

Market study and overview of standardization for road transport and traffic telematics

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National foreword

This document has been produced in response to a mandate from the European Commission to CEN for a review to ensure that the standardization programme in RTTT (road transport and traffic telematics) is in line with current requirements, and in particular that there are no gaps nor any ongoing work that the market has passed by. This report covers Phase 1 which is an evaluation of the global situation. This will be followed by a second phase which is the preparation of a revised work programme to be prepared in consultation with all interested parties. The final phase is the preparation and adoption of the European Standards. BSI have decided to publish this report because it provides detailed information to all concerned with this product area be they government related, manufacturers, system users, road users or students. This is a “snapshot” in time and it should be recognized that some of the information is already out of date. However it is considered to contain the most comprehensive and up to date information available on the subject at the time of publication. It also includes the current work programmes of both the European and international committees concerned, most of which will be published by BSI as either DD ENVs or BS ENs when approved.

It should be noted that this document does not necessarily reflect the views of either the BSI committee responsible (EPL/278) or the European committee (CEN/TC 278). It should also be noted that the document is being published in the form in which it has been produced rather than being re-edited by BSI and has been written by people whose mother tongue is not English. CEN/TC 278 are currently carrying out wide consultation on the document and any comments or further contributions should be sent to the CEN/TC 278 secretary:

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Depending on the consultation this document may be revised as part of Phase 2. This document will be withdrawn when it is considered to be too out of date to be useful.

This Published Document is not to be regarded as a British Standard.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to x, pages 1 to 131 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

**CEN/TC 278
PROJECT TEAM 12
« M 270 Phase 1 »**

**STANDARDS FOR
ROAD TRANSPORT AND TRAFFIC TELEMATICS**

MAY 1999

« It is no exaggeration to say that European standardisation, which does away with the need for excessive regulation, is an important democratic institution. European standards are voluntary rules of conduct, arrived at in an open, public manner. They liberate commerce, spur the development of new markets, protect the citizen as producer and consumer alike and enhance European competitiveness. European standards are a win-win situation »

Martin Bangemann

Executive summary

The present document contains the elements collected and the reflections made in the execution of the survey for the phase 1 of Mandate 270 EUROLUM was granted according a contract signed on 22nd December 1998 with NNI (Nederlands Normalisatie Instituut).

This document is divided into five chapters compliant to the terms of reference of the evaluation study that are:

- the current typical European dimension in terms of technology and its deployment in the area of RTTT
- the implication of RTTT standardisation for European Industry, including its prospects in non-European markets
- the European and world-wide situation with regards to (de jure and de facto) standards, publicly available specifications, etc ... which are currently available or in the drafting process
- the present level of participation of European manufacturing and service industries and users in standardisation activities
- actions that need to be taken by the different actors involved in European standardisation in terms of new or modified standardisation requirements
- missing links with ongoing RTD programmes and actions needed to improve the co-operation between RTTT standardisation and RTD projects.

The **chapter 1** deals with RTTT market, its stakeholders, and trends. It highlights the acceleration of use of ITS systems through mutual co-operation of public and private sectors and shows that, regarding the involvement in ITS organisations, European ITS industry has an intermediate place representing 22 % of the global ITS players, facing to US (15 %) but poorly representing versus Japan (63 %).

In Japan, massive investments were made by the public sector and ITS is expected to develop into a large scale market: in six years up to now, nearly 4 million in-car navigation systems were sold. The main development are foreseen in this latter segment, and the following ones: traffic information, Electronic Fee Collection (EFC), public transport, Commercial Vehicle Operation (CVO) and emergency vehicles, specific segment to Japan and in a more long term prospect, Automated Highways Systems (AHS).

It is interesting to note that value added information services (VASs) are not growing at the same rate than autonomous navigation sector, partially because of **lack of standards** and the multitude of players in the sector.

In US, development are fast in safety systems (51 %), EFC (37 %), Freeway and traffic management (28 %), real time automatic location applications (20 %) and CVO (14 %).

The challenge for service providers is to supply consumers with customised VASs. Mayday and related mobility services are the winners in ITS market in US, linking the use of GPS and GSM, through proprietary protocols like the Motorola ones. The success of Protection One is a clear illustration of this trend, but must be seen through the fact that its mayday services is embedded in a bunch of other services. GM OnStar service, more specialised, is far from its commercial target. It becomes more and more evident that RTTT market will be embedded in telecommunications market and in particular cellular market.

As for traffic information, the local situation, where public traffic data collection is quite low, creates a strong involvement of private sector in the operation of traffic information centres (Metro Networks and SmartRoute Systems): public/private partnership are set up, for the comfort and safety of the driver.

These companies are pursuing **proprietary and de facto standardisation strategies**, with the problem of developing common data bases and traffic data exchanges between public and private bodies.

Europe is in a median position between Japan and US. Public sector leads in infrastructure investment, but due to multiple and specific demands from governments, difficulties are met to set up pan-European traffic information services. However, the trend to consider the transport policy as a whole, trying to co-ordinate different means and systems, and strong willingness to create a set of standards, through the funding of many research projects, will allow to reach European coherence in products and services.

There are difficulties to start private road information services: TrafficMaster spent 8 years to reach profit, while the French service Visionaute ran by Mediamobile is far from its initial commercial targets.

Cellular carriers are just embracing the new market of transport, seeing in it a way for differentiation in a competitive market. Comparing to the US situation, the delay is due to the fact that their objective was to get cellular customers to reach return on their huge investments.

The market for advanced transport technologies is the more promising in the following segments: Advanced Travel Information Systems (ATIS), Advanced Vehicle Control Systems (AVCS), Advanced Commercial Vehicle Operation (ACVO) not forgetting EFC.

A trend in telematics mobile services can be detected through the SFR (Société Française de Radiocommunications) application, run jointly with Alcatel, Unwired Planet and Webraska, using the WAP protocol and giving access mobile phone users to Internet.

To sum up this chapter, it seems that there is a world-wide consensus towards such segments like ATIS, EFC, ACVO and safety systems, using tools like geographic data bases, GSM, GPS and DSRC.

In **chapter 2**, some considerations are developed on the standardisation applied in RTTT arena, presenting two contradictory facets and asking for a balanced policy.

Indeed, on one hand, there are strong links between governments and standard development organisations (SDOs), based on the fact that standards are powerful tools in many fields of national concern like citizen safety, industry investment, commercial development, environment, ... the risk being that they could appear as a panacea and as solution « a priori », leading into efforts and actions in a field where resources are scarce. Some criteria must **limit** their use, as well as when they are necessary, some tracks can be followed, parallel to the standardisation process (de facto standards, consortia, fora, ...).

On the other hand, one can see that their economical importance is great and some figures can be given to highlight their benefits, with as high figures as 80 % enhancements in safety, 70 % in EFC, 40 % in productivity, etc In addition, the overall RTTT market (gathering « small quantity market » like ITMS (Interurban Traffic Management Systems), APTS (Advanced Public Transport Systems), EFC and « mass market » like AVCS and ACVO) which is estimated to a gross total of 116 Gecus, will reach the more easily this target the fewer will be the suppliers with standard solutions. This situation will be likely to occur if a strong and organised action is set up to **foster** standardisation action.

The **chapter 3** presents the RTTT standardisation process in Europe. Looking at this matter implies to describe the various standardisation organisations involved in, like CEN, CENELEC, ETSI and their links with sisters associations like, for instance, ISO and IEC.

A special focus is made on **ANEC** (European Association for the co-ordination of consumer representation in Standardisation) which pursues the general aim to ensure consumer interests are given their full weight in the work of European standards bodies. ANEC is, in various ways, member and deeply involved in the action of CEN, CENELEC, ETSI.

Also to mention is the **ICTSB** (Information and Communication Technologies Standard Board) which was set up by CEN, CENELEC and ETSI to respond to the massive demand of standards from the building of information superhighways and that has also an essential role in co-ordinating the ICT standardisation process.

The structure of CEN/TC 278, dedicated to RTTT, is then described in detail through its 13 working groups (WGs). The initiatives taken to allow it to go forwards at the same pace than the evolution of the related technologies and to keep an eagle eye on it to launch new work items (WIs), like CWAs (CEN Workshop Agreements) in ISSS, appear to be adapted to the need of a fast moving world.

A detailed status report is performed on the 13 WGs as well as on transversal topics like smart cards and intermodality, where an initiative is to note, coming from CEN/TC 320. A case study is presented on EFC (Electronic Fee Collection) and DSRC (Dedicated Short Range Communication) to illustrate in these fields, on which European Commission is focusing, the difficulties, diversity of approaches and achievements in the standardisation process.

The work programme resulting from the TET (Technical Expert Team) design in January 1992 is **still adapted to the main areas in RTTT**, but it seems to call for an update, to fit with the to day situation, technological breakthroughs and market needs, and for an overall reshaping, the weight and output of the different WGs being unbalanced at the present time.

Special focus is made on the movement around **fora and consortia**, that seem **strong boosters** to accelerate the market acceptance as well as support to the standardisation process.

This extensive analysis performed on RTTT in Europe opens ways to some general comments. Besides the esteem that can be felt for the work performed or in progress and the actors involved, some worries may be expressed: slowness of the process, volume of the output, level of involvement of the RTTT community, and above all, lack of enough financial support, are the main drawbacks, presenting some connections between them. It appears to be essential, in order to keep the present impetus, to bring answers to those questions, in an overall solution.

Besides, thanks to the benefits that standardisation process finds in **RTD projects**, links between these two worlds may be tightened even beyond the present connections.

The **chapter 4** examines the RTTT standardisation process in the US to detect what aspects could lead to new inspiration in Europe.

In US, the central concept is an open **ITS Architecture** conceived by the Department of transport (DoT), from which follows a multi-year programme of accelerated standards development to facilitate successful ITS deployment: the national ITS Architecture is a reference framework that spans all of the standards activities. The « critical standards » are needed for national interoperability in those circumstances where large numbers of users, particularly mobile users, must access available ITS services.

The ITS Architecture is initiating a track on which DoT is engaging, to set up a lot of basic **standards that should not only be driven by market forces**. A formal process is described, allowing to start from the Architecture materials and then to define « standards requirements » that have to be taken into account regarding interfaces, message sets, protocols and specific technology for implementation related to the standards to build.

Though logical and justified, the whole process, stemming from the titanic effort to build the ITS Architecture, seems very heavy and, in any case, adapted to the US situation, where consensus on standards is difficult to reach because of the federal structure and the variety of standardisation organisations. However, in Europe, more thoughts could be devoted to this topic: KAREN will help on this track.

