and requirements (Customer Relationship Management)
- Providing new governance and delivery models to maximise the potential for exploitation of the value of this data and the dynamic response to it (Balanced Governance and Pricing)

In our view, the Transport Retail Model turns traditional transport planning on its head. It focuses on identifying what the 'customer' wants and provides it as closely as possible to match this desire. Some of these services have value to the customer and a charge can therefore be applied. Some might be specifically to contribute to required outcomes such as carbon reduction and might be provided as incentives to change behaviour. The whole concept is based around practices currently used by the retail sector – including use of personal activity data to inform supply; segmentation of the customer base to ensure subtle targeting of incentives; smart and quick responsiveness of the supply system and quick identification of new value added services. We are therefore potentially creating a popular and efficient model for transport that does not dispense with the need for traditional infrastructure solutions but does provide much needed balance.

This has important implications for public and private sectors. It suggests an efficiency measure that can be taken up by public sector organisations currently suffering from lack of funds. Managing networks and demand can often be a cheaper alternative to 'buying new'. An increased focus on the needs of customers using customer relationship management can result in improved services. Balanced pricing, extracting the real value experienced by users of the system, can create new revenue streams. But effective leadership, strong local entrepreneurship and excellent partnership working are required to take advantage of the opportunities.

In summary, the two concepts we describe in this paper offer huge potential. We go on to develop some of the detail required to build a business case for TRM. There is further work to be done, but with technology and its use becoming cheap and ubiquitous, with a generation craving sustainable futures and a self-actualised lifestyle, and a recession which is forcing business and government to re-evaluate the way that services are delivered, targeted and prioritised, we feel we are beginning to develop appropriate pathways and solutions.

2. INTRODUCTION

A combination of the worldwide economic recession, demographic factors such as the rise in personal mobility and the increased need for personalised solutions, and the associated development of suitable relevant technology, has led to a renewed interest in managing transport needs rather than the old 'predict and provide' ethos. This has been reflected in transport and related policy documents in the UK. For example, the 'Towards a Sustainable Transport System' and 'Delivering a Sustainable Transport System' suite of documents from the Department for Transport encourage a wider look at the purpose behind transport projects and encourage promoters to consider lower cost management options before moving on to infrastructure solutions.

In previous work with Siemens on world megacities, we have developed the concept of 'Complete Mobility' to describe a desired ideal end state that recognises these trends and describes the type of transport system required to serve them.

In some parts of the retail sector, operations have been transformed by the use of loyalty cards and the management of associated data. This has allowed the tracking of personal habits and preferences, the use of targeted offers and quick response to trends. The rise of mobile phones and downloadable applications demonstrates even more the value of understanding the market in detail and providing tailor made solutions to personal requirements.

In our experience, the value of a retail-style personalised approach to transport has not yet been properly explained or understood. The potential of smart and responsive managed transport networks combined with personalised data and solutions is huge. It offers the potential for achievement of local and national transport and other objectives – at lower cost than might otherwise have been the case. It does not obviate the need for new infrastructure – but it does balance the already understood 'supply' side of the equation with the new realisation of the value of 'demand' side management.

Recently we have seen more radical proposals on funding and management models for transport – for example, using PPP and/or PFI funding to secure investment in transport networks[1], using economies of scale for procurement of maintenance and engineering works (e.g. the Midlands Highways Alliance), and developing new models for ownership, regulation and management of strategic roads based on other transport network or utility models (e.g. CILT Route Map Group). These concepts offer new life to transport demand management and offer the potential for innovation and further development.

This new approach could have significant ramifications for transport planning. Left unchecked, the potential will be realised spasmodically and without reference to publicly desired outcomes. For example, the Transport Retail Model has considerable relevance to congestion management. Real time information to car commuters about tailbacks combined with incentives for door-to-door public transport would give people a real choice about whether to add to peak time congestion or try another mode. This type of offer could be provided to a targeted and identified market – for example, those people we know use public transport for other purposes at weekends and who are particularly concerned about journey reliability.

[1] Tackling Congestion, Managing Growth, CBI, March 2010

This paper outlines some of the key issues in implementing the Transport Retail Model. We start by describing the key features of Complete Mobility, looking at findings from the Megacities report in more detail, and tracing the development of Complete Mobility ideas from the Megacities survey results. The three 'pillars' of or attributes that make up Complete Mobility – user focused, seamless and valued - are defined and expanded. We go on to describe the Transport Retail Model (TRM) as the key implementation mechanism for Complete Mobility. The TRM concentrates on the relatively neglected 'demand' side of the transport planning equation – it does not replace the 'supply' side, but it does provide the necessary balance.

Before describing this in detail, we look at recent research into behaviour change and how these research results can also be harnessed to improve the way that transport can be managed from the user's point of view.

There is no "set menu" to achieving Complete Mobility - however there are three linked enablers for TRM and we go on to explain these further:

- Using new technology to make transport networks more responsive **(Smart Networks)**
- Using new research evidence and personalised ICT to understand preferences and requirements **(Customer Relationship Management)**
- Providing new governance and delivery models to maximise the potential for exploitation of the value of this data and the dynamic response to it **(Balanced Governance and Pricing)**

Although these are all established concepts, the value of our approach is to bring them together into a coordinated and comprehensive whole. The remainder of the report starts to develop a business plan for bringing TRM into operation, with an overview of risks and mitigation as well as possible pathways for implementation.

We finish with recommendations for pilot studies that will be able to provide essential information for further development of the required business plan.

3. The Building Blocks for Complete Mobility and the Transport Retail Model

3.1. Future Mobility Challenges

The mobility system of the future will be dependent upon how decision makers adapt to the challenges they will face, and indeed the nature of the mobility challenge itself. This section reviews the inescapable global megatrends that provide the clear backcloth to the mobility system of the future. However, this is introduced by a 'View from the Cities' - the summary results of a global survey which perhaps surprisingly highlights the fact that mobility policies should not be seen as a merely reactive result of changing trends, but also as a key driver in achieving objectives.

A View from the Cities

A recent Siemens-sponsored study of world megacities showed that cities around the world face similar challenges, in health, mobility, social development, security, water and energy resource management. The 2006 Siemens study entitled, "Megacity Challenges: A stakeholder perspective" [2] reported research at the individual megacity level to gather objective data as well as perspectives from mayors, city administrators and other experts on local infrastructure challenges. Over 500 public and private sector experts from 25 global cities were interviewed for this purpose.

The result was a fascinating and useful picture of how challenges are prioritized and what infrastructure solutions are best able to improve the local economy, environment and quality of life of megacities. At a high level the study highlights that megacities prioritize economic competitiveness and employment, and that whilst the environment is important to them, they are often willing to sacrifice it for growth. However, of particular interest is the prime importance attached by city stakeholders to mobility and transport in achieving the city's economic, quality of life and environmental objectives. In summary, mobility was felt to be the key challenge facing the future success of these cities. Mobility is seen as the enabler of a range of urban priorities. Pertinent findings are as follows:

Transport overtakes all other infrastructure concerns

Transport emerges as the top megacity infrastructure challenge by a large margin. It is the one infrastructure area that stakeholders believe has the biggest impact on city competitiveness. They are also highly aware of its environmental impact (for example, air pollution) and are keen to move to greener mass transit solutions. It is not surprising therefore to find that transport also emerges as the top priority for investment.

Better governance is a vital step towards better cities

With so many areas crying out for investment in better infrastructure, funding emerges as a big issue for many stakeholders in the survey. But for those involved in city management, it is improvements to governance — rather than just money — that is important. Over half of

[2] Siemens, *Megacity Challenges: Key Findings* 2007 (http://w1.siemens.com/en/megacities/megacity_challenges.htm)

respondents with knowledge of urban management see improved planning as the priority to solving city problems, compared with only 12% that prioritize increased funding. In addition to more strategic planning, there is also a strong focus on managing infrastructure and services more efficiently. Both these goals will require cities to make the step from passive administration of existing services, to a more active style of managing systems that focuses on improved efficiency and more measurable outcomes.

Holistic solutions are desired, but are difficult to achieve

The main barriers to strategic management are poor coordination between the different levels of municipal government, together with a lack of strong leadership, according to the survey. Stakeholders express a clear desire for a more holistic approach to city management, but this is rarely the reality today. Many megacities have a multitude of administrative bodies with overlapping and poorly defined responsibilities, which inevitably saps efficiency and makes strategic planning difficult. Governance structures need to balance the needs of the city with the wider metropolitan area, and also take into account the interdependencies between the various infrastructures (water and healthcare, for example).

Cities will seek to improve services, but could do more to manage demand

Faced by huge pressures on public services, cities tend to emphasize direct and immediate supply-side solutions. This does not always mean adding more capacity: in many cases stakeholders emphasize the need to increase the efficiency of existing infrastructure over building new roads, railways, hospitals and so on. By contrast, although it gets mentioned by a minority of respondents, demand management never emerges as a priority. Demand management approaches have been advocated in a variety of areas, but even the specialists in specific infrastructure sectors do not see managing demand as the primary solution to their challenges.

Technology will help to deliver transparency and efficiency

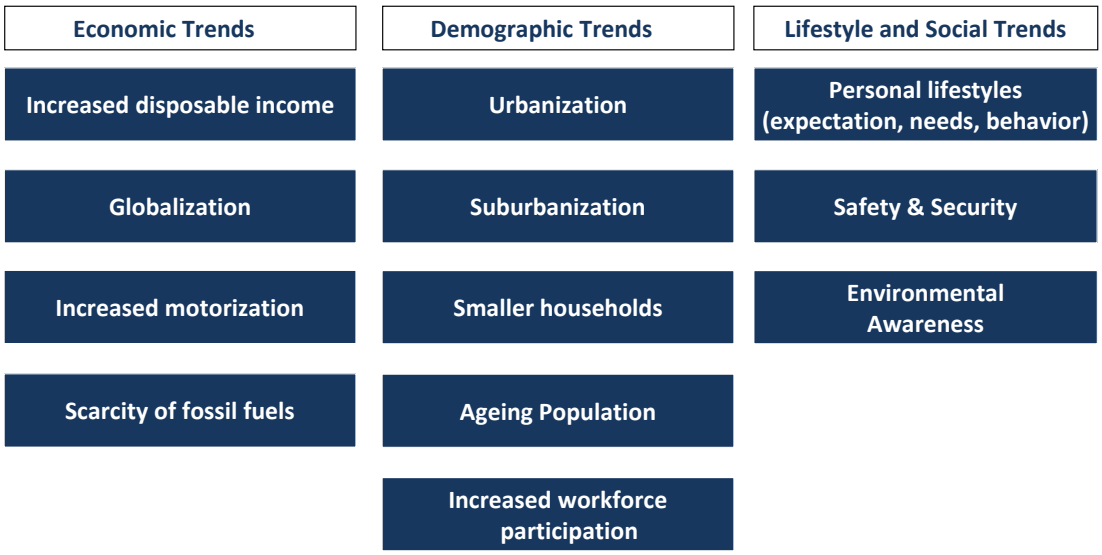
Technology can help city governments in two major ways: by making them more efficient, and more accountable to their citizens. Eight in ten respondents think that their city will increasingly integrate advanced information technology into their administration and operations over the next five years. Moreover, city management specialists predict a strong emphasis on digitalization or e-government rather than on recruiting more staff (64% to 36%). Furthermore the value of technology is not restricted to rich cities. Cash-strapped Emerging Cities place almost as much importance on e-government and digitalization as those in Transitional and Mature Cities.

Inescapable Megatrends

An analysis of key global trends that are changing the demands for transport highlights three clusters of 12 trends, further described in Appendix 1. These trends combine to create a new market for passenger, freight and air related mobility infrastructure and services.

Demographic, social, and economic trends are changing the mobility demands of individuals, companies and governments[3]. The trends are presented in Figure 1 below:

Figure 1 – Twelve Inescapable Megatrends



The role of the city is important. Within the EC the proportion of people living in cities is forecast to increase from 72% in 2007 to 84% in 2050 and urban transport will account for 40% of CO2 emissions and 70% of emissions of other pollutants coming from road transport. In addition most freight and public transport trips start or end in urban areas and thus congestion within urban areas, and other factors affecting trip decision making also negatively impacts on interurban travel.[4]

3.2. Meeting the Challenges: Complete Mobility

The concept of "Complete Mobility" has been developed to meet the trends and challenges described above, in order to realise a system which places mobility at the centre, as highlighted by the megacities research. As such, it describes a future mobility end-state in which infrastructure can be actively managed to meet the increasingly complex requirements of the traveller whilst also supporting local, regional & national policies.

The three pillars of Complete Mobility concept are described in detail below.

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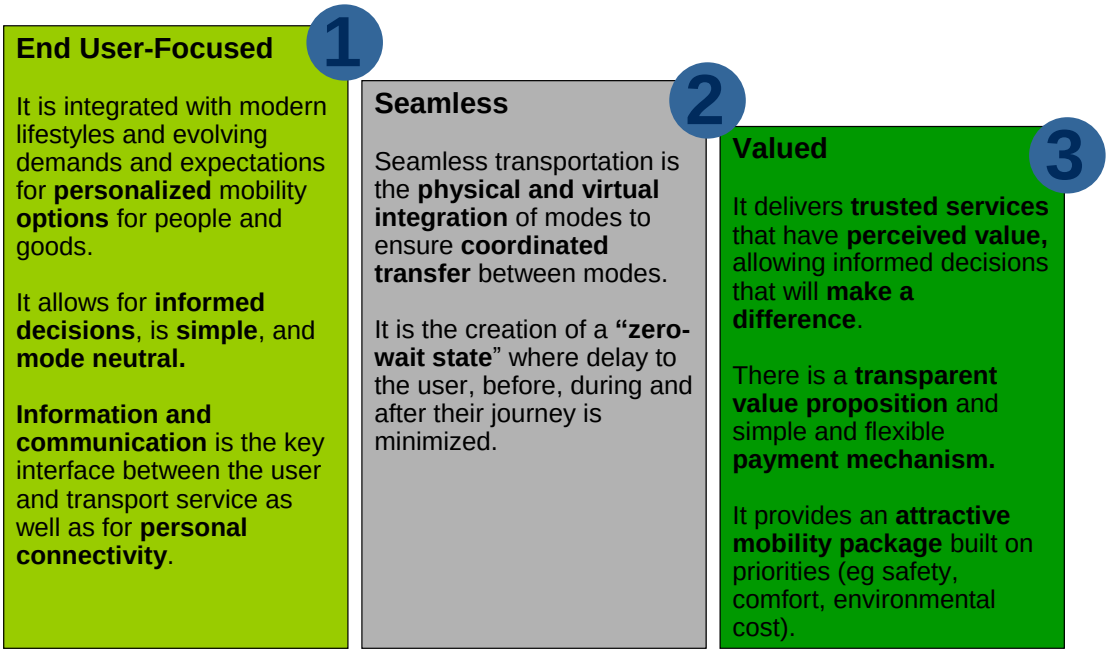
[3] This analysis is congruent with related studies (eg trends and challenges presented within *A Sustainable Future for Transport: Towards an Integrated, Technology-led and User Friendly System (2009) DGTREN, European Commission*.

