Digital Communications Infrastructure Strategy – The Intelligent Mobility Perspective

The Transport Systems Catapult (TSC) vision is to "drive the UK's global leadership in Intelligent Mobility, promoting sustained UK economic growth and wellbeing". In order to drive this vision, the TSC focuses on the global markets within transport systems which will experience a significant amount of growth in the next decade and which provide the greatest opportunity for UK exports. This document does not aim at fully answering to the consultation on Digital Communications Infrastructure Strategy launched by the Department for Culture, Media & Sport but to highlight some specific requirements to the Intelligent Mobility market.

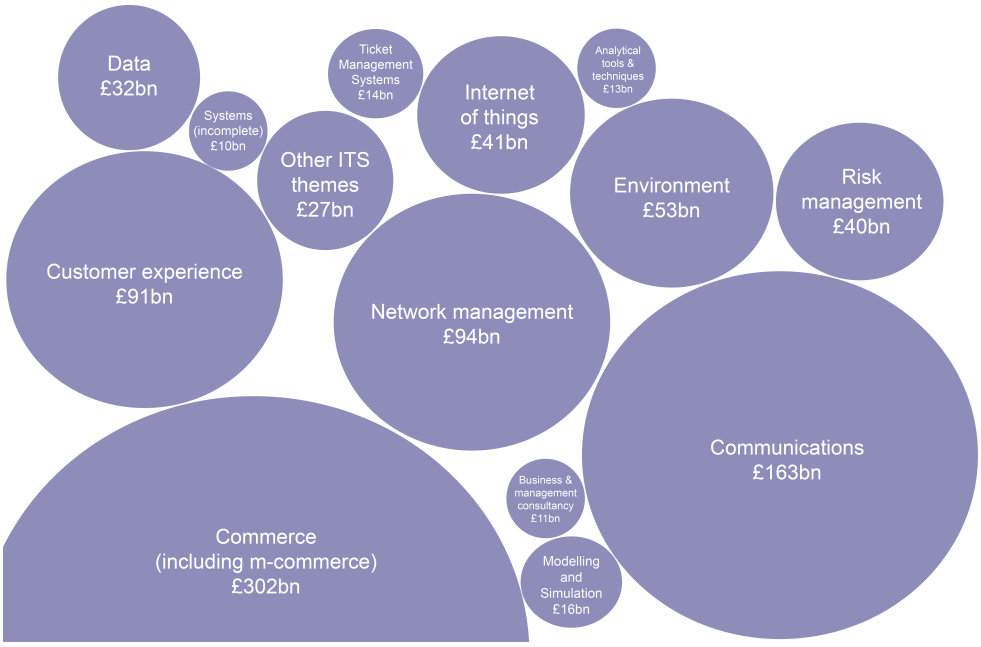
The Intelligent Mobility (IM) market

IM cuts across and goes beyond the traditional transport sector. IM aims to make transportation more sustainable (enhancing cost efficiency and reducing the impact on the environment) while providing an enhanced customer experience. It utilises the emerging technological markets to enable user focused, integrated, efficient and sustainable transport systems.

- User focused transport systems - to meet the needs of an ever connected world and an aging population;
- Integrated transport systems - to maximise the capacity of transport;
- Efficient transport systems - to meet global resource demands; and
- Sustainable transport systems - to address global, social, environment and economic risks, particularly climate resilience.

The global markets for products and services associated with Integrated Transport and Intelligent Mobility are expected to exhibit double digit growth annually over the next 10 years, growing from £137bn in 2014 to £907bn in 2025. It is also expected that the communication requirements for the transportation industry will grow proportionally.

It is estimated that by 2025 this market will include:



IM Requirements in terms of connectivity & communication

In order to enable the development of the IM industry in the UK, TSC has identified three main areas of focus that will need addressing when deploying the new communication infrastructure: full coverage of the UK territories, reliable & immediate communication capabilities and interoperability of the different communication systems.

Decisions on security, confidentiality and data protection will also have a major impact on IM development. While it is clear that those three concepts do not solely depend on the communication infrastructure, making structural decisions with them in mind would only be beneficial.

Coverage

The geographical coverage of the communication systems will have a key role to play to successfully develop IM in the UK and TSC believes that a full coverage of the country is required. While it may require extra investments to equip the uncovered areas of the country, there will be safety benefits that need to be factored into the evaluation process.