The consortium and forum approach, out of the national architecture, is registering success stories: WAP forum with Unwired Planet, AMIC and TSC consortia, two sisters structures, built around the willingness to provide standards that will enable safe, reliable and cost effective vehicle access to a wide variety of emerging electronic devices and services and following the launch by Microsoft of the Auto PC concept. The power of such consortia shows the necessity to imagine and elaborate bridges between standardisation process and outside parallel initiatives, so as to converge on **standards consensus driven**. That is a direction that Europe is heading to.

Leaning on various materials taken from the interviews performed during the survey, the RTTT actors feelings and market trends expressed in many specialised newspapers and surveys, **chapter 5** proposes suggestions to renew the TC 278 work programme and to improve, if possible, the way it is performed.

To begin with, some proposals are made on a general level, promoting ideas to find financial support, to accelerate the progress of the work, to improve the image of the standardisation world and to try to make more efficient the whole process, suggesting means to maintain the WGs' membership motivation at the highest level or to foster co-operation with the « outside » world (RTD projects, EC DGs,...) focusing particularly on the communication side.

More precisely, new WIs are then proposed, following either the expressed wishes of WG leaders, for the majority, or, what the available or emerging technologies suggest at the moment. Thanks to this evolution in the RTTT field, new media, products and services are appearing that could need attention from the standardisation people: a list is presented and the relevance of the topics could be assessed during **workshops**, at the start of Mandate 270 phase 2, where specialists of the fields could meet with CEN/TC 278 experts to exchange and determine their common areas of concern and choose the directions in which to work on the standard level.

Finally, beyond the work programme and starting from the present CEN/TC 278 structure, proposals are formulated to give it both new « engine and coachwork » allowing an optimisation of its efficiency. There are three levels of suggestions:

- on WG level, to propose to introduce new functions in their general mission
- on TC Secretariat level, to enlarge its mission beyond the day-to-day actions

- on TC level, to create a specific structure, aimed at giving the TC means and tools to follow up its outside influence (spread and use of standards), to communicate, to stay aware of technological evolution and to develop a watch to detect the fields where standardisation could give its viewpoint. We call this structure an « **Observatory** », which, besides its passive action as a « guardian of the temple », could perform an active mission by paving the way for a very efficient (fruitful and rapid) standardisation process. Indeed, this observatory could, in addition, be the place where to gather together **decision-makers** of the RTTT actors and thus to ease the emergence of strategic and market-driven minimum agreement basis, allowing to give clear indications to the standardisation process on the direction to go towards.

From all these suggestions, a new image of CEN/TC 278 could take shape maintaining its efficiency and creating a kind of Forum in which the formal standardisation process and organisation could go on, with all the benefits of **cross-fertilisation from parallel operational world**, avoiding the existence of walls of an ivory tower around the standardisation action and placing it in the middle of the stage in full transparency, as it deserves well.

Introduction

Methods and tools used to perform the mission

The chapter at a glance

- Global target of the phase 1: to analyse the **field** for RTTT standardisation and **ways** towards improvements of the standardisation process
- Phase 1 is not a market survey, nor a standardisation survey: it is a **think tank** supplying phase 2 with ideas, initiatives, new work items, in general materials to be selected during this latter phase.
- Market is observed through **case studies** showing trends and giving examples
- The materials of the phase 1 were selected through interviews or meetings with **57** people, all **RTTT experts**.

General method

Considering that the mandate 270 was split into 3 phases to allow staged reflection and action, we tried in the phase 1, we have to achieve, to be the most efficient and creative as possible and to focus our attention not only on the **fields** in which RTTT standardisation could be extended but also on the **way** that the standardisation process could be improved, seeing the aims and the means as inseparable facets of the same problem.

Our ambition to help in the drawing of a new work programme for CEN/TC 278 led us to identify a very large set of new work items or work fields, whatever they are called, either because explicitly WG leaders gave the keys towards them, or more widely, because we felt that the direction could open new interesting tracks. Giving priorities to these topics is either a clear demand of the WG leaders or instead is only a suggestion from ourselves.

Going farther, when among our suggestions, we come to propose the additions of news branches to the CEN/TC 278 standardisation tree, by creating new WG(s), it is because the related fields seem wide and novel enough to deserve resources justifying such a treatment.

Finally, when we propose on one hand to renew some existing internal mechanisms and on the other hand to create some new functions or even bodies, both suggestions are aiming at enhancing the operation of the standardisation process with a machinery tailored to meet new challenges and in coherence with the previous suggestions.

All our proposals are in the continuity of the process engaged eight years ago and now well advanced. To propose to enlarge the scope of the TC and increase its means in no way does consist in making any criticism but rather in paying a tribute to the action performed and the energy spent until now by giving them appropriate and worthy continuation.

We shall insist on an essential consideration to maintain the initial and on-going impetus: as for any engine, fuel is vital, e.g. funding of the standardisation action seems to us of the highest importance.

To sum up, we consider the phase 1 as a **think tank**, while the phase 2 will allow to choose and the phase 3 to update the work programme. We tried in the execution of our mission to open tracks, leaving to the experts to sort the proposals with their double competence in the technical and standardisation fields.

In our proposals, some topics are described rather in detail, other are only mentioned, this difference coming from the uncertainty and scope on their future we can have on them and the hierarchy in their priorities.

Few proposals to launch a new work item can be based on market forecasts and no one on an exact knowledge of the future, either because the field does not allow it, either nobody is able to predict. Besides, we could not afford in the limited frame of phase 1 the execution of a market survey on such an extensive field as RTTT. Many exist and can be used, but they often are in contradiction.

To focus on this point, there are at least three ways to evaluate the markets trends of the ITS industry:

- to review ITS market studies carried by the key consultancy agencies in the world. The analysis usually forecast the 2005–2010 time scale. These studies range from \$ 500 to many thousands dollars and are quite easy to obtain. They target the European, U.S and Japanese markets,

— to estimate the level of investments and to consider the alliances and merging among ITS groups on the different continents. This information is more difficult to obtain and has to be considered over long periods of time to have a better dynamic forecast,

— to evaluate the first results of market introduction of ITS products and services. This is the most difficult information to get, due to the high level of confidentiality concerning first hand source of data linked to marketing strategies in a very competitive environment.

In the following chapters, leaving aside the two last solutions presented above, we did not try to elaborate any synthesis or copy existing surveys: instead, we describe the most evident market trends through case stories and give, inside these case stories some related figures. Due to its particular importance, a complete story on the EFC and DSRC market and standardisation is presented in Annex 3.8 (see also **3.2.1.1** remark).

A few words, to finish, about our report: the set of proposals we make is wide, but even if we are aware that all of them will not lead to standardisation work, we preferred this position rather than the risk to be too restrictive. We are of course convinced that standardisation is not self sufficient and to say it in a rather rough way, that « all is not to be standardised ». Indeed, standardisation can open to new opportunities but as well create constraints intolerable, because of its usage in contractual fields. It can lead to regulation, but it must be in a positive way.

Interviews and questionnaires

To perform phase 1 of Mandate 270, three kind of actions were taken:

1° interviews of the TC 278 WG leaders

13 interviews of 2 to 3 hours each were performed with all WG leaders, be the WG dormant, active or not.

To have a written confirmation of the new Work items the WG leaders wished to launch, we send to each of them a questionnaire to ask them the WIs

- to delete
- to modify
- to add

2° interviews of actors in RTTT field:

- European organisations: DG XIII, ERTICO
- National authorities and Administrations
- Motorways operators
- Research institutes and universities
- Consultants
- Transport operators
- Service providers
- Telecom operators
- Geographic database providers
- Automobile Industry
- Electronic Industry
- Standards bodies

46 interviews were performed either face-to-face either grouping the interviewees. The questionnaire was adapted to each kind of actor.

On the following page, a table gives the list of all the people met with the indication of the body in which he works and the related sector.

We tried our best to meet with as many people as possible, but in the limited period during which the survey was to complete, we had to make choices: maybe some categories are not represented enough. We expect that phase 2 will allow to lead to a better balanced situation.

3° questionnaire sent to all the European standardisation bodies.

The limited time given for completing the questionnaire explains that we received very few answers, only from

- BSI (British Standards Institution) from UK

- SMS (Svensk Materials & Mekanstandard) from Sweden
- DS (Dansk Standard) from Denmark
- DKE FAKRA (German National Committee)
- SNV from Switzerland

Italy through UNI proposed a meeting which took place in Torino on 28th of April grouping representatives from industry and standardisation organisations.

General remarks:

- In the following pages, the materials used, coming from many interviews, are disseminated in different paragraphs and chapters according the focus of this paragraph or chapter.
- This survey was performed, from January to May 1999, under the co-ordination of **Jean Claude ESCARD**, from **EUROLUM**, who was strongly supported by the following contributors he thanks very much for their experience and competence:
 - **Jean Marc GAUTIER** from **ISIS**
 - **Yves MOUNIER** from **ISIS**
 - **Jean Luc YGNACE**
- We would like to thank very warmly all persons contacted and who gave us a part of their time, we know very busy, and a part of their knowledge, very large, as we were aware; we tried to disseminate this knowledge through our survey.
- Especially, we would like to thank the four members of the Mandate 270 Phase 1 Monitoring Task Force who helped us to complete the survey and gave us many useful advice:
 - **Jelte DIJKSTRA**, as Secretary of **CEN/TC 278**
 - **Bernard LAURENS** for **CEN**
 - **Gerd OCHELL** for **ETSI**
 - **Christopher WRATHALL** for **CENELEC**

as well as we are grateful to **John KETCHELL**, Managing Director of ISSS; all accepted the supplementary workload to read through the first draft of our survey and to suggest us many amendments and corrections improving the final result.

Chapter 1. RTTT market: stakeholders and trends

The chapter at a glance

- Aim of the chapter: analyse the organisation of **ITS stakeholders** in Europe, US and Japan, on one side, and analyse **major trends of market development and industrial strategies** on the other side.
- Generally speaking, acceleration of the activity through **mutual co-operation of the public and private sectors**.
- European ITS Industry represent **22 %** of the global ITS players (Japan **63 %**, USA, **17 %**).
- In Japan, thanks to **massive investment in public sector**, rapid growth of in-car navigation systems, but value added services (VAS) not at the same pace, because of **no standards** and **multiplicity of actors**. *Case study*: in-vehicle navigation systems.
- In US, development of **customised VASs**, strong involvement in traffic information from **private sector**, focus on **architecture pushing to standards**. *Case studies*: mobility services and traffic information services.
- In Europe, though important **public sector investment** in infrastructure and data collection, **difficulties in starting traffic information services**, partly as a consequence of **consumer's confusion** facing with many possible media and reluctance to pay what appears as a public service. *Case studies*: TrafficMaster and Webraska.
- Winner applications: ATIS, EFC, CVO using GSM, GPS, DSRC, GIS

1.1 Introduction

The revolutionary development of advanced systems demands an equally revolutionary plan for deployment. The use of Intelligent Transportation Systems (ITS) in which RTTT is involved in the United States, Europe, Japan and many other Asia/Pacific countries has been greatly accelerated through **mutual cooperation of the public and private sectors**. Organizations like ITS America in the United States, Ertico in Europe, Vertis in Japan, just to cite the most important ones, assume an important role to foster this partnership spirit and to provide innovative solutions.