[4] *A Sustainable Future for Transport: Towards an Integrated, Technology-led and User Friendly System (2009) DGTREN, European Commission*.

Figure 2 - The Three Pillars of Complete Mobility



End User Focused[5]

This means that the mobility infrastructure and service offering is focused completely around current and future end-user requirements. This view pervades all thinking and expands the focus beyond the needs of the traditional operator client. It supports a paradigm shift from passive administration of infrastructure to active management of services.

[5] For personal mobility and freight the definitions of the user are as follows:

- *Personal mobility*: the traveller and the city manager charged with managing the network. It does not include the transport operator – the operator must be supported in fitting their offering around the user needs;
- *Freight:* the sender of freight and the receiver of freight despatches, the city manager charged with facilitating freight movement.

Box 1 – End User Focussed

Personalized - There is a trend to individualism; consumers are seeking more opportunities to customize and personalize goods and services. People's lifestyles are increasingly complex. Their needs and wants are less predictable and they need a mobility service which is adaptable and flexible enough to meet these needs. With more mobility options there is a need for simplification – this is achieved by personalisation.

Options - Given this complexity they must be presented with a range of mobility options which closely reflect their needs and wants. These needs and wants may be expressed in terms other than transport and mobility and may not be presented direct to the user. Thus users may express their mobility needs in terms of their environmental impact or by trip-chain multi-purposes. They may also express them via third parties (eg via travel advisers, or health professionals (for health related trips)).

Informed decisions - The user must therefore be able to make informed decisions regarding the options available. Importantly these can include the full range of choice factors (journey time, cost, comfort, wait time etc) as well as new choice parameters introduced as part of local policies (e.g. environmental impact).

Simple - A sense of 'choice paralysis' often influences consumer decisions. The complexity of the transport infrastructure and lifestyle services must be presented in a simple, easy to use, manner for all users. It should be recognised that one size does not fit all. Thus, while good design of travel information systems is generally good design for all, specific channels and interfaces will be best suited to different users (eg visitors, migrants) and for different trip decision points (eg at home, work place). Choices will be transparent, as will their impacts.

Mode Neutral - The range of modal and virtual options on offer, and the tools to make informed decisions built around mobility choices, means that modal emphasis and choice will be a thing of the past – you will take the mobility package which best suits your needs. In the Complete Mobility system, information, tailored packages, and price, journey time and other choice parameters will come together to suggest limited optimal personal trip choices. The user will not feel coerced - the user will feel supported.

Information and Communication - Is the heart of the user experience. There is a trend to networked living where consumers are increasingly willing and able to use connective technology to help manage their lifestyles. Information and Communications Technology (ICT) plays a key enabling role in presenting static, real time, and predictive mobility information, and impact information, as well as network control capabilities. This is built upon the accurate and reliable collection and collation of data, which is disseminated as reliable information. It also facilitates seamless mobility via smart, personalised ticketing.

Personal Connectivity - Multi-tasking on-the-go is becoming essential with today's complex lifestyles. Tomorrow's traveller expects such connectivity. The system and services will increasingly exploit this trend. Options for connectivity will be provided during travel (eg m-Government). New connectivity channels will be exploited for mobility delivery (eg offerings of targeted incentives via networking sites).

Seamless

This means that any physical, financial, or service provider/operator exchanges within a journey (or indeed changes in virtual space) are imperceptible to the user.

Box 2 – Seamless

Physical and Virtual Integration - When a modal transfer or a change in sub-mode is required, this will take place at interchanges which are physically proximate. The user will also be presented with a virtually integrated system, meaning that information provision facilitates easy interchange. Virtual integration can also refer to the provision of on-line services which lead to physical trip substitution (eg online government services, home working).

Co-ordinated Transfer - Modes will be co-ordinated in time and space to make the highest number of planned transfers available to the user.

"Zero-Wait State" - Time scarcity is a problem increasingly faced by consumers. While there are many factors underpinning travel behaviour, at the transfer point the prime motivation is reduction of wait time. A "zero-wait" state minimizes the delay to the user before, during and after a journey: pre-journey planning and information facilitates the journey or virtual connection; integration and co-ordination will ensure the achievement of a zero-wait state at transfers; management systems will minimize delay across all modes during travel; coordinated and reliable arrivals minimize wait at the trip end.

Valued

This means that the user perceives value from engaging with the system. The system presents choices which allow tradeoffs, and gives feedback on the performance of these choices. It thus demonstrates value.

Box 3 – Valued

Trusted Services - Mobility services and information will be trusted by the users. Service providers will be perceived as trusted partners to support lifestyles. As noted above (Options) users may obtain information from third parties. It is thus important that the system provides timely and accurate information and options to these third parties. This relationship may also require some form of accreditation of third party information providers, be they specialist travel advisers or advisers linked to certain destinations (eg hospital travel co-ordinators, workplace travel co-ordinators).

Perceived Value - Users will perceive value in the mobility services and mobility information they use. This is strongly related to the next attribute.

Make a Difference - Decision making by the user will obtain a desired effect. Feedback from the system will ensure that the user understands the efficacy of their choices. This is a golden thread running through the Complete Mobility concept: without feedback users will not perceive the full value of their choices, will not have any desire to act on information provided, and will not be willing to pay for personalised information.

Transparent Value Proposition - The user will clearly understand the total benefits and total costs of using the mobility system. The benefits will outweigh the costs, reflected in perceived value.

Payment Mechanism - A flexible and simple to use payment mechanism will reinforce the value proposition. This applies to the payment tool, point of sale equipment, and billing procedure. This reflects the fact that the value of information and personal travel options will vary by time of day, journey purpose, network status and a wide range of user characteristics. Thus, at any point in the trip chain, users may be willing to pay for a package of mobility (ie information, departure times, journey times etc) which fulfils their needs. The payment system must be able to extract this value. Fallback procedures will be readily available for system breakdowns (including loss of payment tool) and billing queries.

Attractive Mobility Package - A mobility package is provided, consisting of information, travel/delivery, and payment which fully reflect the range of choice priorities which the user may at any time articulate. These can incorporate personal lifestyle preferences such as comfort or wider social values (e.g. environmental consciousness) as well as qualitative and quantitative economic priorities.

The realisation of Complete Mobility would represent a paradigm shift, describing a mobility system which is proactively managed to balance enhanced individual lifestyle choices with environmental quality, global competitiveness and quality of life ambitions of the urban area.

It is important to note that Complete Mobility is underpinned by user focus. The priority for travellers now and more so in the future, is to travel to meet their lifestyle needs. Mobility is a service which is a derived demand – user focus ensures that the supporting lifestyle within an increasingly complex world is the *raison d'etre* for transport.

3.3. Achieving the Future: Transport Retail Model

What's in a Name?

The **Transport Retail Model** describes the mechanism through which Complete Mobility can be achieved. The term Transport Retail Model has been adopted as it attempts to use retail ideas and culture into the transport world. Within the retail sector, especially supermarkets, customer focus and valued offers are the bedrock of the business, with resulting service efficiency and adaptability.

We believe that the central aspect of the supermarkets' offering has been their positioning as ***lifestyle service providers***. Even up to 20 years ago UK supermarkets used to sell a range

of essentials which had changed little over the past 40 years. However, recently supermarkets have expanded their product ranges and service portfolios so that the local supermarket is the first port of call for most needs[6].

Crucially this has been reinforced by very sophisticated data gathering, synthesis and knowledge built on understanding customer buying preferences and needs. Knowing these needs and preferences has enabled supermarkets to plan just-in-time deliveries of products and services and tailor shop product and service portfolios to local needs. Most interesting is the method by which retailers and supermarkets have harnessed this knowledge into a customer facing tool to gain further knowledge - yet also provide tailored services and product offers. The ultimate example is the customer loyalty card (e.g. Tesco Clubcard) which enables the retailer to understand detailed buying habits yet also provide targeted offers to individuals to reflect and develop these habits with resulting increased spend. This can be linked to the overall strategy of the company and be used to foster a competitive position (e.g. Tesco offered early Christmas shopping deals in 2010 to Clubcard holders in order to bring them through the Tesco doors at Christmas before those of their competitors).

Of equal importance is the willingness of customers to allow detailed data to be collected on their spending and lifestyle habits in order to obtain offers to support this lifestyle. The use of targeted personalised offers, aligned to a range of incentives, is the core of the Transport Retail Model.

This concept enables a move to transport choice via incentives and ease of use, rather than preventing or inhibiting choice through charging. Prices then relate to the perceived value of the product chosen – this is vitally important in retaining popular support. Some examples of the use of TRM and its impacts are shown in Figure 3.

Figure 3: TRM impacts on user groups

Business community	Urban communities	Rural communities
• Businesses will have information at their fingertips on real time road conditions and availability and costs of alternative routes and modes, as route planning technology is integrated with transport controls •Commuters will benefit from a more free-flowing, integrated and managed transport system, with options related to reliability and speed of travel	•People will be able to manage their own transport needs with easy access information, ticketing and payment mechanisms, perhaps using all-purpose smart cards or transport 'devices' •For example, a transport device could provide information and allow payment for parking and/or public transport as well as discounts at shops and leisure activities	•A mixture of the improved options available to urban communities and changes to services to enable better access - for example at rural service hubs or using the internet. •For example, access to further education could be by using the same smart card for parking, train tickets, building access and student identification

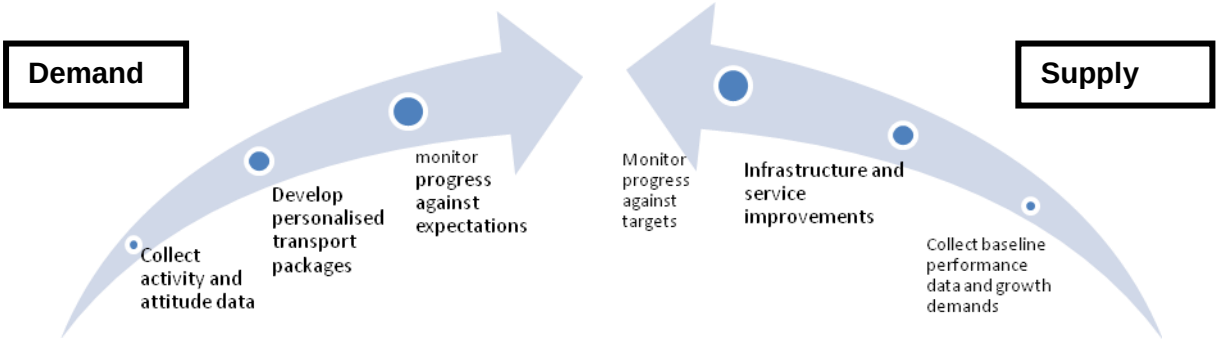
[6] It is of particular note that large supermarkets have necessarily located themselves out of town leading to a clustering of other extensive retail outlets. While this can certainly be challenged on sustainability grounds there is no doubt that such estates have proved popular and their viability (especially that of the supermarkets) has remained generally strong.

Transport supply and demand

The established view of transport planning is a mixture of 'predict and provide' and attempts to change behaviour to meet environmental or other objectives. So far little work has been done on what is actually needed by transport consumers. One example might make this clear.

Transport and health providers might consider the main issue in health transport to be ensuring an adequate supply of ambulances to meet the anticipated needs of the target population in a cost effective and efficient way. However, from the consumer point of view, the key requirement is for one ambulance to arrive at the right place at the right time. Both are right but answer different questions. The first is needed as a planning framework for the whole system, the second responds to individual users' needs. The traditional method of transport planning follows the first and ignores the second. This is why, in many cases, plans fail because they do not address the needs and value systems of the users. It is essentially a transport supplier view rather than a transport consumer view.

