VEHICLES AND INFRASTRUCTURE

A summary of the fourth report from the Transport Visions Network

This is a summary of the fourth in a series of reports to be produced by the Transport Visions Network. The Network is a novel venture to project the views of young professionals into the debate concerning the future of transport and its role in society. It is comprised of individuals who are aged 35 or under from universities, public authorities, consultancies and industry both in the UK and overseas. The series of reports will cover eight different topics and aims to build up a coherent vision for the future of transport. Each report is produced through a managed process of discussion involving e-mail debate, a face-to-face workshop and the writing of the report with input from an editorial board.

The first report in this series, Society and Lifestyles, considered a myriad of issues and trends that are shaping or have the potential to shape the way we live in the future and our travel needs. In the second report, Transportation Requirements, the Network set out twelve guiding principles for the design of future transport systems. In the remaining six reports the Network will explore possible solutions to current and emerging transport problems. The Network will not be seeking merely to guess or predict what the future of transport holds in store. In acknowledging that the future is not predetermined and is ours to shape, the reports will identify developments we would like to see and perhaps those we should guard against.

The first of the six reports on transport solutions addressed the relationship between land use planning and transport. Visions were developed for four different aspects of land use planning. This report examines how vehicles and infrastructure might be used to develop the UK's surface transport networks of the future. In doing so, it has attempted to highlight the balance between maintaining existing systems and making the best use of technological advances to develop new vehicles and new systems.

Technological advances offer the opportunity to increase the capacity that any system of infrastructure can provide. Preferably technology should be harnessed to develop systems that increase the number of people per hour that we move rather than the number of vehicles per hour. Measures such as dedicated lanes and intelligent charging can facilitate this. Similarly, greater support for car sharing and innovative forms of shared vehicle ownership could help achieve such aims. The improvements in throughput in people per hour achieved through these measures may also deliver vastly enhanced energy efficiency per kilometre moved.

Information and Communications Technology (ICT) and notably the Internet, perhaps represents a new transport infrastructure for the 21st century. It provides, much as physical travel does, access to goods, services, activities and opportunities. Yet, ICT is in its infancy and perhaps has suffered from too much being expected too soon from the services of today that use this infrastructure. An analogy has been drawn between ICT and the car. The Internet-based services we have today are equivalent to the car of the early 20th century. ICT systems and services of 50 years hence will potentially offer extraordinary communications opportunities that promise to change the way we do things. Although this may offer us the opportunity to do the things we do today differently, it will undoubtedly allow us to undertake more or different activities, which could create new transport problems.
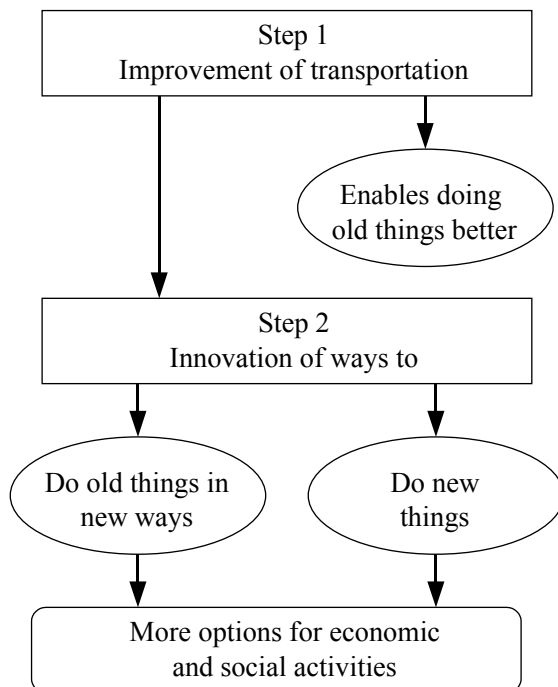
It has been suggested that we have a love affair with the car. To many people the car offers a safe and comfortable means of travel that allows them independence to pursue their lifestyles:

Here in my car
I feel safest of all
I can lock all my doors
It's the only way to live
In cars
Lyrics from the song 'Cars' by Gary Numan

Indeed, the car has offered flexibility in reaching a range of destinations not possible within the same timescales through public transport systems. In terms of total travel (measured in passenger kilometres) the car has not only acted as a substitute for travel by public transport but has facilitated, and over time perhaps necessitated, more motorised journeys and more journeys over longer distances.