People are talking about transportation. The public and their elected officials have begun to realize that transportation is one of the few elements of the national infrastructure that is used by virtually every traveler, every day. The current transportation system is in need of improvement, and there is a rising concern over transportation-related problems. The development and deployment of ITS, and particularly, Road Transport and Traffic Telematics has increased the importance of the transportation issue. Until recently, surface transportation was largely the domain of construction companies and the large automobile manufacturers. The development of ITS, however, has turned the providers of advanced technologies, products, and services into important players in this industry. The opportunities many of these non-traditional transportation companies have already realized will secure the continued contribution of both public and private sector investment in transportation and guarantee a steady flow of new developments to increase safety and efficiency.

Since the mid 1980s, Europe's major ITS programs have been sponsored and/or co-ordinated by a progression of supranational organizations. Eureka, which was established in 1985 as a research coordination initiative of 19 European nations, to stimulate R&D between industries and governments in Europe fostered Prometheus, a 720 millions ECU, private sector, vehicle-oriented initiative that ended with a demonstration in 1994. From 1988 to 1994, the DRIVE I and II programs were managed by the Directorate General XIII to identify potential improvements in road safety and to reduce congestion on the European road network by supporting and exploiting pre-competitive R&D in information technologies and telecommunications. The total costs of the two programs were approximately 260 millions ECU, about half of which was financed by the European Community.

The 4th framework Programme for R&D (1995–1998) allocated 77 millions ECU for road and multimodal transportation. These funding do not include the national R&D transportation programs which also allocated funds for ITS. The 5th framework program (1999–2002), within a total amount of nearly 15 billions ECU aims at helping transportation actions through 4 main key actions amounting around 1,507 millions ECU (Systems and services for the citizen, sustainable mobility and intermodality, technologies of terrestrial transports, energy, environment and sustainable development).

This R&D effort is consistent with the market forecast of the ITS industry. A study of the European market for advanced telematics equipment and systems in the transportation sector¹⁾ concludes that at full penetration the market for road transportation equipment is about 200 billions ECUs. The market for services is really expected to develop after 2005, reaching 56 billions ECUs per year.

In Japan at least five ITS-related organizations, the National Police Agency (NPA), the Ministry of International Trade and Industry (MITI), The Ministry of Construction (MOC), the Ministry of Transport (MOT) and the Ministry of Posts and Telecommunications (MPT), have spent more than 400 billions Yens from 1991 to 1995 only, for ITS deployment.

In the U.S., the DoT allocated 1\$ billion for ITS R&D programs from 1992 to 1997 and a projected \$209 billion will be invested in ITS between now and the year 2011 — with 80 % of that investment coming from the private sector in the form of consumer products and services. This is an enormous number, to be sure. Yet, when one examines the extensive range of technologies that fall under the ITS umbrella, it is possible to see how such a large investment is likely.

The potential benefits of ITS products and services for the traveling population are foreseen in all the continents and there is a similar consensus to evaluate potential markets in the near future. How do we go from here to there, remains the most complex challenge for those in charge of developing and promoting ITS products and services. It seems that ITS deployment does not follow a unique model around the world and that different strategies have to be tested to pave the way to the success. We must learn from successes and also failures concerning initial deployment efforts.

The aim of the present chapter is to analyse:

- the organisation of ITS stakeholders in the different continents
- major trends of market development and industrial strategies in the different continents.

1.2 World Wide involvement of main stakeholders in ITS

As listed in November 1998, there were 978 members registered with at least one of the major ITS organizations like ITS America in the United States, Vertis in Japan and Ertico in Europe. The members represent various sectors of activity and their repartition in each organization can highlight to some extent the state of ITS (and therefore RTTT) trends and potential markets in each continent. ITS market growth will depend on ITS supply and one can hypothesize that the presence of ITS industry representatives in the ITS organizations might be a good indicator of the strength of ITS supply.

The ITS America membership is the most important among the three ITS organizations considered (Figure 1.1)

¹⁾ Market Context related to Telematics Applications for Transport (D6 final report) May 7th 1997 performed by IsFort and quoted by CEN Technical Committee 278 Road Transport and Traffic Telematics.

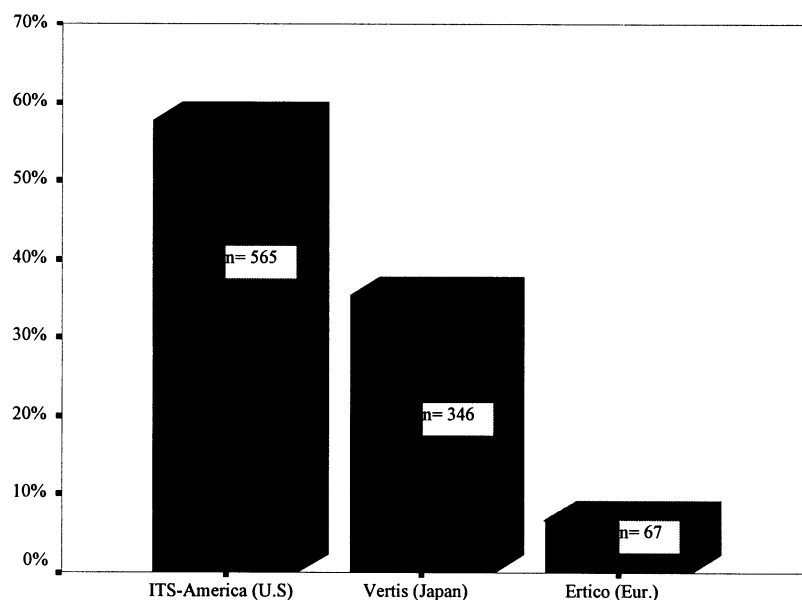


Figure 1.1 — ITS members of ITS America, Vertis and Ertico

The participants profile shows that ITS members represent worldwide and in decreasing order of numeric importance: electronic industry (25 %), consultancy and marketing companies (21 %), universities and research centers (9 %), (Table 1.1)

Table 1.1 — ITS members sorted by core activity

activity	Percent
electronic industry, audio, video, telecom	25,0
services, consultants, marketing, etc.	21,2
universities, research centers	9,5
public sector (DoTs)	8,7
transportation, toll road operators,	7,4
road supply industry	4,3
industry associations	4,2
radio, telecom carriers	3,6
map data bases, software	3,4
cities	3,2
automakers	2,9
users groups	2,5
ITS organizations	2,1
Insurance companies	1,2
research foundations	0,8

The membership profile shows significant differences within each ITS organization. ITS America members are much more often involved in services, consultancy, departments of transportation and universities. Ertico is more often represented by the electronic industry, the Departments of Transportation and the automobile industry. Vertis, the Japanese ITS organization, shows an interesting balance; there is a great majority of electronic industry members as in Europe, and an important number of consultant companies and universities like in the U.S, Figure 1.2.

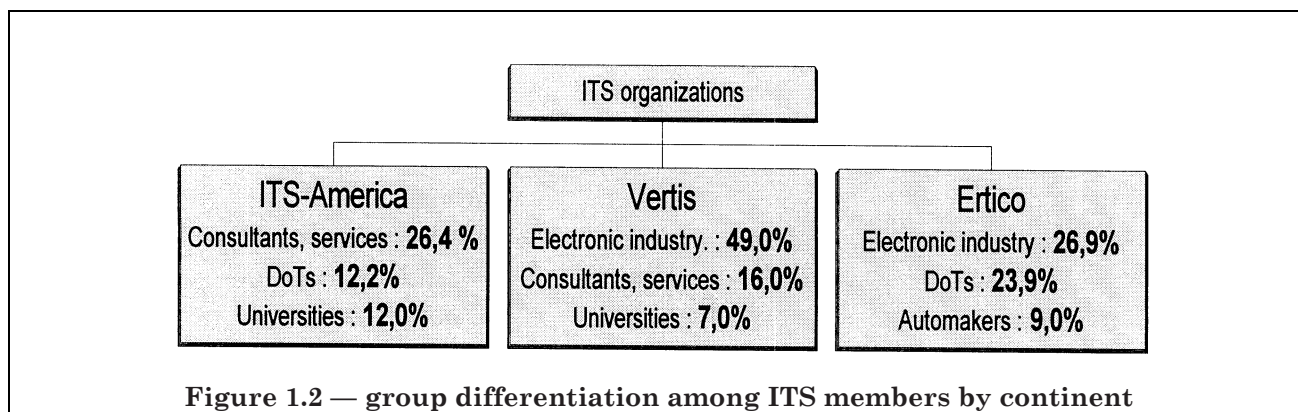


Table 1.2 — ITS groups who joined two or three ITS organizations

ITS members	ITS America	Vertis	Ertico
BOSCH	x	x	x
NAVTECH	x	x	x
MATSUSHITA/PANASONIC	x	x	x
DELPHI	x	x	
ETAK	x	x	
MITSUBISHI	x	x	
ALPINE	x	x	
AMP	x	x	
JSK (association)	x	x	
CLARION	x	x	
TOYOTA	x	x	
YAZAKI	x	x	
DENSO	x	x	
FUJITSU	x	x	
ZEXEL	x	x	
HITACHI	x	x	
HONDA	x	x	
MAZDA	x	x	
MITSUBISHI	x	x	
NEC	x	x	
NTT	x	x	
NISSAN	x	x	
OKI	x	x	
OMRON	x	x	
PIONEER	x	x	
SHARP	x	x	
SUMITOMO	x	x	
TOSHIBA	x	x	
COFIROUTE	x		x
ASECAP	x		x
BMW	x		x
DAIMLER	x		x

Table 1.2 — ITS groups who joined two or three ITS organizations

ITS members	ITS America	Vertis	Ertico
VOLVO	x		x
FORD	x		x
MOTOROLA	x		x
NOKIA	x		x
SIEMENS	x		x
TELE ATLAS	x		x
Netherlands DoT	x		x
Swedish DoT	x		x
SONY		x	x
TEXAS INSTRUMENT		x	x

The development of ITS products or services by companies does not necessarily imply to join an ITS organization. Nevertheless, there are growing institutional incentives (networking advantages) to join an ITS organization while being in a process of the development or deployment of a product, a service, a policy or even a standard in the ITS arena. One must also mention that a number of companies, even if limited, have a multi-continental ITS membership which is the result of the globalization of the ITS industry. The list of the “global” players who participate in more than one continental ITS organization is presented along the Table 1.2.