Figure 4 – Balancing supply and demand sides of the equation



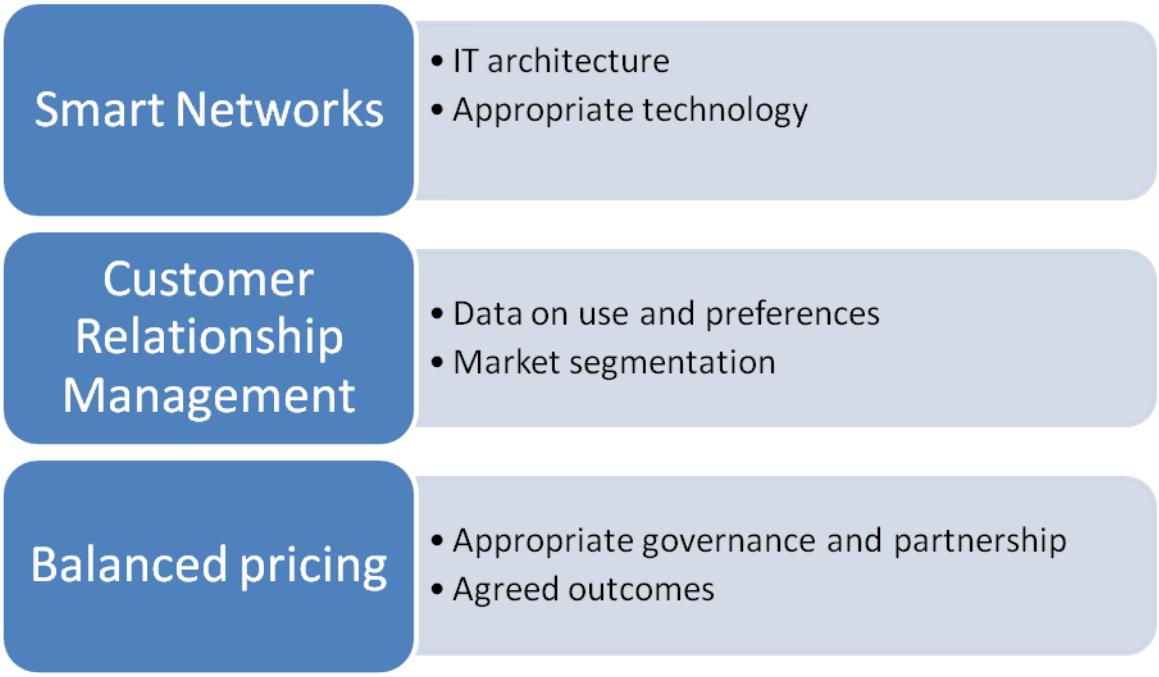
At present transport infrastructure providers and services providers often neglect consumer requirements and do not recognise the ethic of a quality service that many retail outlets aspire to. At a basic level, the purchase of a yearly pass for a significant one-off payment does not elicit the welcome and "membership" feel of joining an exclusive gym for what is often a lower financial outlay. Transport planning needs to start from a comprehensive customer database, and evolve into customer relationship management. As TRM programmes and technology are rolled out, additional data would be added.

Making it happen

There is no "set menu" to achieving Complete Mobility - however there are three linked enablers for TRM:

- Using new technology to make transport networks more responsive **(Smart Networks)**
- Using personalised ICT to understand preferences and requirements **(Customer Relationship Management)**
- Providing new governance and delivery models to maximise the potential for exploitation of the value of this data and the dynamic response to it **(Balanced Governance and Pricing)**

Figure 5 -Summary of TRM enablers



Given the requirement to orientate all aspects of mobility to the user, there is a real need to break down traditional silo-based thinking within and between public and private sector decision making. Indeed, such governance is required if there is to be a full exploitation of ICT. There is now wide scale integration of technology into travellers' lifestyles. Successful exploitation of ICT based tools for information, payment and data collation will only be possible with cross-boundary, multi-actor and predominantly cross-sector based governance.

These three enablers are discussed in detailed within sections 5, 6 and 7. As a precursor section 4 gives an overview of the value proposition which should be provided to the key target audiences whose needs must be met: (i) the mobility user/customer and (ii) the policy maker.

4. Building the Business Case: Mapping the Market

There has been considerable recent research on the psychology behind behaviour change and the potential to use market segmentation to identify groups of people to target initiatives and incentives. We review some of this research in order to demonstrate the market side of the business case for TRM.

4.1. User Proposition

Market segmentation is fairly basic within transport when compared to other sectors. Segmentation may be based on: trip purpose; spatial characteristics; demographics; product/mode usage rates; product related attitudes; psychographics (covering product attributes, lifestyle and psychology); benefits or needs. Some studies go further and begin to look at factors such as: desire to help the environment; need for timesaving; sensitivity to travel stress.

Even this, however, is generally only based on static survey data: there is no real time or dynamic profiling. Indeed it is at the margin – the change in preference and behaviour – that segmentation and profiling becomes particularly useful for the policymaker.

So far, there has been little attempt by transport planners and providers to use the considerable market research available to segment transport users and therefore to begin to tailor initiatives to specific segments. Market research determines segments of the population with particular views on, and habits relating to, transport use. These are not established user groups such as commuters or bus users, but are much more carefully defined combinations of attitudes and actual activities. One example of the research is Dr Jillian Anable's work at the Robert Gordon University in Aberdeen, Scotland.

These techniques have been applied in an MRCMH project for the Department for Transport. This research looked at only those who had moved house within the last two years and applied the segmentation approach, based on perceptions of modes and past and current behaviour. However, they also explored attitudes to mobility solutions, including technological solutions as well as traditional modal approaches (e.g. bike hire, bike lanes, increased bus service frequencies). Crucially, the desire to make use of technological solutions was highly aligned with the frequent car user segments. There is no doubt that the process of segmentation, particularly if applied dynamically, can move the planning of mobility out of the sterile realm of car versus public transport use, into one in which the personalised provision of *mode neutral mobility services* is the prime motivation, with due regard to local mobility concerns and priorities.

The next section provides an overview of literature on use requirements and motivations. This takes as its focus the limits of current information provision (real time or static) and evaluates the potential of personalised incentive based information and offers. Travel behaviour is determined by a number of interrelated factors: (i) Economic (eg price and journey time); (ii) Service attributes (eg reliability, frequency, availability, quality); (iii) Personal (eg habit, income, age). The focus on information is due to the nature of Complete Mobility which contends that the precise and dynamic packaging of services to individuals, reinforced by taregetted incentives, can provide a step change in travel behaviour management. The equally precise communication of these packages to travellers must take place. It is in the realm of information provision (as well as CRM) that ICT provies most potentials: the economic, personal and service attributes of travel behaviour remain largey unchanged – the packaging and communication of them is the matter of focus.

The following section on recent research on information provision draws on literature from transport and related sectors (eg the energy sector) to outline the issues involved in achieving real behavioural change. Section 5 takes this basic research further into the realm of customer relationship management – a key plank of TRM.

Understanding the Traveller[7]

Providing individuals with travel information is certainly not enough to create mobility systems built upon the concept of Complete Mobility. The presumption is that individuals, provided with travel information can make more fully informed choices which will be to their personal advantage and potentially that of the transport system as a whole. In the economic tradition, where the assumption of perfect information is a necessary part of rational decision-making, information systems are a necessary part of choice. However, the design of travel information systems has often ignored the psychological, ergonomic and cognitive processes of retrieving and using information. The factors that might play a role in behavioural change processes are not always addressed in the design of such systems.

People check information when they face uncertainty with respect to their own knowledge on the trip. A recent study showed that when a person has personal experience and is satisfied with their travel, they are unlikely to check information, especially on other modes[8]. In this study it was found that people first decide their mode, and then check information if deemed necessary.

Chorus[9] summarized research that information prior or early on in-trip could affect a trip in the present. They suggest that information post-trip could affect long-term patterns. Post-trip information is considered reliable as it is based on true events, as opposed to speculation (e.g. estimates of time on trips not yet made). Considering that, immediate information feedback in combination with a comparison of other travel choices could influence future travel patterns.

Outside of the transportation field, numerous studies have looked at “soft” measures (not requiring structural changes) to change behaviour in other energy-use areas such as household energy consumption. In a review[10] of 38 studies on interventions aimed at household energy consumption it was found that if the methods are separated, there were 26 studies that used information (e.g. why one should reduce energy use, technology that can reduce use), 23 which used direct feedback (e.g. actual energy use and cost), nine with

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[7] This Section summarises and presents pertinent aspects of a review of behavioural research undertaken in 2010 by E. Owen D. Waygood and Erel Avineri, Centre for Transport and Society, University of West of England conducted as part of the EC FP7 Project CATCH, co-ordinated by MRC McLean Hazel. The full review (D1.1) is available on the Project website: http://www.carbonaware.eu/ .

[8] Farag, S. and Lyons, G. (2008). What affects use of pretrip public transport information? Empirical results of a qualitative study. *Transportation Research Record,* 2069, 85–92.

[9] Chorus, C.G., Molin, E.J.E., van Wee, B. (2006). Travel information as an instrument to change car-drivers’ travel choices: A literature review. *European Journal of Transport and Infrastructure Research*, 6(4), 335-364.

[10] Abrahamse, W., Steg, L., Charles, V., and Rothengatter, T. (2005). A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology*, 25, 273-291.

rewards or incentives, and nine with goal setting or commitments made. Many studies reviewed looked at a combination of different methods. Feedback on behaviour was found to be the most successful method with only one study out of the 23 registering no reduction. Within feedback, continuous and directly available information is best (vs. monthly for example). General information was found to be ineffective, but tailored and authoritative information did have an impact.

Rewards alone have been found to often not have an effect, but seem to improve the effect of feedback. It was found that the impact of direct feedback ranged from 5% to a 15% reduction in energy use[11]. Direct feedback included: self-meter-reading; direct displays; interactive feedback via a PC; pay-as-you-go/keypad meters; 'ambient' devices; meter reading with an adviser, as part of energy advice; or cost plugs or similar devices on appliances. Indirect feedbacks such as monthly billing had results from 0-10%. Those results depended on the type of monthly feedback. Historic (e.g. tracking one's own use over time) information was found to be more effective than comparative (e.g. what others are doing).

Feedback & Incentives

Feedback works best if it is specific to the individual and direct[12]. It should be combined with a "judgement" so that the person understands the information with respect to desirable behaviour. In one experiment, feedback was only in the form of a "judgement" and found to be effective[13]. In this experiment, individuals received an orb that would glow red if energy use was above a pre-set threshold. This feedback created awareness of the problem and acted as a prompt to reduce use.

An appropriate tool in this case may be a feedback to car drivers. Due to the abstract nature of CO_2 and the limited financial impact, it may be most appropriate to provide feedback on total costs of use (direct and indirect), with some other message to stimulate awareness of the problem, uncertainty in their mode choice, cognitive dissonance, motivation, and ease of change.

As seen in household energy-use studies[14], direct feedback is likely to be a key tool in energy reduction and behaviour tool. If individuals are unable to equate current actions with consequences, then changes may be less significant (e.g. the effect of direct feedback versus

[11] Darby, S. (2006). *The Effectiveness of Feedback on Energy Consumption*. A review for DEFRA on the literature on metering, billing and direct displays. April 2006.

[12] McKenzie-Mohr, D. (2009). *Fostering Sustainable Behavior: Community-Based Social Marketing*. Available online at: http://www.cbsm.com/public/images/FosteringSustainableBehavior.pdf, accessed 5 Oct. 2009; Derby (2006) op.cit.

[13] Thompson, C. (2007). Clive Thompson thinks: Desktop orb could reform energy hogs. *Wired Magazine*, 15(8).

[14] Staats, H., Harland, P., and Wilke, H.A.M. (2004). Effecting durable change: A Team approach to improve environmental behavior in the household. *Environment and Behavior*, 36(3), 341-367; Derby (2006) op.cit.

monthly bills). On-board tools could be required on vehicles that, like speedometers, give feedback to the driver on their behaviour[15].

As discussed feedback does enhance the impact of rewards and incentives. Incentives are tools to encourage change, but can lose their effect when removed. If a change is caused by monetary incentives/disincentives, it will likely not create long-term changes that would continue if the intervention was removed[16]. However, people operate in two norm worlds: the market and the social[17]. Thus people behave within a market norms world according to financial incentives/disincentives, but people behave within a social norms world in more altruistic ways. His experiments suggest that using social norms is just as powerful as strong market norm incentives in getting people to perform actions. Another concern that he raises is that using monetary disincentives may make the actions "acceptable", as long as one is willing to pay.

Generally, studies showed that when prices are not mentioned people apply social norms to determine their choices and effort[18] (Heymen and Ariely, 2004).

It is of note that in this literature regarding behavioural change there is a requirement to understand the rich context of decision making and not base incentives and information on mere financial reward – the case proposed by rational micro-economic theory. Feedback, appropriate incentives and a consideration of the context of travel is important.

4.2. Policy Proposition

In the UK, transport policy is developing towards a position that manages the interface between the need for mobility for economic and social development and the need to conserve resources in a carbon conscious world. In 2007 the UK Government published 'Towards a Sustainable Transport System', its response to the Eddington report on transport and economic development and the Stern Review of climate change issues. This established five overarching goals for transport:

- To **support** national **economic** competitiveness and **growth**, by delivering reliable and efficient transport networks;
- To reduce transport's emissions of carbon dioxide and other greenhouse gases, with the desired outcome of **tackling climate change;**
- To **contribute to better safety security and health** and longer life-expectancy by reducing the risk of death, injury or illness arising from transport and by promoting travel modes that are beneficial to health;

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[15] Toledo, T., Musicant, O., and Lotan, T. (2008). In-vehicle data recorders for monitoring and feedback on drivers' behavior. *Transportation Research C*, 16, 320-331.

[1616] Gärling,, T. and Fujii, S. (2009). Travel behavior modification: Theories, methods, and programs. In: Kitamura, R., Yoshii, T., and Yamamoto, T. (Eds.), *The Expanding Sphere of Travel Behaviour Research*. Emerald Group Publishing Ltd.

[17] Ariely, D. (2008). *Predictably Irrational: The Hidden Forces That Shape Our Decisions.* Harper Collins, 2008.

[18] Heymen, J. and Ariely, D. (2004). Effort for payment: A tale of two markets. *Psychological Science.*

- To **promote** greater **equality of opportunity** for all citizens, with the desired outcome of achieving a fairer society;

- To **improve quality of life** for transport users and non-transport users, and to promote a **healthy natural environment.**

These goals are arguably the overarching policy goals which must be directly impacted by any new mobility approach in the UK. As such these goals have been used to assess the value of potential TRM actions within the following table.

Appendix 3 shows that TRM contributes significantly to all the DaSTS goals – particularly the economic, climate change and quality of life goals. It offers the potential for real development in transport – meeting agreed goals - without the need for unaffordable infrastructure. As yet, we have not attempted to use established or Government-approved transport appraisal methods to compare the impacts of TRM with other transport projects or initiatives.