However, we should critically evaluate the idea that the vehicle is the controlling factor. History has shown that there have been expansions in growth of other vehicle modes (e.g. coach, rail and air). If it is the lifestyle afforded by the vehicles we have available that we love rather than the vehicles themselves, then new modes could bring new choices and, in turn, new transport challenges:

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│ Improvement of transportation│
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│          Step 2             │
│    Innovation of ways to    │
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│  More options for economic   │
│    and social activities     │
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Two Steps to Increasing Social and Economic Options[1]

The Vehicles and Infrastructure report does not restrict itself only to a consideration of solutions that might reduce the problems that we face today. Rather, it aims to present a range of futures, which may or may not be appealing to transport professionals and considers how or why they might come about. Six visions of how vehicles and infrastructure might be used to meet current and future transport needs are developed and these are summarised below.

Control Culture

In the control culture, safety and security are the predominant concerns for society. As a result, most citizens are willing to accept a degree of curtailment of their individual freedom in order to ensure these concerns are met. The vehicles and infrastructure in the control culture reflect these dominant values as safety and security in travel have been increased by the gradual accumulation of control mechanisms. Increasingly control has been passed from the individual to 'big brother' systems of vehicle control. This is largely in response to fears about crime, accidents and liability for the consequences of such incidents and the implications in terms of insurance costs.

Vehicles and their drivers are constantly monitored when travelling and their adherence to the laws of the road is remotely enforced. For example, speed limits are automatically relayed to the vehicles and applied independently of the driver's control. Most citizens in the control culture appreciate the reduced level of responsibility they now have concerning the driving task as automation and interaction mechanisms between vehicles and remote systems of control serve to bypass potential human error. The simplicity and convenience of travel in the control culture is generally perceived as a benefit that outweighs concerns over the amount of information that the authorities possess not only about the vehicle but also about the driver.

Community Future

In the community future, society operates according to the dominant values of community and the collective good. As a result, most citizens are willing to forego a degree of personal choice and individual freedom to ensure that these values are upheld. This state of affairs is clearly reflected in the ways in which vehicles and infrastructure operate. It was recognised that increasing car dependence was causing mobility to reach unsustainable levels with highly detrimental consequences for the environment, the economy and society. To rectify this situation it was accepted that drastic measures were necessary to cause a step change in the provision and quality of collective transport. An unprecedented level of Government investment combined with the revenues from a universal mobility tax were then ploughed into a high quality, high density and high

frequency public transport network called the Silver Shuttle Service (SSS).

After a difficult transition period, particularly in rural areas, the SSS proved a popular alternative to the car by delivering the door-to-door convenience and in-vehicle service quality of personal transport without the responsibility of ownership and maintenance. Discrete charging mechanisms were a further aid to take up and citizens responded positively to the communal nature of travel. The SSS facilitated the gradual removal of the car from the range of mobility options. As a result, reduction in the requirement for infrastructure capacity (including parking) has led to the conversion of much former residential road space into community greens and open spaces.

The Handshake

In the handshake, physical interaction will remain central to human activity and not be replaced to any significant degree by virtual interaction. People will meet together in person to conduct business and other activities and will travel over increasing distances to do so. Inter-urban transport networks will be expanded to cater for more travellers. For example the M25 motorway will operate on two levels. The bottom deck will be for the exclusive use of lorries and collective forms of transport such as coaches and buses. The upper deck will exclusively accommodate drive free personal vehicles. Facilities and infrastructure will be extensively developed at interchange points to enable meetings and other activities to take place.

An example of such developments is the Crayford COnference and Interchange Location (COIL) which incorporates both conference facilities and transport links. The COIL benefits from its location adjacent to the M25 which allows easy access to both drive free vehicles and collective transport. Upon arrival at the vehicle park, an airway service of transparent cable cars takes passengers to the interchange terminal (for transfer on to central London). The COIL's proximity to the River Thames means it can also operate a catamaran service to central London, which is particularly popular with leisure travellers. The excellent quality of the conference facilities at the COIL has led to a high proportion of its business users opting to hold their meetings at the COIL rather than travelling into central London.