Ertico members represent 7 % of the total population members of the three main ITS organisations. On the other hand, the European ITS industry represent 22 % of the global ITS players, the Japanese groups represent 63 % of this population and the American groups only 15 %. We consider as global ITS players the companies which belong to at least two continental ITS organisations.

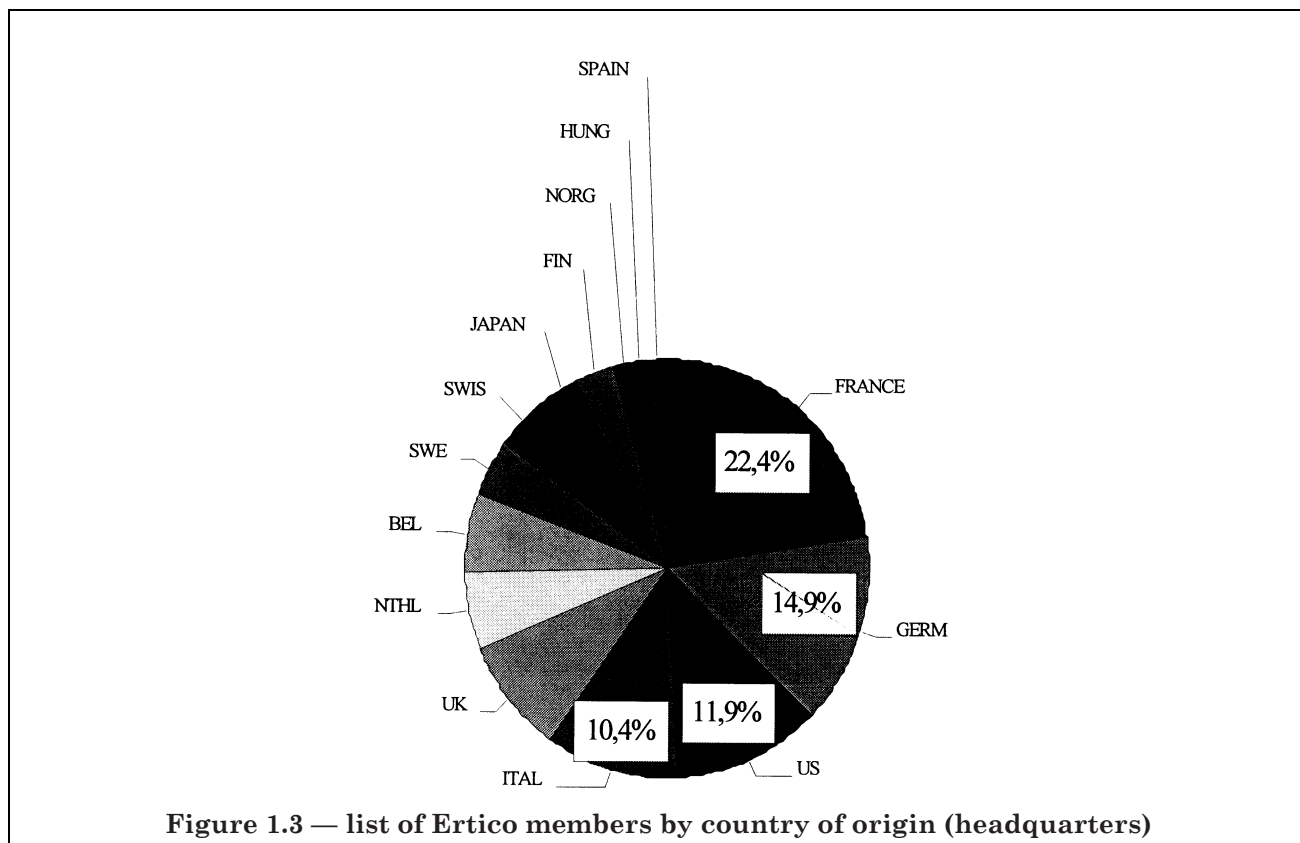
The continental ITS organizations have a majority of local members but each one is open to foreign participation. U.S. companies with headquarters in North America represent 82.7 % of ITS America membership, Japanese groups represent 6.2 % of this population and European groups represent 5.3 % (Table 1.3).

Table 1.3 — list of ITS America members by country of origin (headquarters)

	Frequency	Percent
US	467	82,7
JAPAN	35	6,2
CND	18	3,2
GERMANY	8	1,4
UK	6	1,1
BELGIUM	4	,7
NTHL	4	,7
SOUTHAMERICA	4	,7
FRANCE	4	,7
SOUTHAFRICA	3	,5
SWEDEN	3	,5
SAUDI ARABIA	2	,4
CHINA	2	,4
AUSTRALIA	2	,4
DENMARK	1	,2
KOREA	1	,2
SINGAPOUR	1	,2
Total	565	100,0

Ertico membership is also open to foreign groups (headquartered outside Europe). The foreign participation is about 13 %, very similar to the ITS America situation; the list of Ertico members by country of origin is presented Figure 1.3.

The U.S. groups represent the majority of the foreign participation in Europe.



The elements presented here show that many groups involved in the ITS industry or services business have a worldwide perspective. A part from global strategies of the groups two other key elements have to be considered at this point in order to have a better understanding of ITS/RTTT potential deployment: what are the market trends and what is the role of the standardisation process in fostering products and services ?

1.3 ITS trends and markets

The Financial Times Automotive and others groups give a broad picture of global ITS/RTTT markets for the next ten to fifteen years, Table 1.4.

Table 1.4 — Worldwide ITS market forecasts for the next 10 to 15 years

Technology	Market	\$ US	Year	Source
Intelligent transportation systems	USA	\$425B	2015	FT Automotive
Intelligent transportation systems	Japan	\$385B	2010	Japan news
Intelligent transportation systems	USA	\$452B	2015	Hagler/Bailley
In-vehicle products	USA	\$17B	2015	FT Automotive
In-vehicle products	worldwide	\$18.0B	2005	Allied Business
Obstacle warning & driver safety systems	USA	\$11.9B	2015	FT Automotive
Telematics	Europe	\$62.3B	2015	FT Automotive
Advanced traveler information systems	Europe	\$28.6B	2015	FT Automotive
Electronic toll collection systems	Europe	\$3.5B	2015	FT Automotive
Semiconductor content per car	Worldwide	\$438 from \$177	2008	Semico Research Group
Automotive electronics	Worldwide	\$75B	2015	FT Automotive
Car navigation systems using satellite technology	Worldwide	\$7.5B	2015	FT Automotive
Electronic toll collection systems	Worldwide	\$13.2B	2007	FT Automotive
Electronic toll collection systems	Worldwide	\$15.0B	2015	FT Automotive
Electronic toll collection systems	USA	\$5.73B	2015	FT Automotive
Collision Avoidance Systems	Worldwide	\$10.0B	2003	Allied Business
Mobile Location Services	USA	\$3.0B	2005	Ovun
Mobile Location Services	Europe	\$4.3B	2005	Ovum
Mobile Location Services	Japan	\$910M	2005	Ovum

The table shows a relatively big amplitude of market sizes among products and continents. Most of the studies are based on expected investments from the public sectors for road equipment able to justify private investments for in-car devices and services. The Isfort SpA was commissioned in 1997 to study the future market for telematics applications across all transport mode in Europe, but with a particular focus on road transport. The study forecasts a cumulative market of 192.6 BEcu for road transport equipment and annual revenues of 56 BEcu for services by 2010. There is no further evidence that the public investments will be made on time, if ever made.

One can assume that the market trends will result from the global industrial forces and investment strategies in the different continents; the Japan, U.S and Europe situations show different industrial strategies to market ITS products and services.

1.3.1 The Japanese case

ITS use advanced information and telecommunications technologies to resolve various traffic problems. Japan has seen major progress in the development and application of such products and technologies in the last few years.

To promote the application of ITS in Japan, in February 1995, five Japanese government agencies set up a liaison committee. The Ministry of Construction, the National Police Agency, the Ministry of International Trade and Industry, the Ministry of Transport, and the Ministry of Posts and Telecommunications are working together to rationalize and accelerate the development of ITS in Japan. In the private sector, two other organizations were established. The Vehicle, Road, and Traffic Intelligence Society (VERTIS), is an industry-academia consortium to promote ITS, similar to its counterpart ITS America in the United States. The Committee on Domestic Policy for ISO/TC204 promotes international standardization concerning ITS. The total allocated budget for research and development, deployment and infrastructure improvement for ITS was 53,196 million yen (US\$ 409 millions) in fiscal year 1998, for all five governmental agencies.

1.3.1.1 Japanese Market Growth and Potential

One Japanese government ITS expert and VERTIS officials estimate that Japan's total ITS market, including fields concerning electronic, telecommunications, and the automobile industries, will expand to 50 trillion yen (US\$ 385 billion) by the year 2010 based on developments in ITS technologies.

As a core multimedia business, ITS is expected to develop into a large-scale market. As an example, the cumulative number of shipments of car navigation systems exceeded 3.7 million units at the end of January 1999, creating a 700 billion yen market (U.S\$ 5.3 billions). Almost 900 000 VICS (Vehicle Information and Communication System) units with real time traffic information capabilities were shipped within the first 30 months of initial service from June 1996 to December 1998. Approximately 20 percent of vehicles equipped with car navigation systems have VICS units. In addition, the market for navigation systems and electronic VICS will become a 2 trillion yen or US\$ 15.4 billion market. This of course is in direct relation with the huge public investment in infrastructure (US\$ 1.2 Billion cumulated amount on the years 1996 to 1998), which is to be extended to the whole country, strongly pulling up the in-car equipment market.

1.3.1.2 Market Development and Prospects

Areas for further ITS development in Japan include:

- 1) Advances in navigation systems: Gather and provide road traffic information in real time, providing route guidance traffic information, and destination information.
- 2) Electronic toll collection systems: Conduct automatic toll collection without requiring that a vehicle stop.
- 3) Assistance for safe driving: Encourage proper driver behavior by giving warnings and/or performing automated driving.
- 4) Optimization of traffic management: Improve traffic signal timing for public transportation and give optimum route guidance.
- 5) Enhance efficiency of road management: Control special vehicle operations such as traffic control on approved routes, planned roadwork information, and ITS distribution.
- 6) Support for public transportation: Schedule increased levels of public transportation at higher levels of automation.
- 7) Improve efficiency of commercial vehicle operations: Gather and provide information on truck operation status; provide information for pickup and delivery vehicles.
- 8) Assist pedestrians: Guide or lead disabled persons along optimum routes. Give evacuation instructions when natural catastrophes occur. Provide pedestrians with route guidance and available facilities in the vicinity.
- 10) Control operation of emergency vehicles: Provide reports on the condition of areas affected by natural disasters. Dispatch rescue vehicles to affected areas.
- 11) Expand fiber-optics infrastructure from 8,370 km in JFY 1997 to 27,300 km in JFY 2002, according to the Ministry of Construction's five-year plan to support the national program for the Promotion of an Advanced Information and Telecommunications Society.