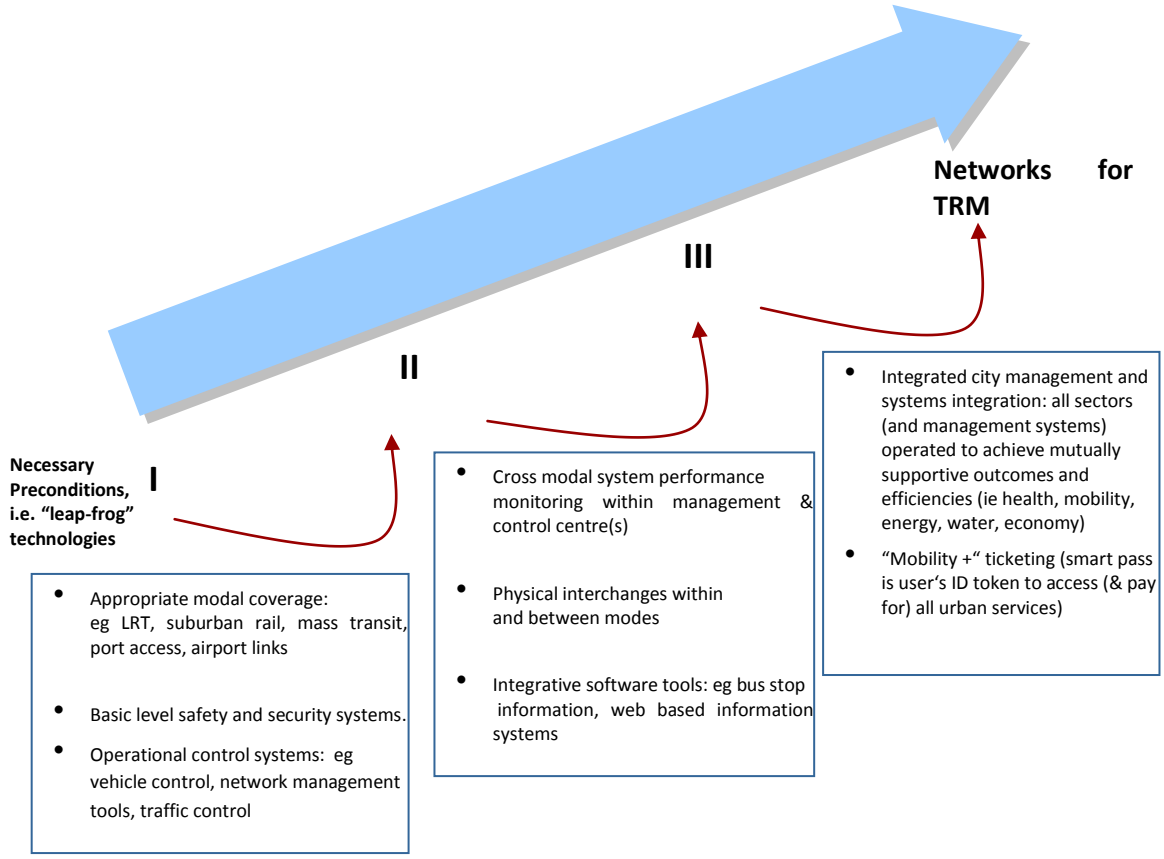
In order to ensure that TRM does meet national and local goals, a form of governance is required that recognises the goals and that sets up delivery systems to meet them. Without this, there is a danger that the TRM or something similar will happen haphazardly and without maximisation of the public benefits. At present, the public sector holds key information in the form of traffic data, use and preference data (for example from concessionary fares), sometimes ticketing, charging or toll data, and the results of travel surveys and other ad hoc information. Public transport operators, some of whom have links with the public sector, hold data on public transport use. But this data is not brought together to enable the value to be extracted from it in terms of marketing, behaviour change and potential revenue streams. Much data on transport choices and preference remains unknown, but the gradual use of IT such as smart cards is increasing the stock of data available. This process should be properly managed to ensure a reasonable allocation of value to the different partners likely to be involved.

It is also important to recognise that technology itself can become an important enabler and indeed driver in changing governance arrangements. For example, the successful Scottish multi-application Entitlement Card (reviewed in section 5) grew out of attempts by the Scottish Government to modernise government by placing the customer at the core of all service provision, using certain key technologies to facilitate this. While the key technologies such as the smart card, gazetteer, back office integration (see section 5) were essential parts of this modernisation, they also necessarily drove an organisational and business transformation by ensuring that Departments and offices reviewed how they did business and how it should be delivered: integrative technologies necessitate this governance review.

5. Building the Business Case: Smart and Responsive Networks

The first key enabler of TRM is Smart Networks. This includes transport networks, smart city networks and citizen networks. The case for building smart and responsive transport networks is well known and does not need to be reprised here. A summary of the 'pathway' towards Complete Mobility via improvement of network management is shown in 6 below.

Figure 6 - Networks for TRM



To move along this pathway, an IT architecture suitable for TRM will be required. A proposed outline architecture is presented in

Figure . This shows a high level configuration which highlights the essential part of TRM, as well as supplier drivers and sector requirements.

The architecture shows that mobility stakeholders, be they city (or interurban authorities), operators, individual businesses or indeed large event stadia, all require business solutions (e.g. in transport, education, tourism). While currently they purchase directly from individual suppliers, within a TRM scenario they would purchase solutions which comply with

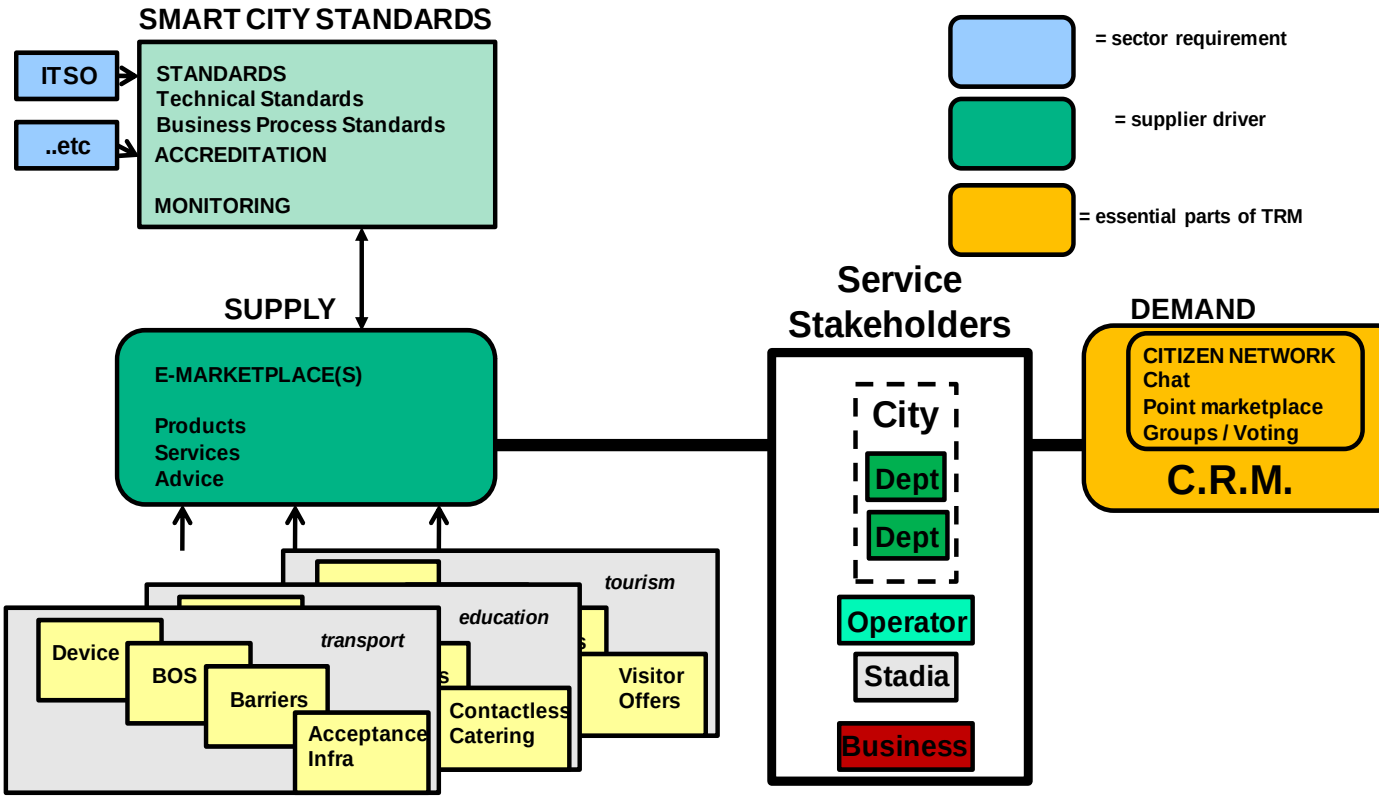
interoperable standards (Smart City Standards) - technical and business processes. There would be a requirement for accreditation and monitoring of these standards and engagement with existing standards bodies (e.g. ITSO) to ensure compliance[19].

With such standards comes the opportunity for suppliers to purchase full or part interoperable solutions via an eMarketplace for products, services and advice. While not essential to TRM such a marketplace does provide a positive driver to supplier innovation and competitive pricing. On the demand side there an essential aspect of TRM is presented: the Citizen Network (underpinned by a Customer Relationship (CRM) Tool).

The earlier discussion has highlighted the need for citizen/customer engagement and understanding. Indeed it has been stressed that rewards and incentives and attempts at providing user focused incentives and personalised offerings must be context specific, concern lifestyle, and provide the opportunity for feedback. In order to achieve this there is a requirement to engage citizens via a citizen network. This is a base for downloading applications, trading incentive points and chatting / interacting with a range of user groups. Importantly this is not necessarily a unified front end to users and thus just another portal, rather a functionality which can indeed stand alone, but also interface with other networks, be they social networks, professional networks, clubs or other groups. Importantly in order to undertake these activities there is a need to register and thus a profile built up of the user. This would include basic data, but also application use and other inputted data. This enables CRM activities to be undertaken, targeted offers made – which importantly can be then facilitated via the application device being used (be that a mobile phone, smart card or PDA).With common standards for interoperability and communication comes the possibility for cities, businesses and operators to be able to link into the TRM system as required and controlled by new governance arrangements.

[19] It is of note that a similar approach has been successfully implemented within Scotland as part of the Scottish Entitlement smart card initiative. In addition. an existing Consensus Working Agreement on such standards is still live -MMUSST (http://www.cen.eu/CEN/sectors/sectors/isss/cen%20workshop%20agreements/Pages/mmusst.aspx). While these concern smart card based solutions the principle of interoperability and monitoring and accreditation within open standards still holds for any device.

Figure 7 - TRM Architecture



Scotland's National Entitlement Card provides a useful example, although it should be noted that it only illustrates one part of TRM. Local smart card schemes had been introduced in Scotland in the early 2000s (notably in Aberdeen, Dundee and Edinburgh) to support a suite of municipal services such transport ticketing, library pass, leisure pass, schools applications.

These were funded from a range of local sources but were boosted in 2003 by funding from the Scottish Government's Modernising Government Fund which aimed to deliver joined up services in a way that is seamless to the customer. It was recognised that this modernisation required a long term business change programme in public services, which the Modernising Government initiative aimed to achieve.

A number of methods were implemented to realise a common approach to key service delivery and data sharing. Key technologies were put at the heart of this programme as part of the Customer First initiative. These were:

- Electronic customer records built on core datasets (eg address gazetteer)
- Back office integration and business process re-engineering
- Customer Relationship management tools and contact centres
- Secure on-line access arrangements for online service delivery
- National entitlement card (smart card).

The aim is that these are combined to realise cost savings for Government, improvement in business processes and also a more user focused customer offering.

The National Entitlement Card was developed along the model initially adopted by Dundee. The Entitlement Card Programme realised a common format (local standard) for applications within the smart card, incorporating national standards where applicable (eg ITSO) and obtaining agreement amongst suppliers in a range of application areas as to the use and interface of the national cards (thus precluding proprietary (and often expensive) local smart card roll outs in individual application areas). As such new application roll outs (eg a leisure pass within a city) would still be implemented by a leisure supplier, but they would work to the standard developed within Scotland, and importantly ensure that the application was loaded onto an Entitlement card as opposed to a proprietary card

In addition, a central back office arrangement was established which could be used by local authorities to manage the smart card infrastructure, applications and cardholder details. Crucially, while establishing a national standard and central service, this could then be used as a framework for local authorities to incorporate their own local services to meet local needs.

The national free travel concession provided a central core application for the entitlement card, and funded the roll-out of smart cards for elderly and disabled people within Scotland. This national application and card infrastructure further increased the asset in circulation to be further exploited by local authorities (who could increase the number of applications available to citizens). In fact, a central application also now exists with the agreement with Squid, an e-money provider, to be exploited by local schemes.

The Scottish experience shows how important the development of a de facto standard (and adoption of national standards) and a clear programme which is user centred and recognises the business transformation required to provide the joined-up services which are essential to this user focus, can be achieved.

Scotland now has a flexible tool to deliver policy. This ranges from Dundee's use of the smart card to provide incentive points to pregnant mothers in areas of social deprivation to quit smoking (in partnership with a local supermarket)20, to a national bus concession for 16 – 18 year olds and the use of the card as a university / college matriculation card. The scheme has many of the facets which are fundamental to TRM, and with the development of a Customer Portal, a potential next stage for the Project in Scotland, the TRM model can be developed further.

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[20] This successful scheme was originally aimed at teenagers but quickly spread to all pregnant woman (Give it up for Baby). It has now been subsumed into a wider programme (Quit4U) which is for anyone (male / female) in areas of social deprivation.

It is interesting to contrast the Scottish roll-out of national travel concessions cards and the English approach. Within Scotland a clear policy framework was established to improve customer focus per se across public services. This was supported by key enabling technologies, of which the smart card was part. Thus, the delivery of a national travel concession fit within such an initiative (and the organisational and technical approach and standards it had developed). In England the travel concession was implemented as a single "silo" application in a single policy area (transport). As such local authorities in England have managed to put out smart cards to elderly and disabled people, but the opportunity to increase the application range and thus seamless service delivery, has been lost. With no common card standard to accept a range of applications and lack of organisational mechanisms, local hot spots of joined-up service delivery exist (eg Southampton, Nottingham, Chester, Bracknell Forest) but these are despite the national concessionary card roll out in England.

