Strategy for development of future railway communications systems (T351)

Overview
Modern communications technologies have developed at a rapid pace over recent decades. However, the railway industry has traditionally been slower than other industries in exploiting these emerging communications technologies. One reason for this is the safety and security measures needed for railway application are different from other commercial applications. In implementing the global system for mobile communication (GSM), the European railway industry has implemented a separate GSM protocol and network, the global system for mobile communications for railway networks (GSM-R). Being able to use the commercial GSM communications protocol could have reduced or removed the need for substantial investment in GSM-R.

In future, the integration of railway safety functionality into commercial communications equipment should provide greater operational flexibility and cost benefits for the industry. RSSB and its stakeholders recognise this and want to help the industry to benefit from the commercial and operational opportunities that developments in commercial communications technologies can offer.

Aims
The goal of this project is to provide the railway industry with a long-term communications strategy. This will enable it to benefit from technological progress in communications, by exploiting new opportunities, and the use of standard commercial equipment and cost effective services.

The project:
- Evaluated the future communications needs of the rail industry.
- Evaluated the users' communications requirements.
- Identified the shortfall imposed by present technologies.
- Identified where current technological developments can overcome the identified shortfalls.
- Identified a strategy for the industry to contribute to product standardisation, so avoiding the reliance on specific developments for the railways.
- Identified how best to maintain an informed position, allowing participation in the research activities of European and UK standards bodies.
Methodology
RSSB commissioned QinetiQ to conduct this research, which was divided into four phases.

Phase 1, User Communications Needs
This captured the requirements of railway stakeholders, and established the extent to which current needs are met by current voice and data communications systems. Phase 1 also identified current technology shortfalls and possible new communications needs that could be realised if technology were not a constraint.

Phase 2, Emerging Technology Solutions
QinetiQ exploited its broad expertise in communications to identify relevant emerging technologies (within a five to 10 year time-frame) and to match these technologies to the requirements identified during Phase 1. QinetiQ then explored how additional data and voice capacity, available beyond safety critical requirements, could be exploited and how different technologies could be integrated to provide further benefits. The emergence of wireless technology was addressed, together with barriers to the introduction of new technologies.

Phase 3, Understanding Future Communications Technologies
This built on the analysis provided from Phase 2 to consider the directions of future communications technologies. It recommended how the railway industry should influence and exploit these developments. A method of maintaining this knowledge was presented.

Phase 4, Development of Communications Technology Strategy
This showed how a long-term vision would guide future strategy. A framework was provided, to develop a technology road map in the railway industry. An associated strategy for the development of future railway communications was proposed.

Findings
The findings of this project are:

Operations
- There is a need for the railways to migrate from analogue to digital communications to obtain improvements in capacity.
- The current wireless system (GSM-R) is unlikely to provide adequate bandwidth for the long-term increases in operational data traffic.
- The approvals processes should be appropriate for systems that are in general commercial use, and should not restrict the development of the commercial railway.
- To modernise and improve their communications services the railway companies (as a co-ordinated industry) need to work with other transport sectors (cars, buses, air, road haulage) to maximise their influence on the communications products and maximise the market size for them.

Technology
- The communications industry is moving strongly to broadband technologies and the use of internet protocols (IP).
- Digital communications are now commonplace throughout the railway industry for safety-related
operations, business, and customer/passenger applications. It makes sense to develop a communications infrastructure with components and technologies that are common to the industry.

**Business Needs**

- Provision of services direct to passengers is pulled by the passenger expectations for similar communications technologies which they enjoy in the home and office.

- The franchise periods of the TOCs limit the amount of investment available for new communications projects on trains.

- As a major user of technology the rail industry needs to keep updating its communications technology base if it is to remain competitive within the transportation market.

**Legislation**

- There is a need for industry-centred reflection and co-ordination. One aspect of privatisation has been a loss of co-ordinated investment initiatives across the rail industry. Failure to address this issue is resulting in slow response and loss of economies of scale when adopting newer technologies. It is critical that these investments are well understood by all, properly validated, and timely. This will maximise the return on investment in communications infrastructure and contribute to robust rail transport services. This will require some government involvement: to set up an industry-wide communications strategy; to encourage joint activities; and back-up initiatives with legislation as required.

- The wider EU role of the railways across Europe will increase in response to rising road congestion, environmental pollution and growing energy constraints. The communications market should be viewed on a European scale.

**Next Steps**

The project findings have been discussed at the cross-industry forum Vehicle Train Control and Communications System Interface Committee. The findings of this project will influence the DfT technical strategy due to be published in the middle of 2007.

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