1.3.1.3 The market "winner" in Japan

The Japanese in-vehicle navigation systems market remains by far the most important in the world (Figure 1.4 and Figure 1.5); This can be explained by the massive investments made by electronic companies in this sector since the early 80's.

It is true for autonomous navigation systems which represent almost 4 millions units in the country since 1993. It is also true for added traffic information devices (VICS) which came to the market in 1996 and represent a total sale of almost one million today. The development of VICS is a core example of how a telematics service (communication of traffic information to an in-car unit) came as an option for a non telematics device (autonomous in-vehicle navigation). This deployment was possible because of massive investments from the public sector to collect traffic information, but also because the auto industry and various telecom providers were able to promote traffic information services through private organizations set up for this purpose. Today the VICS market is not growing at the same rate than the autonomous navigation sector. This may be due to several reasons:

- the lack of standards to collect and disseminate traffic information,

- the multitude of players involved in the process,
- the “limited” value of the information itself for the drivers.

This example shows how difficult it is to make a critical distinction between telematics and ITS products and services. The concepts are very dependant when considering market acceptance, marketing and industry development.

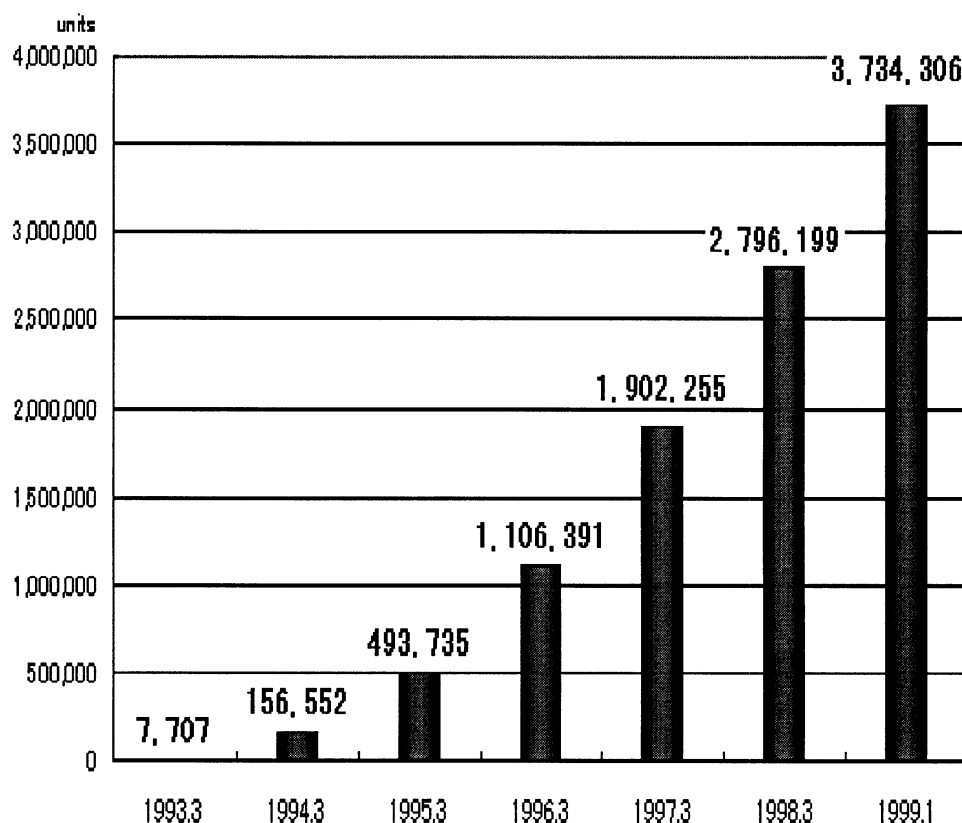


Figure 1.4 — sales of in-car navigation devices in Japan

1.3.1.4 Industry strategy

The electronic industry is leading the RTT/ITS industry in Japan. The new generation of route guidance systems are involving the latest developments of Digital Versatile Disks, low cost liquid crystal displays (joint venture between Toyota, Sony, Sanyo and Sharp), embedded voice recognition chips (Hitachi) and other microcontrollers.

On the other hand the automakers are also involved in the telecommunication business through major participation in long term strategic investments.

Japan is also involved in long term telematics issues like the Automated Highway Systems implying communications between the road and the vehicle. The Department of road and construction is the key public player in this domain. The association for Research on Highway Cooperative Driving Systems has been set up in September 1996. Research funding has been significantly increased in 1997 with an annual budget of U.S \$ 105 Millions. 24 key industry players are members of this association;

One can mention Toyota, Nissan, Honda, Mitsubishi, Oki, Sumitomo, NEC, Hitachi, Toshiba et Nippondenso among them. The goal of this association is to test a fully automated highway in 2010.

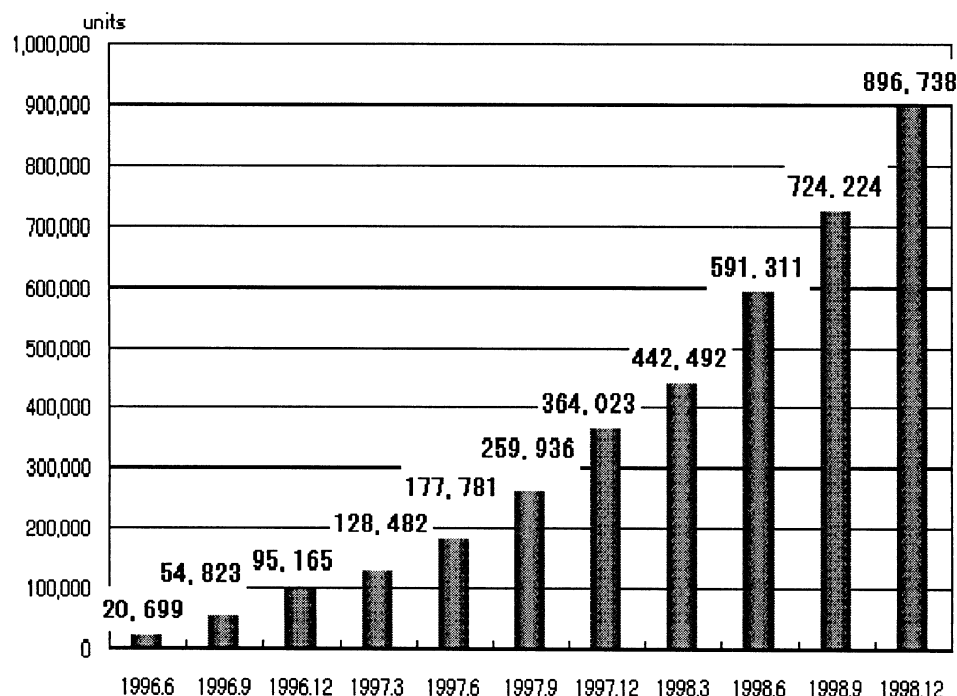


Figure 1.5 — sales of VICS traffic information units in Japan

1.3.2 U.S. ITS arena

1.3.2.1 Major trends

It is interesting to note that the ITS market generated around US\$ 1 billion in 1998, which is close to achieve the expected annual revenue of US\$ 1.5 billion by the end of the decade.

A study conducted by Frost and Sullivan showed the repartition of the Forecasted Compound Annual Growth Rate (CAGR) over the next few years.

- Commercial Vehicle Operations (CVO) to improve highway safety and increase productivity: CAGR: 13.9 %. This market generated the highest ITS revenues in 1997 with more than US\$ 300 millions. 500000 units have been sold in 1999
- Safety Systems and Specialized Traffic Operations to increase safety and efficiency of motor vehicle: CAGR: 50.7 %,
- Real-Time Automatic Location Applications to vastly improve public transportation: CAGR: 19.8 %,
- Toll Road, Freeway Management, Traffic management and Control to increase efficiency of traffic flow: CAGR: 28.0 %; the toll road sub-segment could have the highest CAGR of 33.7 %, although this market is quite low due to the low number of toll facilities in the U.S. This market mainly addresses bridges and some road links in the East.

The ITS forecasts do not include the consultancy work sharing a big part of revenues.

The trends of the U.S telematics markets cover two main aspects:

- the in-car electronic market
- the mobile telecommunication sector and other hand-held devices providing information content for the mass market pulled by the high security concern of the American driving population.

On the consumer demand level, general interest in car navigation systems is rising in the United States. A survey conducted by the Center for Strategy shows:

- 70 % of California car owner are interested in an after-market, on-dashboard model with a monitor, and are willing to pay \$700 to \$1000 for this model

- 26 % want to buy an OEM pre-installed, in-dash model with screen display and are willing to pay \$600 to \$700 for this model
- 17 % prefer a low-end, voice-navigation model with no screen display and are willing to pay \$500 to \$600 for this model

According to Fall Creek Consultants, (1998) Intel divides in-vehicle applications into four segments:

- Information: trip guidance, route planning, identifying points of interest and congestion avoidance
- Safety: emergency location, vehicle immobilization, operator identification, and weather information
- Infotainment: user selectable news and music on demand for the driver; while for the passenger there are PC games, movies, news and Internet surfing
- Productivity: hands free phone, FAX/modem, voice and email messaging and personal itinerary

The challenge to those providing the service is gaining a competitive advantage by customizing their cars and navigation systems with enhanced features that meet the consumers' specific needs for productivity, entertainment and status. This information must be provided in such a way that it does not distract the driver or other electronics that control the critical vehicle functions at a reasonable cost.

1.3.2.2 A case study: GPS/cellular/call centers: the mobility service winners

The mayday and related mobility services represent the winners of the ITS markets in the U.S.

The deployment of these services came a part from the so-called public/private partnerships models which were foreseen within the ITS America organization. These services are market oriented and are based on the existence of low cost technology to connect the car to a call center through an in-car GPS tight to a cellular communication.

Motorola is the key industry player in this domain by linking the GPS and the cellular through proprietary protocols, which could be the next de facto standard for mayday services in the future. Ford, GM, Jaguar, Mercedes, Renault, BMW and a lot to come are using similar technology to provide their services.

The **Protection One** Group is leading the way of the call centers providing mayday and mobility services in the U.S.