There are a range of related key enabling technologies within mobility which should be recognised. These are presented in Figure 8 below (see also Appendix 2).

Figure 8 - Example TRM Technologies and Interventions

Technology Categories	Key Technologies & Interventions	End User Focused	Seamless	Valued
Access & Payment	e-Ticketing	*	*	*
	Advanced Payment Technologies	*	*	*
	Corporate Travel Packages	*	*	*
	Environmental Travel Packages	*	*	*
Information & Booking	Travel Information (real time & static)	*	*	
	On Transit Information	*	*	
	Traveller Initiated Transit	*		
	Personal Travel Planning	*	*	*
	Mobile Booking	*		*
	Within Station Guidance	*	*	
Physical Integration	Hub Connections		*	
	Targetted Freight/Transit Corridors		*	*
	Real Time Modal Interchanges	*	*	
	Space Allocation & Sharing	*		
Virtual Integration	Traffic Control and Command		*	
	RFID Tracking		*	
	Back Office Integration		*	*

6. Building the Business Case: Customer Relationship Management (CRM)

"CRM is a philosophy and a strategy supported by a system and a technology, designed to improve human interactions in a business environment."[21]

CRM is a strategy to learn more about customers' needs and behaviours in order to develop stronger relationships with them. It is about understanding current and potential users or customers. Through CRM, business can:

- gain an insight into customer behaviour, purchasing habits, opinions and preferences.
- profile individuals and groups to market more effectively and increase sales.

CRM allows better relationships between businesses and their customers. The benefits can include:

- increased sales through better timing by anticipating needs based on historic trends
- identifying needs more effectively by understanding specific customer requirements
- cross-selling of other products by highlighting and suggesting alternatives or enhancements
- identifying which customers are profitable and which are not

This can lead to better marketing of products or services by focusing on:

- effective targeted marketing communications aimed specifically at customer needs
- a more personal approach and the development of new or improved products and services in order to win more business in the future.

Ultimately this could lead to:

- enhanced customer satisfaction and retention, ensuring that good reputation in the marketplace continues to grow
- increased value from existing customers and reduced costs associated with supporting and servicing them, increasing your overall efficiency and reducing total cost of sales
- improved profitability by focusing on the most profitable customers and dealing with the unprofitable in more cost effective ways.[22]

CRM in the public sector usually focuses on "improving levels of services to citizens whilst optimising cost to serve".[23] In the private sector, competitive pressure and the demand for shareholder returns lead to a focus on optimising customer value often for short-term profits. In the public sector, the pressures are different, and usually much more complex, for several different reasons:

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[21] http://i.zdnet.com/whitepapers/Oracle_CRM_US_EN_WP_SocialCRM_Comes_of_Age.pdf citing CRM Magazine, October 2003 – Reality Check column

[22] Business Link http://www.businesslink.gov.uk

- **Citizen expectations**: Citizens' expectations of their experience from organisations are rising. Rather than being set by other government bodies, expectations are set by private sector experiences e.g. in retailing, travel, and financial services. The political capital to be gained, or lost, from poor service is immense.
- **Rising demand**: Demand is rising not only because of demographic factors (e.g. rapidly ageing populations, increasing numbers of refugees and economic migrants) but also emerging needs, such as national security, personal vetting and environmental concerns.
- **Need for cost reduction**: Financial pressures and budget constraints increase the focus on cost reduction. However, as in the private sector, piecemeal focus on cost reduction can actually increase overall costs e.g. trying to treat patients quickly can lead to more second treatments, often at higher cost per treatment.
- **Fraud**: Reducing fraud has the double benefit of increasing available revenue with the political benefit of "being tough on the causes of crime". CRM approaches can allow real-time access to customer data, allowing fraud protection to take place more easily.
- **People volunteering out of local provision to access differentiated services** – e.g. going to private schools, resisting attempts to lure them back on to buses, private health and social care because of a perception of better service elsewhere and a willingness to pay extra for that service
- **Need for increased relevance of government and its services**: In many western countries, voter participation is declining and the proportion of citizens living outside government influence is increasing. Several studies (e.g. of US voting patterns) suggest that this is skewed towards particular ethnic groups. This reduces the relevance of government and the preparedness of these groups to contribute to and participate in government. Relevant, timely and empathetic CRM approaches can help address this trend.[24]

People in networked markets have figured out that they get far better information and support from one another than from vendors. In transport this is easy to observe – people ask friends and family their opinions on the best way to travel from A to B; experiences (positive and negative) are shared and passed-on. People often "trust" their friends and family more than they trust the companies providing the goods/services. Within the mobility industry much research has shown that informal and family networks are the most trusted source of travel and activity information[25].

This change has happened quite rapidly over the last few years, aided by technological change (quick and easy access to internet to find and discuss information) and societal change (lack of trust in large companies following various scandals + new generation of people entering the workforce who have always known/used technology). Companies are beginning to engage

[24]http://www.qci.co.uk/public_face/Content/SON%203%20-%20Chapter%208%20-%20CRM%20in%20the%20Public%20Sector.pdf

[25] The city of Phoenix, for example, relied heavily on sophisticated word-of-mouth techniques to let people know of its Circulator system -- free buses that traverse the same fixed route -- after setting it up in certain neighbourhoods.

with customers using similar “tools”. This forms the basis of Social CRM which should support more traditional CRM.

Customer families within TRM

Dynamic segmentation may perhaps provide the most useful and insightful methodology for providing user focused packages of mobility. Families do naturally emerge in targeted offers. While groups could be defined using parameters such as age, location, income, as we have noted, deeper ‘lifestyle’ groups are more pertinent for valued offers. These themselves suggest application and offer families. Unlike other parameters lifestyle does not automatically categorise individuals by demographics or stereotype/pigeonhole people according to factors which are out with their control. (The problem with categorising by demographic factors is that people do not necessarily fit/want to fit into their typical demographic - i.e. someone who is not a student or used to be a student might still have a ‘student lifestyle’, or an older person might be still very active and not fit a stereotypical older person’s profile). By offering lifestyle categories, individuals are given more freedom to fit within categories which are relevant to their own situation and habits, which are dictated by their individual choices, not by external factors (such as age, location, etc).

Table 1 presents some potential application families which could emerge from CRM analyses, detailing the main transport focus for each family, and furthermore some additional benefits and uses. While this figure presents potential distinct lifestyle categories, these are not all inclusive to individuals. Instead, a user is likely to encompass more than one of these lifestyles, and would select 2 or 3 categories which, when combined, cover the majority of their lifestyle habits and choices. Importantly, once logged into a Citizen Network members of these families can be offered targeted services, messages and offers which can increase commercial performance of partner companies and support local policy. The use of “points” is a unifying strand in achieving these common objectives.

Table 1 - Application Families

Profile	Transport focus	Other benefits/links/uses
Active	Travel on PT on evening and weekends to leisure centres, gyms, golf courses, etc	Gym/sports centre membership card, golf club membership (with your handicap recorded), calorie counter (e.g. for gym users), fitness programs, recording of scores or personal achievements (e.g. best running times)
Special events	Sports events special services, football supporters travel schemes, concerts, conferences, etc. Specific route at a specific time on a specific date.	Football/rugby season ticket, concert ticket/pass. Calendar of events (football fixtures, concert dates, etc).
Shopper	Travel on weekends, late night shopping nights, routes to town centre and shopping centres, luggage space for shoppers to	Store loyalty cards, virtual receipts for item returns, card works on city centre shopping

	store shopping	lockers
Night Owl	Travel on late/night buses/trains, weekend travel, city centre	Entry to nightclubs, ID to confirm age, bars and restaurants loyalty cards, cinema cards
Commuter/ Student	Travel during the week, on peak times, to CBD or business parks, travel to universities/colleges, buses between campuses	Coffee stores, lunch outlets, office security fob, virtual personal business cards, student card, university library card
Family	Group travel, routes to city centre, parks, family attractions etc. Weekend afternoons. Specific PT routes for children to school/ after school clubs.	Entertainment complexes and centre entrance, school registration, healthy eating clubs for children at school, recording of children's allergies
Outdoorsy	Travel out of city on PT, PT that serves active lifestyle (bike buses/trains to bike routes, services to snow slopes, routes to hill walking areas) Weekend routes, seasonal.	Outdoor accessory store discounts, ski slope bookings, emergency contact information (phone number, blood group) qualified skills (PADI diving, etc)
Community	Local routes, throughout the week, frequency rather than speed of journey important	Membership/registration details for local services- GP, library, dentist, appointments virtually logged on card
Green Traveller	PT network, multi modal, links to non motorised transport	Carbon counter/tracker of travel, voluntary carbon offset scheme, etc.

7. Building the Business Case: Balanced Governance and Pricing

7.1. Governance

The first requirement for defining balanced pricing is properly organised governance. The governing body must be responsible agreeing overall goals and objectives and for setting required outcomes. In most cases, the overall goals are related to the three overriding principles of (i) quality of life; (ii) environment and (iii) global competitiveness.

In the UK, the five goals in the 'Delivering a Sustainable Transport System' suite of documents can be traced back to this model.

Recent work has been published by the RAC Foundation on reforming the management and funding of strategic roads[26], and it would be possible to set up a governance arrangement that would fit with a reformed strategic road management organisation. It might also fit with reformed local road arrangements or with new models such as those enabled in recent legislation such as the Transport Act 2008.

Key elements requiring resolution are:

Scale – in many cities different aspects of transport and different networks are operated at different scales and with different boundaries. Attempts to rationalise provision are often compromised by other objectives such as the desire to provide for free competition amongst operators or by the nature of the infrastructure asset e.g. national strategic highway networks. There have been some moves towards the management and development of transport networks on an integrated basis – for example, the requirement for a Traffic Manager for all highway authorities in England – but these still tend to be limited in nature, the Traffic Manager focusing on removing obstructions to congestion on roads rather than taking a wider view. It is worth remembering that in the UK the devolved Governments in Scotland, Wales and Northern Ireland may also need to be involved. In many cases the most appropriate scale for TRM operation will be the City Region or the travel to work area. In most places, existing governance arrangements for City Regions are unlikely to be adequate to this task, although the new Integrated Transport Areas (ITAs) may offer the best potential.

Requirement for both private and public sector involvement – at present in the UK the public sector is generally responsible for roads whilst other transport networks are owned and managed by different private and quasi private sector organisations. TRM cuts across current patterns of responsibility and return on investment, and new models will be required. There are relatively few (if any) current partnership arrangements in place that could serve as models for a TRM system, although there are many examples of public private sector partnerships within the public sector including PPP/PFIs for new infrastructure and maintenance. It may be possible to extend the UK PFI model to TRM. There may be a few more relevant examples internationally – e.g. Brisbane / Netherlands tolling with IBM[27].

Leadership and innovation from the public sector partner - the nature of TRM means that it involves a number of traditional central and local government departments with no one

[26] Government and administration of national and local roads in Great Britain, John Smith, 2009

[27] See Appendix 2.

specifically responsible. Therefore it is difficult for the concept to gain a foothold. However, the current economic situation, requiring deep public sector cuts, may turn this around as the public sector searches for ways to maintain or grow services at much lower cost. TRM offers the potential to provide responsive services with new revenue streams. By better managing existing supply and demand, it also means that infrastructure requirements previously thought necessary may not be required (or may be able to be delayed in the programme).

7.2. The Governing Body for TRM

In this section we are assuming that the governing body and delivery organisation are separated. Possible starting points for a governing body 'pilot' might be:

- An Integrated Transport Authority (ITA) (e.g. SYPTE, Centro)
- Transport for London
- City Region (e.g. Greater Manchester, Tyne and Wear, Greater Nottingham)
- Voluntary grouping of authorities in sub region or city region (e.g. as part of a Multi Area Agreement, or as part of an established transport partnership as in Scotland, Thames Gateway, MKSM or Transport for South Hampshire)
- Unitary City Council lead with participation from surrounding authorities (e.g. as part of a Local Area Agreement)
- County Council as highway or unitary authority

Although any of these models, with appropriate leadership, could develop TRM, in our view the ITA or city region governance models offer the best potential because:

- They are already very conscious of and open to ideas around the contribution of transport to achieving a better city
- They provide an actual or potential integrated transport setup that could be extended to cover the areas required for TRM
- They have demonstrated considerable leadership and innovation on public transport including provision of integrated ticketing, interchanges and in accessibility and marketing
- Residents, employers and users are already accustomed to an integrated transport approach and are more likely to trust the governance arrangement developed for TRM

The TRM governing body will be responsible for:

Setting the transport and city outcomes that TRM should aim for - this could include specifying accessibility, customer satisfaction and environmental measures and targets to the delivery organisation. It could also include more general indicators on health, social inclusion and employment. This strategic planning function will link closely to the general transport and land use planning function.

Setting the principles for responsibility and pricing mechanisms – the TRM offers the potential for additional revenue streams to be returned to public or private sectors, as well as the ability to contribute to overall outcomes. The governing body will have to take some difficult decisions about pricing – including the general level of charges for value added services and the principles of return on investment.

Providing a forum for the engagement of stakeholders – suitable arrangements will be required to ensure an appropriate balance of interests between local and national politicians and interests, the delivery organisation, public transport operators, specialist lobbyists and the local community.