Leisure World

In leisure world, a very large proportion of people will conduct work and business remotely and often in the home. This will be facilitated by a combination of technological change and societal pressure. By contrast, leisure travel will continue to rise and solutions to activity-based congestion will become the most pressing transport issue. As a result, activity centres invest heavily in providing effective transport links to their sites. This involves the introduction of high quality collective transport with on-board facilities, which enable the leisure experience to begin on the journey to the attraction. For example, 'stadia express' services enable sports fans to travel to matches on buses equipped with video and Internet facilities to allow them to keep up to date about their teams. Similarly, train and coach services to leisure attractions will include on-board children's play areas. This cultural trend will permeate down to local levels as swimming pools provide attractive cycle paths to enable local residents to enjoy a pleasant journey to the amenity.

Tourism becomes the most powerful industry in the UK in leisure world. This creates pressure upon many of the nation's heritage attractions that requires a new approach to access to alleviate adverse environmental impacts. One approach, pioneered in the Lake District, known as heritage rings, proves particularly successful in facilitating sustainable access. Tourist traffic is directed to satellite 'park and ride' centres on the edges of the rings where collective transport then takes visitors to the heritage centre. Visitors are then free to travel around on bicycles or electric vehicles rather like golf carts. Global tourism is influenced by the prominence of virtual alternatives to travel. Technological developments enable total immersion so that virtual international holidays can be experienced from the UK.

After You

In after you, society faces up to excessive demand upon resources and infrastructure by giving priorities to certain users and uses. This is reflected in the management of transport network capacity. For example, there are LOCAL lanes, which are only used by bicycles, motorcycles, minibuses and pencil cars (single occupant width vehicles). Roads in residential areas and city centres are designated as LOCAL lanes and this

has helped to reduce accidents. One lane of main roads is also typically designated as a LOCAL lane.

Whereas previously everyone could choose when and how to travel even if this resulted in inefficient usage of networks, now usage is allocated according to agreed priorities. Between the hours of 10am and 4pm commercial and freight traffic, including driverless vehicles, have priority. Outside those hours other users can access this infrastructure. Users can ensure access to the transport network by booking their travel slot in advance. The reliability of the transport network is enhanced by technological developments and flexible infrastructure. For example, if there is a traffic incident, switchover lanes enable the direction traffic moves on the roads to be changed to alleviate congestion or enhance safety. Users are informed of such developments via head-up-display technology in their vehicles, negating the need for any physical change to road signing.

Design for All

In design for all, an increasingly diverse and aging population will mean that meeting all the very different mobility needs of the population is a major challenge. The principal vehicle solution which emerges for personal transport is the Plug and Play Vehicle (PPV). This is a modular open architecture vehicle in which users develop their own vehicle design based around the core propulsion technology. For example, they add their own carrying capacity, which because of the modular nature of the vehicle can be changed at will (i.e. from single occupant commute trip to family outing). All internal features (i.e. Internet access, sound system etc.) can be selected and plugged in by the user.

The standard PPV has been followed on the mass market by the Intelligent Diagnostic Vehicle (IDV) which provides personal mobility which transcends traditional barriers of mobility impairment. The IDV diagnoses the degree of manual control which it is safe for the user to have and applies automation to other driving tasks. Alternatively, the IDV can operate as an entirely automated vehicle enabling the user to both enjoy personalised, private travel whilst being able to work, rest or play. In design for all, technology is applied to provide holistic solutions. Therefore those who enjoy communal transport are served by fully automated public transport, staffed not by a driver but a customer information officer. Similarly, walkers and cyclists enjoy greater safety as the IDVs and PPVs detect other infrastructure users through sensor equipment.

Conclusions

The visions attempt to present the reader with a range of alternative solutions that make different use of perceived technological advances. They do not set out detailed technological and design aspects of vehicle and infrastructure systems, but provide a picture of how different systems might integrate to meet the needs of society. The solutions may not only apply within the context of the scenario for which they were developed. A mixture of solutions from the different visions may be appropriate.

We are likely to see significant change in the nature of vehicles using our infrastructure in the future. Radically new infrastructure networks are less likely to be developed. New hybrids of the systems in operation today may form the basis of our systems for the coming decades. This should be supported by a more intelligent infrastructure for information provision, trip management and charging. However, the type of solutions that flourish will be highly dependent on the values of society and the market conditions created by Government.

[1] Garrison, W. and Ward, J. (2000). Tomorrow's Transportation: Changing Cities, Economies, and Lives. Artech House, Boston.

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