The Protection One Mobile Service GroupTM National Response Center near Dallas, Texas, is an example of leadership in certified mobile monitoring. Every aspect of the system was designed to meet the needs of location-based monitoring. The specialised voice/data integration technology is just one case in point. The center is also the only telematics monitoring station in the U.S. with complete on-site/off-site system redundancy. By replicating the systems at a back-up site, Protection One can promise seamless service in the event of a primary system failure. One of the most extensive industry database keeps Protection One Mobile Services GroupTM in the lead. **The Public Safety Answering Point (PSAP)** database was created for the launch of Lincoln RESCU and becomes a proprietary standard for the industry. Map screens are amended regularly to reflect new streets and route changes. The participation of the group in the National Emergency Number Association (NENA), allows them to stay up to the minute on changes and developments within the 9-1-1 agencies (national number for emergency calls). Protection is also linked to both NavTech and Etak digital navigation technologies to ensure the ability to provide assistance anywhere it's needed.

Dedicated cellular services

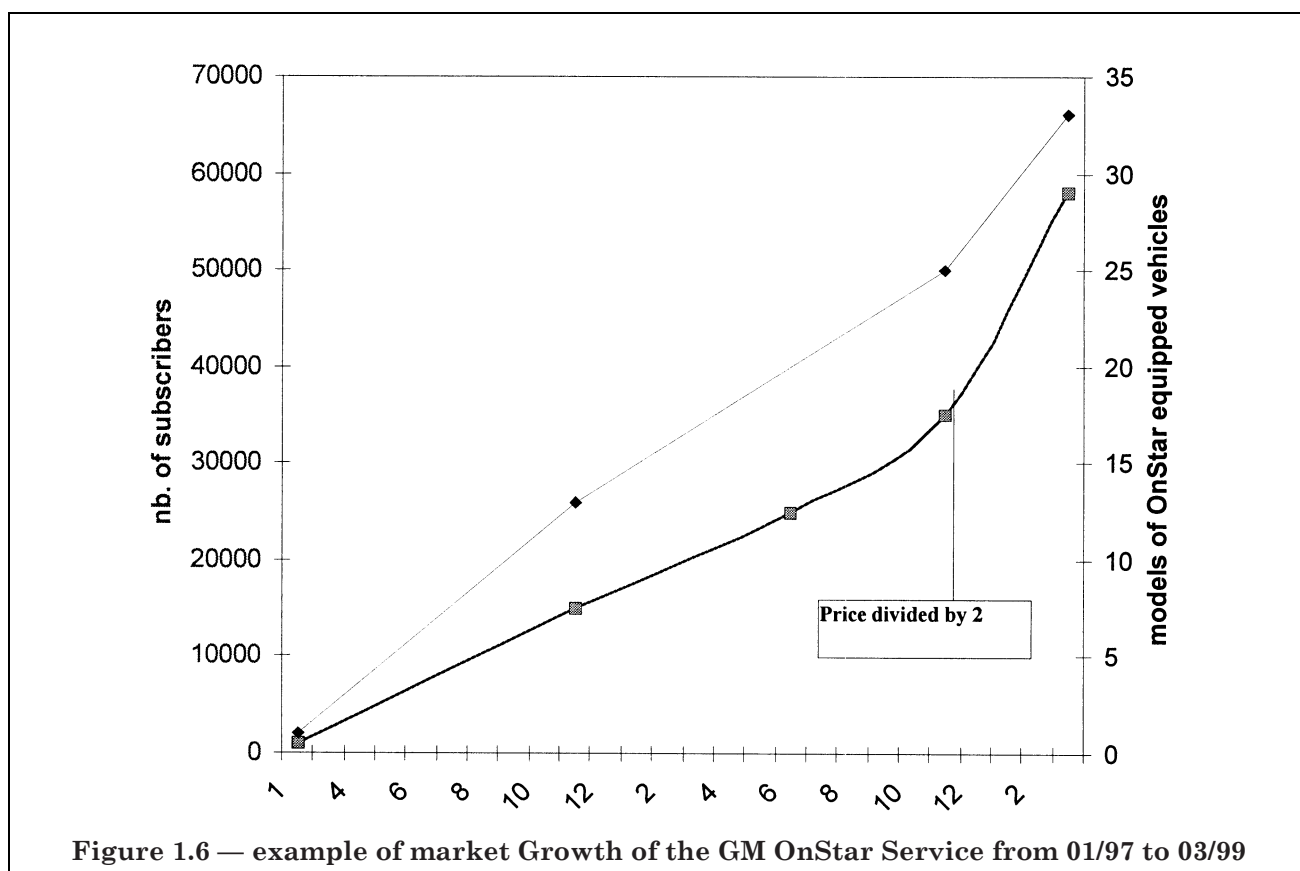
The Protection One Mobile Services group is also teaming with GPS manufacturer GARMIN International to introduce the first portable, wireless handset with a navigational screen and direct link to Protection One's First Assist location-specific services. The GARMIN NavTalk is a full-featured analog cellular phone with a map screen that displays major roads, lakes, railroad lines and interstate exits. Its cellular capabilities combined with First Assist's services enable subscribers to summon help from the call center to find a specific address, receive immediate emergency assistance, or locate a nearby utilities like gas station by pressing a single button.

NavTalk, a list price of \$625, will be offered through GARMIN's existing retail distribution channels with the option for the customer to purchase the First Assist service. Protection One's services begin at \$8.95 per month for basic emergency response, roadside assistance and lost and found traveler service; the enhanced package with routing assistance added to the basic package is \$11.95.

Competitors

ATX Technologies, a relatively new start up, emerges as the main competitor of Protection One. This company recently cut a deal with Brink's Home Security to provide technology and response center services for a new Brink's division called Brink's mobility Security. The division will use GPS and wireless technology to track vehicles, provide enhanced personal security and other convenience services.

The GM OnStar service: it is the first mayday service who came to the market a few years ago. The product is available for 35 different GM models which represents 60000 GM cars today, Figure 6. This success is the result of a high advertisement coverage but is still far from the 2 millions units initially forecast by 2003.



GM, the company doing much of the national advertising for GPS-based telematics also believes the industry has several challenges to overcome. "We have four major challenges that are system cost, dealer installation, cellular activation, and one service package", said Mark Timm, GM OnStar program manager. Timm said that GM OnStar has cut its unit cost by 50 percent (see Figure 6). The unit is dealer-installed for \$695, the basic safety security charge is \$199 annually; alternatively the premium mobility service is \$399 each year.

All the mobility services proposed by the service providers rely heavily on cellular technology, signal availability. Right now, many GPS-wireless systems don't have that ability to do both voice and digital. GSM and Code Division Multiple Access standards only are set-up to do voice and digital. The digital network is serving more and more customers in the U.S but the network is much less developed than in Europe.

It is clear that Europe would have a competitive advantage to test these services in-house and consolidate the service provider side of the business to get major markets shares outside Europe. This market is capital investment oriented and a positive return on investments would be possible for global companies.

The market share between the GSM and CDMA standards could be a key issue of future telematics services providers. Though the demand for cdmaOne telephones continues to grow more rapidly than the demand for GSM phones, GSM's lead at the market's starting gate nearly guarantees that it will remain the most popular digital standard until 2003.

According to a new study written by Micrologic Research and published by Forward Concepts, the market for GSM cellular telephones will grow from \$15.5 billion in 1999 to \$24.5 billion in 2003, a compound annual growth rate (CAGR) of 12.1 %. During the same period, the study forecasts the worldwide cdmaOne cellular market will grow from \$3.5 billion to \$20.4 billion, a compound growth rate of 55.9 %. The IS-136 digital cellular standard, sometimes called American TDMA, is forecast to have a more modest effect on the market with worldwide handset sales of \$1.4 billion in 1999 growing to only \$3.5 billion in 2003. The report indicates that there will be limited third-generation (3G) cellular service available in Europe and Japan by 2001 and in North America by 2002. The number of 3G cellular subscribers is predicted to reach 16.9 million in Europe, 12.5 million in Japan, and 10.6 million in the Americas by the end of 2005. The study predicts that there will be at least two 3G standards. Europe will use W-CDMA/TD-CDMA and Latin America will use cdma2000. North America and parts of Asia, including Japan, will use both standards.

It becomes more and more evident that the road telematic market will be embedded in the cellular market.

The GPS market for hand held devices remains important, mainly among households with more than \$60000 in income. Many products add the GPS capabilities. The autoPC from Clarion, the car PC product developed by Intelliworxx and Comroad (Germany) combines Intelliworxx' in-vehicle computing platform with Comroad's Streetguard telematics module, which is a wireless communications and GPS interface. Features include hands-free cellular phone interface, e-mail, wireless data capability, and automatic vehicle location.

The European Siemens is one of the few European manufacturers being part of the GPS business in the U.S. Siemens Semiconductors recently announced they have formed an alliance to develop next generation components and software based on the U.S Trimble's Global Positioning System. The initial product offering from Siemens will be a complete GPS chipset consisting of a radio frequency front-end and base-band correlator with an integrated Siemens processor. The automotive market is an important target for the venture.

1.3.2.3 The Traffic information sector as a business opportunity

The situation is very different from the Japanese case. The public investments in traffic data collection are quite low, except for a limited number of urban regions. This creates a situation where the private sector is eager to run traffic information centres under public contracts. The traffic information dissemination is supported by **advertisement and media business**.

Two main groups are competing in this market: **Metro network**, a media company, teaming with the map data base maker Etak, and **SmartRoute Systems** teaming with the other main map data base company, NavTech. SmartRoute Systems designs, develops and deploys Advanced Traveler Information Systems. They focus exclusively in traveler information data collection, fusion and dissemination; SmartRoute works with state and local transportation agencies, metropolitan planning organisations and private industry. SmartTraveler is a **proprietary data management** and dissemination service, delivering real-time, route-specific, multimodal traveller information through a variety of media, mainly radio and TV broadcast as well as Internet servers.

The approach to implementing these services is to create public/private partnerships with government agencies that have interest in better informing travellers and commuters of traffic and transit conditions. These partnerships begin with SmartRoute or Metro assuming the capital costs of building out travellers centres to serve region's traveller information needs. In addition, the companies fully staff and operate the centres with their own employees.

Usually, the public sector commitment is twofold: (1) provide for free whatever information they have to the regional database and (2) to purchase, for a specified period of time, services from the system for widespread dissemination of real-time traveller information to accomplish public policy objectives of congestion and air quality improvement.

Agreements are also negotiated that allow revenue sharing with public agencies of profits from sales of the databases to private entities, such as cellular and paging companies or other hand-held devices like the new version VII of the Palm Pilot. The agreements did not yet produce a wide stream of revenues for the public sector, as the services are mainly at no cost for the travelling population.