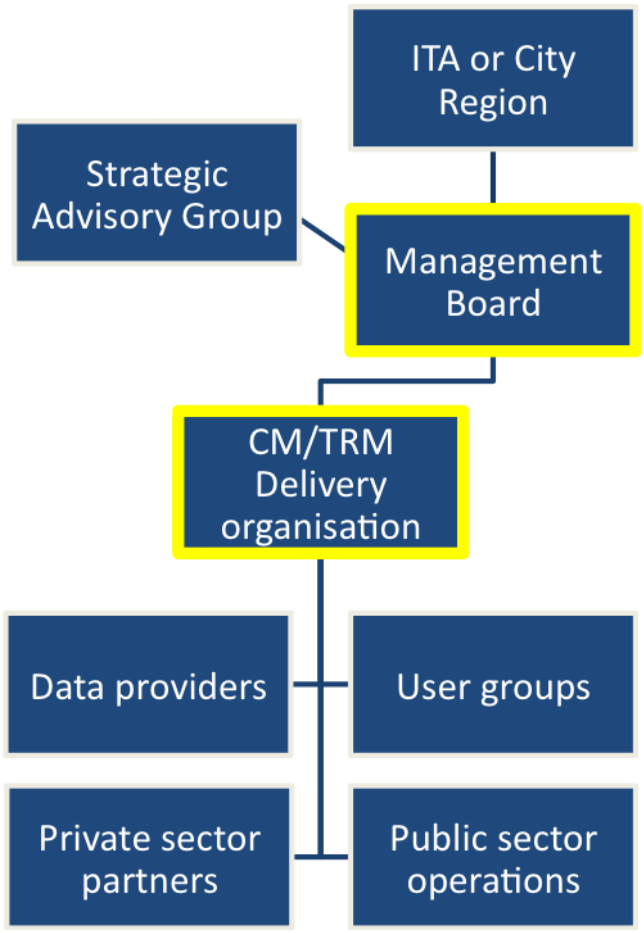
Satisfying democratic requirements –TRM should be set within the relevant local democratic system. As mentioned above, the city region scale appears most appropriate in most cases although 'sub-regions' may also be possible in areas with a polycentric but interrelated form of settlement. There may or may not already be an appropriate governing body at this scale.

Marketing – a TRM solution requires generalised marketing like the Big Wheel integrated transport marketing campaign in Nottingham (www.thebigwheel.org.uk) as well as a high standard of personalised and targeted marketing activities. Whilst the detailed marketing activity can be transferred to the delivery company, the overall strategy will have to be endorsed by the governing body.

Data and finance – similarly the governing body will be required to make decisions on the difficult areas of data availability and protection, and also on reconciling financial issues where there are different participants on board. For example the use of a single smart card for a number of different activities (including potentially incentives and payments) means a transparent and consented to reconciliation process will have to be found.

Figure 9 below shows a possible governance model - a Management Board set up by the ITA or City Region, advised by a group of experts, and responsible for procurement of a delivery organisation that has some influence over the key requirements of data and customer preferences. This model is explored further below.

Figure 9 - Potential governance and delivery structure for TRM



7.3. Delivery of TRM

The governing body could make use of their well-being powers in the Transport Act 2008 to set up a delivery organisation, which could be one of the following:

- An arms length company wholly or partly owned by the local authority and/or its public sector partners
- A joint venture between the local authority and a private sector partner
- A private sector contractor procured in the normal way, and subject to procurement rules and payment requirements (including a contractor of a new regulated private road network)
- A company or organisation including community representation of some sort (eg a company limited by guarantee or co-operative)

Again any of these models might work but in our view the preferred option is a procured private sector contractor, because:

- Innovation, customer responsiveness and efficiency are likely to be maximised
- The relative roles of governing and implementation are clearly defined

- Payment can be related to performance by use of indicators and targets (including a requirement for customer satisfaction)
- The model is relatively easily understood by stakeholders including customers

The delivery organisation will be responsible for:

Providing the appropriate delivery vehicle to efficiently meet transport and city outcomes – in our view this is likely to be a private company, which is contracted by the governing body to undertake activities to meet the required outcomes. Each city or city region could set up a procurement process on a similar basis to those currently used for highway maintenance contracts. Potential delivery organisations include:

- Large IT or transport operator companies (eg Siemens, IBM, Cisco, Stagecoach)
- Companies with relevant expertise but outside the immediate transport area (eg mobile phones, banks, retail)
- New consortia of smaller companies but with varied expertise
- Specialist companies currently involved in highway maintenance contracts (eg Atkins, Amey, Mouchel). These sometimes include traffic management.
- Companies currently involved in other public sector outsourcing (eg Capita)

As this is a new market area, actually finding and correctly procuring a company with the right balance of skills and experience is an identified risk. For public acceptance, it is likely that an 'open book' approach to finance will be required.

Providing innovation and development of the basic service – the delivery organisation will have to demonstrate a dynamic ability to react quickly to new ideas and potential commercial and other opportunities to meet the set outcomes. Whilst this is difficult to ensure successfully in public sector contracts there are now some examples in place that could be used. These include:

- Payment dependent on meeting set targets such as congestion reduction or number of passengers
- Joint responsibility for meeting set targets where these are not entirely within the delivery organisation's control
- Separate competing contracts for parts of the whole project (although there is certainly an important co-ordination and overall management function required)
- Inbuilt freedoms to generate new revenue streams where they may not initially be seen (eg to develop value added applications to the passenger transport customer base, or to realise financial benefits by providing details of habits and preferences to another organisation). These would have to be subject to legal requirements on data protection as well as an overview on their adherence to required outcomes.

7.4. The scope of the delivery organisation role

The delivery organisation will probably have different levels of responsibilities in different areas, and the scope of the work to be carried out will be one of the first requirements for a governing body decision. At minimum, the scope must include:

- Ability to access and manage data from various transport sources including tolling, parking and if possible surveys and preference data
- Marketing of initiatives
- Ability to liaise with private and public sector partners to continually adapt and add value
- Financial management and reconciliation according to the principles set down by the governing body
- Ability to build an IT architecture to link and develop existing ticketing, smart card and network management initiatives

Further detail is provided in Appendix 4. However, it could also include:

- Management and operation of highway network, including maintenance and Urban Traffic Control Centre(s)
- Management and operation of on and off street parking
- Management and operation of road or bridge tolling and charging
- Home to school, social care, health related and community transport management
- Management of fleets including ambulances and health transport
- Public transport services

7.5. Balanced pricing models

There are two basic models for pricing TRM products to customers:

1. Market pricing – this enables a market model where service providers will set prices for value added services based on market research, competition and costs.

2. Social pricing – this would assume prices based entirely on achieving desired social outcomes such as carbon reduction or accessibility to services.

In our view, it is necessary to include an element of social pricing in order to meet these desired outcomes, but it may also be necessary to include an element of market pricing in order to incentivise the delivery organisation and to encourage innovation. The detail of the 'right' balance depends on the principles agreed by the governing body and requires further investigation.

TRM can be developed incrementally, building on existing good practice, identifying and making use of expertise and skills that already exist. It would create new income streams, for example:

- Utilising the cash stored in a pre-purchase and/or e-purse system
- Providing chargeable services for parking and transport suppliers
- Providing chargeable services to consumers
- Allowing additional applications to use the same IT systems and data
- Allowing a points system to be used as variable value tokens and developing income streams from acceptance from retailers
- Big money prize draws built around application and transport system usage (X-Factor Model)

These revenue streams can be very large, and reconciliation and recompense to partner organisations will be an important role.

7.6 Road pricing

The CILT Route Map Group recently produced a Paper28 looking at the potential for road pricing in the UK. The Route Map Group defined the problem as follows:

'Over the past 10-15 years, attempts to introduce road charging have failed, with the exception of Central London and a small scheme in Durham. The reason is clear enough; as so far presented to the public, charging is deeply unattractive and politicians at both central and local level see it as a vote loser.

Yet transport planners and economists almost all agree that charging would be more efficient and could lead to higher investment in a much better transport system. Their view is broadly supported by the CBI, the RAC Foundation, the freight industry and Chambers of Commerce'.

The Route Map Group go on to consider other possible charging models, including;

- Treating the road network as if it were a public utility like water or telephones, with private sector supplier(s) and a public regulator. This model would include some sort of tolling or payment via charges but paid through the medium of a private sector operator.

- Full privatisation of the motorway network, which would be sold outright to a private sector organisation, again with a regulator. The Government would receive a capital sum. Use would be charged via tolls or distance pricing and VED might be abolished.

- Strengthening the current minimal encouragement to local authorities to undertake congestion-based road charging in individual cities

The TRM offers a useful contribution to this discussion. Arguably, the private sector is more likely to be entrepreneurial in searching for added value and in extracting benefits from a contract to operate and manage roads. This should be balanced by a contract that is demanding and challenging on achieving congestion and accessibility benefits. As long as data issues can be resolved, there are many opportunities for TRM in the Route Map Group ideas.

For example, one could envisage the following stages of development:

Private operators might be given the opportunity within the contract for provision of value added services – this could include services for which a payment is necessary. These services can then be packaged with a toll payment mechanism. For example, the operator could provide RAC members with additional information about parking and the London congestion charge, and at the same time offer easy payment facilities via the toll card or tag. So a RAC driver from Leicester could pay their M1 motorway toll, London congestion charge and parking fee in one smooth process.

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[28] Who would want to pay for using the road? draft, CILT Route Map Group, 2010

Private operators could be given responsibility for traffic management and congestion management. This could be done by tolls or charges related to distance or level of congestion but a further aspect might be the creation of incentives to not drive at peak times or to use other modes of transport. So for example a RAC driver could decide whether to pay the charge to receive a relatively clear road, or to travel outside peak hours for a reduced fee, or to travel by bus or coach at a discounted price.

The next stage would be for the private operator (subject to data protection legislation) to develop arrangements with non-transport providers such as football clubs, universities, out of town shopping centres or employers to generate tailor-made initiatives for their people. For example, RAC members who are known to drive to Manchester United away matches (because of their tolling or charging history) could receive public transport /match admission/refreshments promotions specifically targeted to those games and locations.

A further development would be for traffic generators such as universities or employers could use the tolling and demand management potential of a managed highway network to manage its own traffic. In suitable locations, the road operator could enter into separate contracts with traffic generators, exchange data on road users and work out ways of managing this demand using appropriate mechanisms. For example, the M6 operator could contract with Keele and Manchester universities to ensure fast and reliable access to their campuses by a choice of road transport. In return, the universities would provide a complementary balance of discounts and payments, as well as operational issues like varying staff start times and managing parking, to match. Both universities and operator would be working to a single performance contract based on accessibility and reliability.

The advantages of incorporating TRM into a radical proposal like full privatisation of motorways is that it focuses on the demand side of the equation, providing the means for a responsive approach to customer requirements. It balances the normal supply-based view and provides a perceivable benefit to ordinary people.

7.7 Business Plan

We are conscious that further work remains to be carried out on finance generally and on developing the detail of the business plan. A start has been made – see Appendix 7, but further work is required. Further work is needed to:

1. Quantify revenues at the application level and cross-application level;

The revenue flows surrounding mass smart media payment and access tools are potentially very high. The Hong Kong Octopus card revenue is estimated to be approximately £2 billion with non transport applications (retail/fast foods/vending/swimming) probably bringing in half of this revenue[29].

2. Quantify savings (within-sector and cross-sector) to the public and private sector;

3. Qualify the risks (legal, technical, political, data protection);

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[29] Whitwell, S (2005) Smart Cards: Cashing in on an untapped market (www.ntangiblebusiness.com)

4. Quantify capital and ongoing costs of operation.

It is our strong contention that these can only be fully understood within a real-world implementation. A pre-analysis and case must of course be undertaken in order to scope a deliverable pilot project. However, while risks and costs are often readily identifiable in the pre-stage, the benefits, revenues and savings are often only clear within implementation. This is even more the case with such a segmented target group as well as multi-sector stakeholder involvement.

8. Conclusions and Next Steps

8.1. Conclusions

1. The concepts of Complete Mobility and the Transport Retail Model have considerable potential to inform and contribute to the meeting of transport and wider objectives. This is confirmed by recent research on behaviour change that focuses on the value of incentives and choice in achieving desired behaviour change.

2. The three key enablers of TRM are smart and responsive networks, customer relationship management and balanced governance and pricing.

3. The business case for CM/TRM is that it can help to achieve desired outcomes at lower cost and at a greater efficiency than traditional transport planning methods, but we also recognise that further work needs to be done to identify and quantify costs and benefits.

4. A business plan for TRM can be developed based around the additional revenues to be obtained from better information on customer use and preferences, better targeting of marketing and information, and use of technology to ensure rapid response. The operational plan revolves around best use of personalised IT and customer relationship management.

5. TRM offers a potential way forward that can facilitate and be managed with new and radical ideas for reform of strategic road management and charging for added value items.

8.2. Next Steps

This report has included some progress towards the definition of a business case and business plan for TRM. It notes that risks are high and estimates of returns on any financial investment uncertain. In our view a robust pilot study is required. This will provide evidence where there currently are gaps and will identify barriers, opportunities and unknown risks.

The table below compares possible pilot studies. Each has benefits and could be usefully piloted. But our primary recommendation is to start small - for a first pilot study of a company, workplace or university as this offers manageable parameters as well as tangible benefits. Ideally this would be located in an area which has made progress with certain aspects of the TRM enabler packages. Further implementation projects would increase in scale as shown in the table.

Table 2 - Pilot Study Comparison

Options	Likely characteristics/benefits
Company, workplace, university or similar	Large scale traffic generator Closed' system with access to users Already interest in managing transport May already have TRM activities in place e.g. smart cards, IT systems Manageable size for pilot, low cost
City/city region wide	Likely to be relevant travel to work/catchment area for city Could match existing local authority governance and boundaries Could match public transport operator areas Possible local funding options Potential big impact on local targets, but may also raise expectations outside what pilot could provide
Country wide	Compatible policies/practices might be in place e.g. Scottish National Entitlement Card Potential big impact on for example carbon, congestion or health targets Benefit more likely in terms of 'proofing' concepts rather than practice

8.3. Where to start

TRM is a very flexible and adaptable model that can start small and develop incrementally. Figure 10 below shows a possible starting point (developing a suitable device) and first steps with Figure 12 showing possible further development leading to desired city outcomes. However, it must be emphasised that this is only one possible 'route' and the pilot studies will clarify options that are tailor made to their specific circumstances.