It is believed that autonomous vehicles will be widely accepted by the population in the next decades, thus one needs to anticipate the issues that will be faced when reaching the edge of the signal coverage. While systems are developed to minimise the risks of accidents their reliability depends on their ability to perceive and communicate with the environment. “Shut-down” procedures of the vehicle could be developed to reduce the risks of crashing, but this would also mean leaving people with limited alternate means of transportation. Also, the fact that not-spots often overlap with low population density areas would be an aggravating factor in case of accidents with a slower emergency response and limited help from by-standers. As a failsafe option, one could design systems to prevent passengers going too close to the edge of the signal envelope, but that would also prevent users from reaching certain destinations and further exclude some of the UK’s most remote locations.

Real-time & Reliability

Having quasi real time and reliable communication capabilities will also be key safety factors in IM. Again, considering automated or autonomous vehicles, any delay or inaccuracy in communications between the infrastructure and the vehicles has the potential to generate accidents. Risks related to miss-communication with traffic lights in urban areas are amongst the most obvious examples, but faster paced environments, where reduced vehicle spacing will become the norm to maximize capacity utilization (smart highways, train lines and airports), could also be exposed to significant lag risks.

A lack of reliability would also have commercial consequences as customers are reluctant to purchase services without the assurance they will be able to fully use what they paid for. Paid-for internet access in mass transportation is one of the prime example of services that could be jeopardised.

People centric systems, universality & interoperability

While travellers do not necessarily pay attention to the ways they are able to communicate or remain connected, it is important for individuals to be connected at all times. The IM concept encompasses this

philosophy and therefore strongly relies on the concept of universality and interoperability. In order to simplify developments in the IM field, it is important that the new infrastructures remain compatible with the current ones and that their various elements are built with interoperability in mind. While safety may be maintained despite a lack of interoperability (by designing systems able to communicate with all of the information sources), "failsafe" designs will significantly increase industry costs, therefore slowing down IM developments in the UK.

In order to maximise the economic potential for the UK and export IM expertise and products as efficiently as possible, it would also be beneficial to consider a certain level of commonality with the major economic partners of the country.

Security, confidentiality & data protection

Other elements will be vital to the IM development in the UK. While TSC is not a communications infrastructure expert and therefore cannot comment on the best built-in technological options to address security, confidentiality and data protection, it is believed that highlighting those requirements at an early stage is important.

A security breach on an autonomous vehicle could lead to malicious remote control of the vehicle potentially resulting in physical damages to the vehicle, its passengers and its surroundings. While IM systems designers are already factoring these types of direct attacks in current projects (e.g. building closed-loop controls systems), in an inter-connected world, it is however possible to affect a vehicle by focusing on the environment it is evolving in. Traffic lights, variable speed limits signs, road lighting (for road transportation); various track signals (for trains, tubes & trams); instrument landing systems (ILS) (for planes) are all critical elements of the IM infrastructure, which are expected to become more "intelligent", therefore connected and potentially vulnerable to manipulation.

Also, while the interoperability and universality principles will enable customers to remain connected at all times while being on the move, one should expect them to exchange more and more data. Questions about storage, ownership, access and protection of this data will have to be addressed in light of the new requirements.

TSC Conclusions

Intelligent Mobility offers significant economic benefits and the UK is well placed to capture a significant proportion of the global market estimated to be worth £900 bn per annum by the mid 2020's. Much of the benefit is heavily dependent upon the transfer of data and the current assumption from those developing Intelligent Mobility is that that the data infrastructure required would be in place. The exact scale and requirement of the infrastructure required to support Inteligent Mobility, is however unknown as the two sectors, Transport and Digital Infrastructure have not as yet engaged.

We therefore recommended that a neutral organization such as the TSC is tasked with supporting the interface between the transport and Digital infrastructure sector ensuring that the expectations, market opportunities and public policy as well as technical requirements are aligned to deliver maximum

economic benefit.

From the perspective of Intelligent Mobility and the needs of the transport sector the data transfer capability should be agnostic to the digital infrastructure. This will allow the greatest freedom to develop transport solutions based on market needs and opportunities.

While it is clear to TSC that having a country-wide real-time communication capability that is reliable will bear a certain cost, not having it would also generate miss-opportunity costs for the IM market. At this stage, further work would be required to evaluate the exact impact of different infrastructure strategies.

Within the consultation TSC analysis indicates that the more likely scenario for the next 5 to 10 years is the 3rd one, but also that requirements may exceed the terms stated in the consultation, especially with the Internet of Things expected to radically change the way we currently use the communication infrastructures.