The companies involved in the business are pursuing proprietary and de facto standardisation strategies. The main concern is to develop common road data bases tools for positioning purposes and traffic data exchanges between public and private bodies. The competition remains strong between the different players involved in the business.

1.3.3 The RTTT sector in Europe

1.3.3.1 *Global issues*

Europe stands in a median position between Japan and the U.S. On one hand the public sector lead in infrastructure investment is still important but this trend does not allow the growth of turn key traffic information centres markets due to multiple and specific demands from government and cities agencies. On the other hand, the existence of a strong public transit sector allows major important investments even though if this sector is heavily subsidized and that RTTT technologies are not yet considered as a productivity tool. The existence of an important toll road network, especially in Southern Europe, allows a stronger ETC market.

The automotive sector developed dedicated traffic information in-car systems before Japan and the U.S; This was possible because of wide spread FM subcarrier communication network, the RDS TMC.

The first market results of the deployment of the 2000 FF Visionaute device with the traffic information services provided by Mediamobile a TDF subsidiary are not promising after almost two years. Less than a couple of thousand drivers registered for the service.

This can be explained by the relatively low area coverage, the Region of Paris only, or by a low demand for the product. The willingness to pay a monthly fee of FF 100 is not proven. Recent European market studies show that the willingness to pay for such services is at **\$ 5 a month (30 FF)** level and this is very consistent with similar studies carried in the U.S. as well.

The market for in-vehicle navigation devices is reaching 1 million in Europe today, far less than Japan but more than in the U.S.

The cellular carriers are embracing now the new market of transportation and mobility services through cellular phones and call centers. This came later than in the U.S. for a major reason: the huge investments needed to develop a European wide GSM coverage did not allow this industry to consider the service aspects of the business. The first goal was to get cellular customers and the data channel capabilities were not targeted as a priority. Today, the cellular business is reaching profitability and almost 20 % of the population is equipped. This allows the carriers to consider new transportation services as a new sector of differentiation in the very competitive market of cellular business.

To conclude this introduction, one may say that RTTT market is high technology oriented in Europe and the service side is not enough developed. Major investments in technology will not succeed in the absence of major risky investments for service deployment. European players have always considered the traffic information related services as a key application. It seems that the mayday and other global mobility services correspond to higher demand. But in this activity also, it is important not to hinder the market when it only emerges, with a price policy that could not match the demand: Odysline, the EB (Emergency-Breakdown) call service just launched by RENAULT is available at a monthly subscription rate of 195FF (\$ 30).

1.3.3.2 Market for advanced transport technologies

The following tables (source: C.M. Guerici/V. Marcolongo, 4th World Congress on ITS in Berlin, October 1997) give a reference framework for the trends in demand and supply in the advanced transport technologies for eight European countries (France, Germany, Greece, Italy, the Netherlands, Spain, Sweden and the United Kingdom) representing 75 % to 90 % of the European Union potential. It is based on several surveys, including the ISFORT one, ordered by DGXIII.

Market segment	1995 penetration %	2005 penetration %	2015 penetration %	Potential market (million ECU)
ACVO	2–3	16–17	24–29	22,500
AUTMS	10–15	18–19	19–25	8,900
APTS	4–6	10–12.5	22–24	3,700
AITMS	16–17	29–31	33–41	2,900
ATIS	< 1	8–10.5	N.A.	89,200
AVCS	< 1	4–5	N.A.	54,600
EFC	< 2	4–8	9–10	10,800
Total				192,600

ACVO: Advanced commercial Vehicle Operation
 AUTMS: Advanced Universal Mobile Telecommunication Systems
 APTS: Advanced Public Transport Systems
 AITMS: Advanced Integrated Management Systems
 ATIS: Advanced Travel Information Services
 AVCS: Advanced Vehicle Control Systems
 EFC: Electronic Fee Collection

Regarding the mobile location services market, value added services including:

- information services (vehicles equipped with GSM, RDS-TMC, DAB terminals)
- safety services (vehicles equipped with cellular and GPS)
- tracking services (vehicles equipped with GPS receivers and electronic tags to locate and monitor vehicles, cargo, packages and people),

the forecast are the following (source: Alex Nourouzy, 5th World Congress on ITS in Seoul, October 1998) by the end of the year 2005:

- 17 % of the new cars shipped in Western Europe will be equipped with location device (21 % in Japan and 13 % in the US)
- 6 % of the total fleet vehicle market in Western Europe, Japan and the US will be equipped with location devices.

1.3.3.3 A key player in the European RTTT business sector: TrafficMaster plc

TrafficMaster plc provides traffic information and related services in the United Kingdom. The company collects live traffic information from a proprietary national network of 8000 sensors which cover all mainland motorways and some major trunk roads.

The company focus upon developing a range of products and services via automakers, motoring associations and cellular network operators. Some key partnerships with the private sector industry, like BMW, Jaguar, Citroën, Denso, Opel, Mannesmann, etc., allowed this group to show the first benefits by the end of 1998.

Citroën recently announced that the new Trafficmaster Oracle unit has been specially developed with a high quality level of speech and extended vocabulary to accommodate Trafficmaster's trunk road network. Integrated in the Xantia fascia model, the unit has no visible controls other than a switch which enables the driver to choose between receiving automatic verbal announcements or to select on demand, following a red light warning that a message has been received. The system provides location specific warnings on traffic conditions and expected delays delivered via the car's on-board stereo system.

Jaguar is also fitting the latest S-Type with a fully integrated on-board satellite system. The traffic information provided by Trafficmaster through the GSM network is directly displayed on the screen; the navigation system plans an optimum route using a digested map contained on a CD-ROM and guides the driver to the destination with the aid of visual and verbal instructions. Using Trafficmaster data, the system will highlight both congested and free flowing routes, via coloured directional arrows. Red indicates a delay of 25 minutes or more, amber indicates a delay of 25 minutes and green indicates that traffic is free flowing.

Trafficmaster is one of the few industry group investing in the infrastructure market for traffic purpose as well as security. A new car tracking system called Trackstar has been developed by the company. The Trafficmaster network of sensors and transmitters are upgraded to recognise a stolen car ID and through a direct communication link, identify the car exact location and direction of travel. The system is then able to slow the vehicle down to around 15 miles per hour in a controlled manner. The Trackstar can compete with any GPS equivalent system at a much reduced cost. The system will be priced under £200 and annual fee will be around £60. Trafficmaster is developing now over new European markets.

TrafficMaster reached an agreement with the German Mannesmann Autocom group to market jointly the services to automakers and GSM carriers throughout Europe. They have developed a common cell-broadcast protocol to be used by both organisation in the provision of telematics by GSM; the new technology is supposed to sit side by side in the marketplace with the proprietary UHF beacon technology. It has to be stated that Mannesmann is pursuing the installation of the beacons over the German freeway network to obtain the traffic information.

To round up this case study, it has to be said that TrafficMaster developed its products with no reference with the existing standards (POCSAG excepted).

1.3.3.4 Other GSM based experiment in Europe

A part from the Mediamobile solution, above presented, and the on-going development of the Internet based transportation services through the new Nokia hand set, the experiment designed by the French SFR cellular carrier shows the new trend in telematics services.

Using the U.S. Unwired Planet's (UP) mobile Internet, 400 SFR subscribers are able to navigate their way around Paris thanks to tiny graphical maps showing the road conditions in real-time.

This novel mobile application has been developed by Webraska Mobile Technologies SA, a start up specializing in real-time value added services. This announcement coincides with the first public trial of a mobile Internet service on a wireless network in France being conducted by SFR-Cegetel, Alcatel and Unwired Planet. The trial follows the approach defined by the Wireless Application Protocol (WAP) Forum and will allow users to access web sites constructed in both HDML and WML. Similar experiments are conducted in Germany with Deutsche Telecom, U.P and Webraska.

Webraska Mobile Technologies is a startup company established in July 1998, after more than a year of development, by engineers and management originating from major telecom equipment manufacturers. Webraska's Intelligent transport telematics applications and fleet management services, which are based in part on several patents pending approval, are accessible via the Internet from fixed and wireless terminals.

UP, headquartered in Silicon Valley, is a leading international supplier of open standards-based servers and microbrowsers to the wireless industry. UP.Link Server Suit is a proven gateway and value-added applications platform that offers interactive live access to a wide variety of existing information services and value-added telephony applications, including Email, Personal Organizer, Voicemail,(tm) and Electronic Customer Care. UP products support multiple air-link protocols, with implementations for GSM, TDMA, CDMA, PDC, PHS and CDPD, over circuit-switched, packet or Short Message Service (SMS).

1.3.3.5 *The Public role in the European RTTT environment*

Aside from the key industry efforts in market strategies to reach the end-user with related investments, public/private R&D is now followed by a large dissemination of the systems and numerous ITS systems are running in a day to day basis in the different European countries and the European industry has developed a large know how on these systems.

One important evolution is to be mentioned in different European cities: the trend to consider the **transportation policy as a whole** trying to co-ordinate and make best use of the combination of different means and systems (centralised Traffic Control Systems, Freeway Management Systems, Incident Management Systems, Automatic Traveller Information Systems, Advanced Public Transportation Systems). These systems are integrated as a general Travel Management System to make best use of every possibility and to react to incidents in a co-ordinated manner considering all means of travel. For example in Toulouse, these systems will be installed in the same building with the aim to exchange traffic information between the different bodies involved in traffic management. These efforts are more often transportation policy oriented than business oriented which may limit the growth of market share by private investors.

The trend is, in Europe, well in line with the long tradition of **public initiative** which led very early to the conception and realisation of « traffic management systems » and such tools as TICs (Traffic Information centres), operated by the authorities, that still are the main traffic information suppliers and the principal means to manage the traffic.

Remark: *as already stated above, the same tradition/policy is not true in US, where private initiatives have the lead and a new business is emerging, while in Japan, public influence is strongly present through VICS initiative.*

In Europe, the focus is still more on the evaluation of a wide range of different technologies and the creation of a set of standards that would be applied across Europe. The European Commission funds a large number of research projects and trials launched in different cities. These trials are tendered for by the private sector and are run under the supervision of the host country's department of transportation.

A key issue would now be to emphasise the RTTT activities along markets and technologies already driven by market demand: the GSM based technologies belong to this category.

Chapter 2. Standards in RTTT arena: scope, objectives, priorities and prospects

The chapter at a glance:

- Aim of the chapter: to present the different aspects and implications of RTTT standardisation in and for Europe, both in **public and private interest**, taking into account the political, economical, financial and organisational matters.
- 4 ways towards standards: consortia, de facto, SDOs, regulation. In most cases, a mixed way. A trend: to build an **architecture** from which standards derive.
- **Standards carry much weight** in the public concerns (lever for safety, productivity, commercial action, outside competitiveness, consumer comfort and purchase power, etc...)
- ... but, they are **not a panacea**: all is not to standardise and all cannot be standardised, because of fast technology evolution and scarce manpower resources in standardisation bodies
- **Criteria** exist that can **limit** the standardisation work programme
- **Receipts** must be found to **improve** the operation of the standardisation process and make it **more efficient**
- A special focus on the **economical impact of standards**, which is rather impressive.