Figure 10: First Steps to TRM

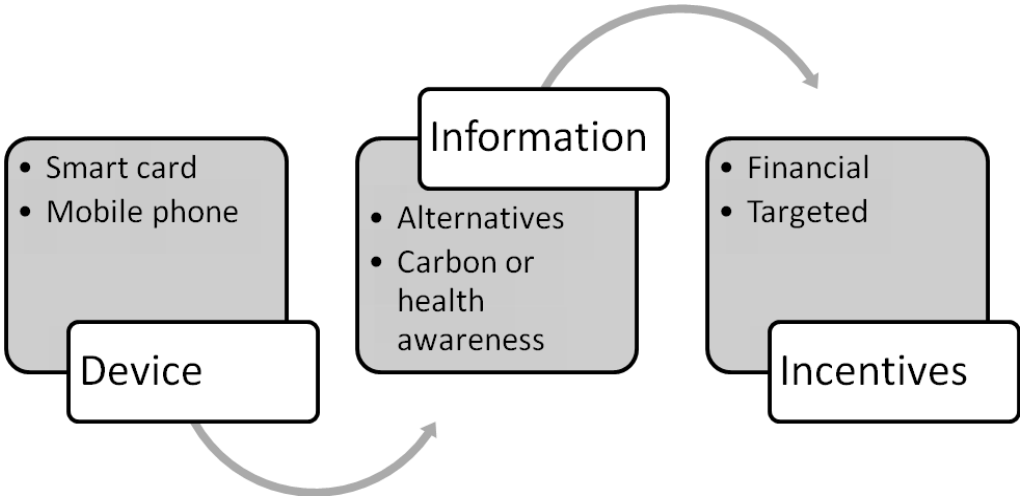
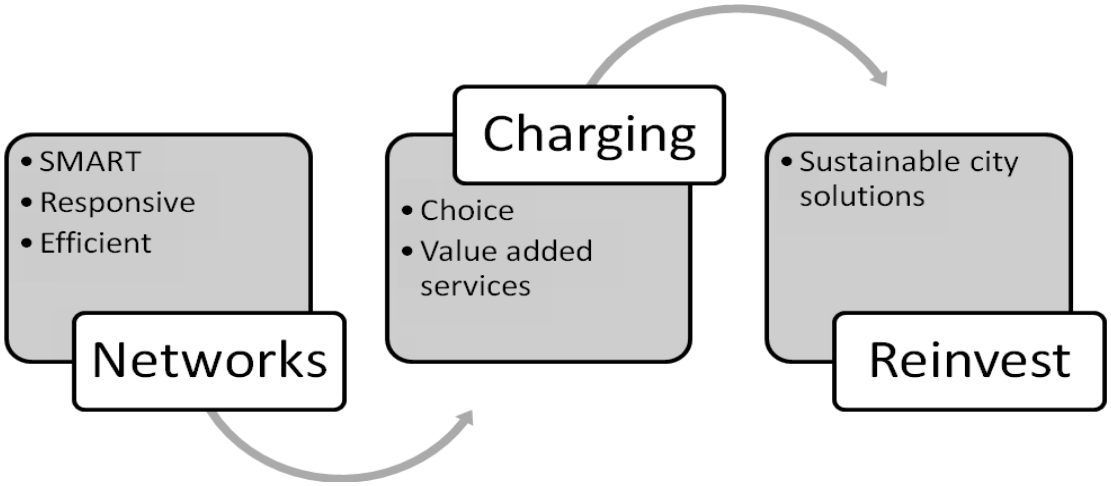


Figure 11: Potential Phase 2



8.4. Proposed pilot study

We conclude that two options may be viable. Both exemplars should build upon existing standards (eg supporting ITSO), aim to realise local policy objectives, and have a good range of user segments. In addition, there are a number of awareness and publicity initiatives, and even allied research programmes, which can provide a useful backcloth to such pilots[30].

The first is to pilot TRM in a 'closed' environment like a university or workplace will allow several aspects of TRM to be piloted at once. These could include:

- Governance
- Delivery models
- Architecture requirements
- Selected behaviour change initiatives
- Selected transport network 'responsiveness' initiatives including dashboard
- Non transport benefits and applications

[30] We feel that such pilots fit well into debates, publicity, and public relations activities regarding Future Transport/Future Cities. Importantly these can capture the public's interest and attention.

A good example of this already in action is Nottingham Trent University, summarised in Figure 12 below:

Figure 12: Nottingham Trent University Integrated Planning

However, such a pilot study would not be able to assess impacts outside the main study area – for example it could assess the number of cars entering the site but could only extrapolate impacts on the surrounding road network. It would also focus on a particular type of transport user – commuters or students – and not other types. But notwithstanding these issues a workplace or university based pilot would provide considerable evidence on which to base further pilots and begin proper implementation where value for money benefits are proven.

A second option for a pilot study is to work on the basis of an existing nation-wide initiative such as RAC membership. This would allow for other aspects of the model to be further examined and tested, such as:

- Targeted behaviour change initiatives and impacts based on profiling of membership, including value added services and offers
- User satisfaction with these initiatives

- IT issues related to for example the use of multi application smartcards
- Costs and benefits

Such a pilot could consist of:

- Involvement of partners (suggested possibilities are the Highways Agency, Transport for London, large scale traffic generators, public transport operators)
- Recruitment of volunteer RAC members
- Review and assessment of existing IT and potential improvements (potentially using smart cards)
- Selection of a package of value added incentives and offers, in combination with partners
- Testing of selected offers for viability and user satisfaction
- Establishment of successful initiatives in a wider context and further development of model

Although we are not aware of an existing example there are three initiatives in existence that provide demonstrations of elements of this proposal:

The Squid card in Dundee, Scotland is an adaptation of the Scottish Entitlement card to provide Dundee residents with a cash purse and use as an access card for some Council facilities.

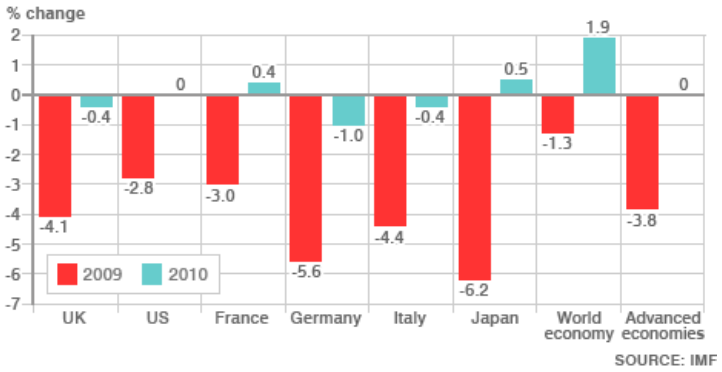
The Brisbane, Australia road tolling system uses a contactless 'tag' that allows car drivers to pay tolls without stopping at a payment point. Queensland Motorways Ltd, which is a private sector organisation operating the tolls, is now planning to provide other services to tag holders such as public transport and congestion information, and is in discussion with potential partners to create wider value added offers for toll tag holders.

The Spitzmijden project in the Netherlands (described in detail in Appendix 2) uses smartphones to provide rewards to volunteer drivers who change their behaviour (eg by driving outside peak hours).

Increased Disposable Income – Across the globe, average household incomes are rising. Coupled with this there has been a significant increase in access to credit for many households. We have seen, in particular, strong growth in the group classified as the "middle-class".

Globalization – With the recent global economic recession, there here has been a dip in world trade over the past 2 years. The World Trade Organisation, for instance, reported a 9% global trade decline in 2009. There is however steady improvement expected by the IMF & WTO over 2010 and in the longer-term globalization has undoubtedly touched all global economies.

Figure 3 - World Economic Output Projections, 2009 & 2010 (Source: BBC News)



Increased Motorization – There is evidence to show that all global regions have experiences an increase in personal motorized vehicle ownership. In part this is due to the increase in disposable incomes, as mentioned above, but the falling costs of car ownership is a significant factor also.

Scarcity of Fossil Fuels – Modern lifestyles and industry are putting great pressure on demand for fuel and energy. Fossil fuels, by their very nature, are limited and will struggle to meet the growing demands. Prices are often very unstable.

Urbanization – The growth of urban areas has been widely reported over recent years – globally over 50% of people now live in urban areas. In many countries, this has been fuelled by migration of large proportions of the population from rural to urban areas.

Suburbanization – Running parallel to the trend of urbanization is suburbanization. Urbanization has resulted in more people living and working in cities. In many cities, however, density has often fallen as development spread outwards. Suburbanization is often characterized by extensive development on the city outskirts.

Ageing Population – Globally the proportion of elderly out of the total population is growing. The UN has reported that this ageing is unprecedented - the twenty-first century will witness even more rapid ageing than the 20th century. It is a global phenomenon although different countries are at very different stages of the process, and the pace of change differs greatly. (Source: UN Population Division, *World Population Ageing: 1950-2050*)

Increased Workforce Participation – Many countries are experiencing changes in workforce participation and patterns of working. There is often now more flexibility in working hours or more opportunities to work part-time or to telework. This is, for example, allowing more women to join the work force. Furthermore, more elderly are able to work beyond retirement age.

Smaller Households – In many developed regions, an increase in single person households has been identified. Where single-person households are less common, there still remains a general reduction in household sizes. This is primarily due to changing family structures and increased income of individuals.

APPENDIX 2 – REWARD BASED BEHAVIOURAL CHANGE IN THE NETHERLANDS

Spitsmijden Project

The first Dutch Spitsmijden project was launched in October 2006 to study whether reward stimulus could be a possible control instrument to influence mobility behaviour. The experiment sought to provide a scientifically based insight into the effects of positive stimuli on the participating drivers, to study the feasibility of a reward scheme to encourage commuters not to drive during the morning rush-hour (defined as 07:30 to 09:30h). The trail was compromised of behavioural analysis, technical and organsiational implementation, welfare optimization and a traffic simulation. The project was carried out by a public-private partnership comprising universities, private companies and public institutions.

Rewards

Figure 3.21: Yeti smartphone

Upon registration, the participants chose one of two types of reward. The first type of reward was one of three levels of monetary reward (€3, €5, variable) for each morning rush hour that the participant avoided. The second type comprised savings towards keeping the Yeti smartphone at the end of the trail. These particpants received a Yeti at the beginning of the trail which provided them with traffic information during the trail. If the number of avoided car trips during the morning rush hour exceeded a stated number, the participant would be allowed to keep the Yeti at the end of the trail.

Location Technology

The geographical focus was on a heavily congested Dutch motorway link from Zoetermeet towards the Hague (A12) and involved 340 regular rush-hour commuters. The outcomes of the behavioural analysis led to the establishment of a number of parameters which were then fed into specially developed simulaton models. The first model was based on economic welfare theory and was used to determine the optimal reward level. The second model was a dynamic traffic model that allowed the simulation of different reward levels and an assessment of the global impact of the corresponding reward schemes.

Technology

Various technologies were utilised for the experiment ranging from Electronic Vehicle Identification (EVI), On Board Units (OBU), cameras with number plate regonition to GPS position logs. This combination of technology makes it possible to determine the participants' time and location data.

Figure 3.5: EVI system components

Results:

'The traffic information via the Yeti was very usefull. I could sit at home and decide whether I should just stay and drink another cup of coffee.'

The results of the first stage of the Spitsmijden project show that the reward trials succeeded in encouraging car drivers to avoid the morning rush-hour. The impact of of the reward on rush-hour travel behavior were significant, both for the monetary and the Yeti smartphone reward types. So much so, that a reduction of rush-hour car trips of approx 50% was observed. This reduction was reported to be obtained mainly through the rescheduling of trips to earlier or later points in time. A shift to public transport was also reported, but to a lesser degree (from 4% in preliminary measurements to 9.5-12% during the reward phase).

After the end of the reward phase, car use during the rush-hour returned to pre-measurment levels. This suggests that behavior stimulated by rewards is not continued when the reward is withdrawn. The participants do not value the alternative behavior stimulated by the reward enough to continue using the options they had chosen during the trail. Although interestingly, public transport use was slightly higher during the post-measurement period than during the preliminary measurements.

Project Phase 2

Spitsmijden was such an innovative and promising concept that in November 2007, the Minister of Transport decided to encourage more trials (from Sept 2008 to May 2009) involving elements of the Spitsmijden concept as part of the programme Different Payment for Mobility.

Spitsmijden 2 achieved comparable results, but this time over a nine month period. It showed that participants were also willing to adjust their behavior over a longer period. This shows that rewards can be used a a mobility instrument over a longer period without a reduction in effectiveness.

APPENDIX 3: MEETING POLICY REQUIREMENTS

DaSTS goals	Transport-related challenges	Smart Impact	Why?	Example
Support national economic competitiveness and growth	Reduce or manage congestion (or improve reliability)	HIGH	Allows technology to maximise efficiency of networks and provide incentives and payments to manage use	Dynamic traffic management and behaviour change initiatives e.g. incentives to travel outside peak
	Improve access to international 'gateways' (ports, airports) and 'hubs' (major cities)	MEDIUM	Freight and employee travel management including information on road conditions, logistics, discounts and information on public transport options	Dynamic congestion and roadworks information
	Improve accessibility to work	HIGH	Employee travel management including subsidy for targeted segments e.g. workless	Combined public transport and car park access smart card. Subsidy for workless.
	Support development areas including housing	HIGH	Behaviour change incentives for residents to encourage sustainable options	Discounts for local shops and services on 'community travel card'
	Support transport industry by reducing regulation and ensuring vfm in transport spend	LOW	Supports vfm management rather than infrastructure solutions	Dynamic traffic management and behaviour change initiatives e.g. mobile phone information on congestion
	Increase resilience of transport networks	MEDIUM	Provides means of transmitting information in emergencies	Mobile phone text alerts built on travel habit data
Tackling climate	Reduce emissions by promoting	HIGH	Promotes behaviour change using	Incentives for active transport

change	public and active transport modes		incentives	on personalised smart card
	Improve land use and transport planning integration	HIGH	Management of traffic predicted from development sites	Incentives for not using car tailor made to lifestyle preferences
	Promote greener vehicles and fuels (increase carbon efficiency)	HIGH	Provides incentives for 'greener' behaviour	Incentives or additional payments depending on choice
Better safety, security and health	Reduce transport casualties	LOW	Better management of emergency services	Emergency services fleets linked to traffic control centre
	Reduce transport related air pollution	HIGH	Provides incentives for behaviour change	Incentives for not using car tailor made to lifestyle preferences
	Reduce vulnerability to terrorist attack	LOW	Better network management to respond to emergencies	Emergency services fleets linked to traffic control centre
	Reduce crime and fear of crime	MEDIUM	More information reduces fear of crime e.g. by reducing waiting times Reduces need to carry money.	Real time bus information on mobile phones and at bus stops
Promote greater equality of opportunity	Improve accessibility to services – social inclusion	HIGH	Services can be packaged and targeted to those in need	Social care packages provided on personalised smart card
	Support measures to redress regional and local economic imbalance	MEDIUM	Enables better targeting according to need	Targeted incentives for young unemployed people linking work with leisure opportunities

	Improve accessibility for disadvantaged people	HIGH	Services can be packaged and targeted to those in need	Packaged social care and leisure services with transport options e.g. taxi access
Improve quality of life and promote a healthy natural environment	Reduce transport-related noise			
	Minimise impact of transport on natural environment, heritage and landscape	HIGH	Encourages better management of existing infrastructure rather than building new	Dynamic traffic management and behaviour change initiatives e.g. advisory routeing based on real time traffic conditions
	Improve experience of end to end journeys	HIGH	Promotes an integrated approach covering different modes	Access to all elements of end to end journey by one smart card
	Better connections within communities	HIGH	Promotes local interaction e.g. by incentives to use local shops	Link applications to local priorities e.g. health, local shops, community activity

APPENDIX 4: SCOPE OF TRM DELIVERY ORGANISATION

Managing and developing transport network and use data – the organisation should be able to access, use and manage data from:

- Urban Traffic Control Centre(s) or equivalent
- Real time bus, tram and rail information
- Ticketing and passenger data
- Tolling or charging of roads
- Parking data
- Existing transport (and other if possible) smart card data
- Concessionary fares
- Any other relevant source – for example, personalised travel plans, workplace or school travel plans, school and social care transport, car clubs, cycling, walking, health related, traffic generation to visitor attractions and retail centres, visitor numbers, numbers passing through airports, stations or interchanges, freight, land use changes

Any contract for the TRM delivery organisation will have to be agreed with the current data holders, and arrangements made to ensure that the data is made available. There will have to be agreed protocols on potential use of the data.

Marketing – an important element is to understand and segment the market. The delivery organisation should have access to current transport marketing and awareness initiatives, and be able to build upon successful projects. However, it will also take cues from private sector marketing. This opens up all sectors, even ones that are traditionally anti-public transport. This also means that a two way dialogue can be established and services/products can be specifically targeted to specific segments. It means that every city will be different and the pathway to complete mobility will vary. For example, some cities that are car oriented may start with segmenting the car driver/passenger market and offering mobility packages that combine, fuel, road tax, parking, tolls, etc in one package. Then car clubs, bike hire and public transport could be added and users incentivised to achieve a different mode balance in different places at different times of the day. A partnership could be formed with the motoring organisations to emphasis that this is user focussed based on value pricing, the normal retail mechanism, and not road pricing by the back door. This also yields management information which can be used to manage the city in a broader way. Loyalty schemes will be critical to this with points or carbon credits.

Liaison with partners – CRM offers new business models because it offers new revenues, new management information streams and new ways to manage demand. For the private sector it offers access to a large market and the ability to sell value added services to this market. To maximise this potential, the delivery organisation will have to keep in constant contact with likely private and public sector partners, developing new ideas and bringing about synergy to increase efficiency and effectiveness. This role could be likened to bringing about the development and use of apps on an iphone, or of multi applications on a smart card.

Financial management and reconciliation – associated with this will be a requirement to manage finances to ensure that appropriate returns are provided to relevant partners. As a general principle, revenue raised should be ring-fenced for improvements relevant to TRM. This will require new protocols and procedures.

APPENDIX 5: GLOSSARY: NON-TECHNICAL

Term (in document)	Definition
Mode	Different forms/types of transport used to move people or cargo (e.g. train, bus, car, ship)
Transport demand	The demand from people for different forms of transport
Transport supply	Provision of transport infrastructure, vehicles, etc
ICT	Information and Communication Technologies- the application of advanced computing and communication technologies to deliver a wide range of services – usually quicker and cheaper and greater capacities then in the recent past
Segmentation	Dividing the market into groups of individual markets with similar wants or needs based on a range of criteria
Predict and provide	Estimating future transport demand and providing the infrastructure to meet this projected demand
Congestion management	System of surcharging users of a transport network in periods of peak demand to reduce traffic congestion
Real time information	Up to the second information provided to passengers about transport services (usually using ICT)
Governance	The system of regulation, policies and rules which are used to manage and control
Global megatrends	Issues and trends which are generally universal and global
Infrastructure	The physical and organisational structures required to support a society (roads, power, etc)
Megacities	Generally a city with a population of 10 million or greater
Mass transit	Public transport which is open to use by the public and can carry large volumes (buses, trains, ferries)
Strategic planning	Planning an overall direction and aim, and apportioning resources to meet the aims
e-government	The exploitation of ICT to deliver a range of public services (from benefits to payment processing) electronically and enabling citizens to directly communicate with their government

Payment Mechanism	Method for paying to use a transport form or service (e.g. coin operated machine, online payment, etc)
IT architecture	The fundamental organisation of an IT system, incorporated in its components, their mutual relations and in the principles controlling the use of the system
Point of Sale equipment	The hardware and software used for checkouts where monetary transactions occur
Multi-application (smart card)	A pocket-sized card with embedded integrated circuits which can process data- and has several applications, which can be both financial and non-financial
Interoperable standards	Capability of a product or system to interact and function with other products or systems
ITSO	Specification created to provide interoperability for smart ticketing schemes
eMarketplace	An electronic marketplace where buyers and sellers meet and interact virtually
PFI/ PPP	Private Finance Initiative (PFI) and Public Private Partnership (PPP) are used to describe a procurement or outsourcing arrangement where a partnership is established between a public sector body and a private sector organisation to deliver public services
Integrated Transport Authority	Authority responsible for coordinating and promoting the use of public transport within a region
Integrated ticketing	Ticketing system through which passengers can use a single ticket across different modes (e.g. train and bus)
e-purse	An electronic purse which can be loaded with value to purchase items. Typically the values are small (eg loading of up to £50 and payments of up to £5)

APPENDIX 6: GLOSSARY: TRM FUNCTIONS

Electronic Ticketing: the use of personal electronic means to store travel rights and privileges. This can utilise various media: smart cards, RFID tag, mobile device (e.g. GSM);

Advanced Payment Technologies: methods to enable the user to make payments. This can cover zone/period tickets as well as comprehensible single payments for multimodal trips. This usually utilises some form of electronic voucher which may be active (e.g. card payment) or passive (e.g. retrospective payment). Payments can be cash value (micro or large), utilise fidelity points, or exploit vouchers/offers;

Corporate/Environmental Travel Packages: packages of modes, mode features (e.g. wireless enabled carriages), payment tools and information which come together to meet a target group (e.g. local workforces) or specific user requirements (e.g. environmental package);

Travel Information: real time and static information delivered to users via a range of media (e.g. phone, VMS) and at different stages in the trip chain. Predictive information is a useful addition to this package;

On Transit Information: a specific location of great utility is on-bus information. This is particularly important given the "seamless" aspect of Complete Mobility, as it is the key location to provide users with specific real time interchange options;

Traveller Initiated Transport: transport (modes, capacity, origin-destination) which is reactive to expressed/planned demand from users. The mode is insignificant. The fulfilment of demand to users expectations is the key;

Personal Travel Planning: electronic or person-led travel planning advice to users (individuals or household) or other groups (e.g. workplace). The planning information and advice will utilise other key technologies/infrastructures described here;

Mobile Booking: the ability to be able to book transport away from a traditional home/work base. This can be whilst travelling or at trip chain breaks. Importantly the booking procedure and systems recognise stored preferences;

Within Station Guidance: guidance technology for travellers within transport environments such as large stations. This is important if there is a move to mobility hubs and large interchanges. This is of particular use to travellers with physical impairments, though of use for all travellers. This reinforces the seamless aspect of the system;

Hub Connections: activity hubs which can be centres for information, interchange and network access (physical and virtual);

Targeted Corridors: freight and transit corridors which can be the focus of high quality services provided under strict performance contracts. They can be focused on a range of modes (e.g. bus, BRT) but more importantly can guarantee minimum service levels to the user;

Real Time Modal Interchanges: information and control systems to facilitate Managed Transfer (maximising the number of planned transfers available to the passenger at interchanges);

Space Allocation and Sharing: re-balancing of exchange space (space for activity and exchange between people) and movement space (space allocated for mobility);

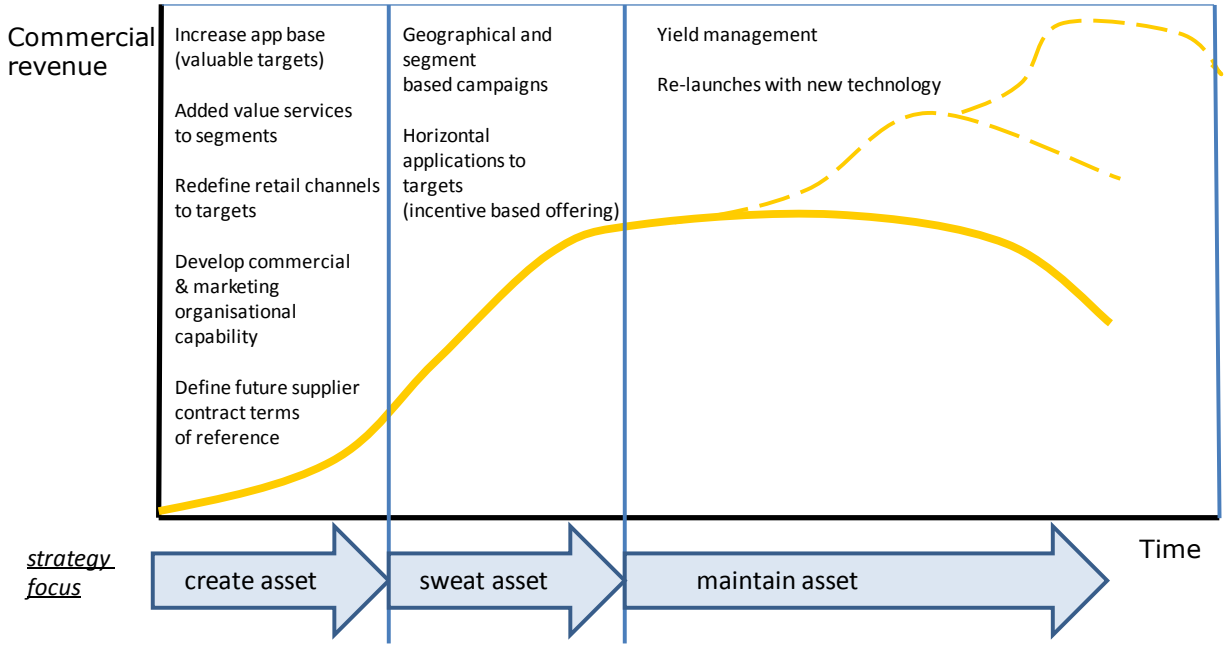
Traffic Control and Command: urban traffic management and control systems which are at the core of data collection, collation and information generation (to understand the network) information dissemination (to facilitate behavioural change) and system control (via gating, access control as well as variable pricing);

RFID Tracking: to support traffic control and command (and feedback) by providing real time tracking of travellers and vehicles. Tags can be used as a basis for electronic ticketing;

Back Office Integration: system integration which is necessary to manage a multimodal integrated transport system. This must include booking and despatch systems.

Likely pathway

Figure 4 -Strategic Focus for TRM Commercial Development



Critical Success Factors

- Understanding of the full benefits and implications of TRM, as well as the steps to reaching it;
- Clear objectives and powers, including acceptance of the principle of continual development of the TRM system;
- Acceptance, co-operation and agreement from stakeholders, particularly public transport operators and traffic managers;
- That the delivery organisation has an innovative, entrepreneurial and customer oriented approach;
- That previously identified barriers to integrated transport, such as competition, data protection and procurement rules can be used pragmatically and positively to achieve benefits – in practice this probably means support from Government, at least from the Department for Transport;
- Availability of data from a wide variety of sources;
- IT capability to bring together networks and to create or develop personalised travel packages
- Getting the principles for balanced pricing right

TRM Risk Analysis

Table 3 presents a headline risk analysis for TRM. As a new concept, TRM has high risks. It can be seen that the potentially highest impact risks concern lack of political support, and legal issues concerning data protection and competition laws.

Table 3- Risk Review

Risk Nature	Risk Description	Outcome and mitigation	Probability	Impact
	List risks which threaten achievement of Service / Section objectives. It's important to record clearly the cause / trigger and the implication of the risk being described.		*HL = Highly Likely L = Likely FL = Fairly Likely U = Unlikely VU = Very Unlikely EU = Extremely Unlikely	'D = Disastrous S = Severe L = Large M = Moder N = Negligib
Political	Insufficient political support and/or too much interference or internal argument	Transparent processes, initial agreement, government and stakeholder support	L	D
Operational	Data non-availability and lack of co-ordinatio	Appropriate governance and protocols in place	L	S
	n Performance failure	Adequate redress in contract	FL	M
Legal	Data protection laws preventing access to information	Appropriate legal advice	L	D
	OFT - competition rules preventing integration and co-operation	Appropriate legal advice	L	D
Technical	IT failure to provide adequate platform for integrating different databases and management systems	Detailed feasibility and pilot study	L	S
Commercial	Procurement failure	Use established mechanisms	FL	M
	No suitable delivery organisation bids	Detailed market analysis	U	M
User Acceptance	System fails to meet expectations	Detailed system performance and testing specifications will be provided for review, comment and approval prior to formal testing stages	L	L