2.1 Scope of European RTTT standardisation

Starting from the definition of RTTT (Road transport and traffic telematics):

« a group of services using information technology and telecommunications, in vehicles and infrastructure, to improve (mainly) road transportation from the points of view of safety, efficiency, comfort and environment »,

the related standardisation activity has the following scope:

« Standardisation in the field of telematics to be applied to road traffic and transport, including those elements that need technical harmonisation for intermodal operation in the case of other means of transport. It shall support among others:

- vehicle, container, swap body and goods wagon identification
- communication between vehicles and road infrastructure
- communication between vehicles
- vehicle man-machines interfacing as far as telematic is concerned
- traffic and parking management
- user fee collection
- public transport management
- user information »

2.2 General objectives of standardisation

A good definition can be taken from a EC guide (R&D and standardisation by A. Thiard and W.F. Pfau, dated 1991)

« The earliest and most permanent objective of standardisation is essentially industrial. It is to supply the tools for promoting the principle of economy in human and material resources and the energy used for the production and exchange of goods and products.

The other objectives which are inclined more towards the general interest, can be grouped under the following headings:

- to supply a communication tool (common language, contractual basis, technical references,...) between partners
- to contribute to the protection of the public: worker and consumer safety, product quality, protection against abuse and fraud, etc ...
- to contribute to the promotion of the quality of life: health, hygiene, environmental protection, etc ...
- to promote trade, domestic and international, by eliminating technical obstacles due to differences in national practices and by creating a « common language »

- to promote cohesion in industrial and technological development by the progressive creation of a « technical culture » which is common to the partners within a given country and beyond the borders, through genuine technical co-operation »
- to lower costs for all « upper actors » (public authorities and industry) by reducing R&D expenses thanks to stability and unicity of specifications and then also for « lower actors » (consumers) that will benefit from these savings.

Standards and public policy

The « public interest » in technical standards has been defined in terms of both control and stimulation. Most policy makers have recognised that standards are needed to regulate the quality and safety of goods, but many have also recognised that standards can play a role in stimulating industrial production and trade. During the past ten years, there has been an unprecedented rise in the incidence of sometimes highly interventionist public policies with respect to the development and use of industrial standards.

Many governments now take the view that the relationships between standards development organisations and government should be expanded and strengthened. Public sector intervention is now frequently directed at correcting resource and procedural imbalances in standards committee participation.

The public sector can also seek to promote standards as information mechanisms to reduce uncertainties between producers and consumers. Standards are also used to pursue various forms of industrial and commercial policy. Governments seek to enhance the image of national products through the promotion of quality control standards. They also advocate standards as mechanisms to promote competition and to give direction to the process of innovation.

The expansion of links between governments and standards development organisations can often result in confusion regarding the statute of individual standards. As developed by private industry, most standards are voluntary. When referenced directly or indirectly in regulations, policy initiatives, or public sector procurement specifications, however, these standards can become virtually mandatory. Moreover, government support for particular industry standards initiatives can often have important effects — positive and negative — upon the domestic and international competitiveness of the products incorporating these standards.

2.3 Objectives of European RTTT standardisation

While keeping the above mentioned general objectives as a target, now coming to Europe and focusing on RTTT, the basic objective of standardisation activity is to promote European development through the creation and maintenance of a coherent set of European standards in the field of RTTT.

The key objectives are:

- a range of (proposals for) standards facilitating pan-European **interoperability** and **compatibility** of RTTT services and systems, and made **available in timing** with the needs for the **real implementation** of the services
- a **support** for the use of these standards, a careful **evaluation** of their effects in use, and modifying them when relevant.
- **co-ordination** of effort with other standardisation bodies and **harmonisation** activities related to the field of RTTT
- promotion of **consensus formation** in global (international) RTTT standardisation issues.

The derived objectives are:

- to base these standards on solutions agreed by **consensus** in a well balanced representation of different interests
- to co-ordinate efforts and encourage projects in the European Research and Technical Development programmes **to produce and test proposals for standards**
- to seek support for project teams from the EU Commission (and EFTA Secretariat) on well specified high priority items, **where normal voluntary work is not expected to produce results in proper time**
- **to report to all parties concerned** the progress of work and the experiences gained in the developments and use of the standards.

Four major motives for standards must be strongly underlined:

- protection of the citizen through promotion of the **quality of life**, and especially safety: RTTT is really a field where these motives are of the utmost importance either on driver safety level or on environmental protection
- to keep the consumer his purchasing options from a range of competitive providers: RTTT users need standards in order **to avoid getting locked into a single product**. The consumer is not only end-user: he can be an intermediate actor as a transport operator strongly wishing to avoid dependency from an equipment supplier for his trucks.
- vendors want standards **to protect their investment** thanks, to economy of scale: standards would allow equipment suppliers to exploit economies of scale in the development, production, distribution and maintenance of equipment.
- standards can avoid the **cost of developing customised products** and services for individual customers.
- to allow system **integration and interoperability**.

On this last point, some comments may be done (see ITS Handbook, World Road Association, PIARC, 1998):

- the benefits of synergistic **integration** include cost savings, enhanced capabilities, easier user acceptance and fuller system completion thanks to mutual reinforcement of RTTT technologies, shared data bases such as the common use of data between traffic and transit management centres, exchange and co-ordination between organisational units such as between highway patrol and emergency services and synergism between transportation and communication infrastructures.
- standards enable technical **interoperability** but does not guarantee it: indeed, there are three aspects of interoperability to be satisfied:
 - technical, involving the ability of equipment to communicate
 - procedural, involving data and procedures to exchange meaningful information
 - institutional, involving financial agreements and contractual relationships between operators and users of an RTTT service.

For example, a standard may guarantee the technical interoperability of a DSRC tag. Different implementations of the standard, however, might prevent procedural interoperability by, for example, the selection of different values for particular parameters such as message length and content. Furthermore, identical implementations of a DSRC standard do not ensure that one toll road operator will honour a tag issued by another, which would require interoperability (Gifford and White, 1998). Nevertheless, **a technical standard is a prerequisite for interoperability**.

To conclude, two comments made during the interviews are interesting in their description of the way standards can be seen and used:

- From a local authority: « standards can be seen in a positive way, as helping us, since they facilitate the writing of specifications and in a negative way, as a restrictive tool, because their existence makes it easy to impose constraints to suppliers ».
- From a representative of an auto-maker: « standardisation is a way for our industry to show that we are involved in the creation of a frame where driver's safety and comfort are protected and to set up a requirement frame in order to precede the government in its willingness to enforce regulations; this action is aimed particularly towards the after market to prevent some equipment suppliers (manufacturers and sellers) to have wrong behaviour »

2.4 Towards standards

Standards result from four different types of institutions and processes. RTTT is primarily concerned with one of these, the consortium, whereby users or suppliers join together to establish or endorse a particular standard or specification. Under a second approach, the market may adopt technologies that become “de facto” standards by virtue of their dominance of the market. A third process is development through accredited standards development organizations. A fourth approach to developing standards is through the adoption of laws and regulations, as in the cases of auto fuel economy and tailpipe emission standards.

2.4.1 Consortia

Under a consortium approach to standardization, a group of interested suppliers or users of a particular system or component convene and develop a standard for it. One of the hallmarks of consortia-based standards is that they can be developed quickly and consequently allow products and services to reach the market faster.

Consortia are widely used in the computer and telecommunication industries. Examples of consortia standards include the World Wide Web Consortium (W3C), which produces software and specifications for the World Wide Web, including HTML (hypertext markup language), used for laying out web pages, and a successor called XML (extensible markup language). Another consortium is the Infrared Data Association (IrDA), which developed the standard for the infrared data link used in wireless printing and wireless networking applications. In the area of ITS, the toll tag specifications were developed using a consortium approach.

We shall see many of them, specific to RTTT, in chapter 3 (see 3.3.7).

2.4.2 De facto Standards

A « de facto » standard is a design or protocol that dominates the market through the unorganized actions of suppliers and consumers, without any formal adoption or enforcement by non-market or regulatory bodies. De-facto standards are often associated with a single manufacturer, or in some cases a single customer.

Examples of de facto standards abound. Microsoft Corporation's DOS and Windows software dominate the personal computing market. VHS is the de facto standard for videocassettes and cassette recorders.

The ownership of the intellectual property rights of a de facto standard can be open, subject to licensing or proprietary. Openly available standards may be adopted and utilized by any manufacturer, user, or secondary supplier. The owner of the standard may also license its use to other manufacturers or secondary suppliers, possibly requiring the payment of a licensing fee or adherence to other licensing requirements. These requirements may range from simple labeling to more wide-ranging requirements governing the provision of end-user support or the bundling of licensed products with competing products. Finally, the owner of a standard may treat it as proprietary and restrict its use by any but selected secondary suppliers or even treat its technical specifications as trade secrets and refuse to divulge them.

There are two primary concerns about de-facto standards. First, the owner of a de facto standard has market power, which it may use to retain customers and increase market share.

The second major concern is about the eventual technical superiority of de facto standards. Emergence of a de-facto standard may occur in a number of ways. Consumers may simply prefer a particular manufacturer's design. The timing of a product's release and the restrictions on its manufacture by other suppliers (patents, copyrights, licensing agreements, etc.) can also influence its market share, both through the intentional strategic behavior of a supplier as well as through simple luck or bad fortune. The strength or dominance of a particular supplier may also lead consumers to believe that it will be able to support its products more readily. Hence, the emergence of a de facto standard depends on factors other than technical performance alone. It is theoretically possible for a technically inferior design, favored with a clever marketing and deployment strategy, to gain market dominance over a technically superior design that is poorly marketed. That is, in a market-based competition between two technologies, the "wrong" technology might win. In the view of some, such a "market failure" justifies government intervention.

There has been an energetic debate over the merits of market versus state-mediated technology choices.

2.4.3 Formal Standardisation Organisations

A third standards development channel is the formal standardisation organisations that are usually organisations or associations that develop standards for a particular technical area such as telecommunications or automotive design. Many of them, involved in the RTTT field will be described in the chapters below: ISO, IEC on a world wide level or on the European stage, CEN, CENELEC and ETSI.

Later on, in § 3.1.8, a focus will be made on the different statutes which these organisations, either in Europe or in the US, give to their respective standards and the related constraints

2.4.4 Regulation

A fourth standard development approach is the regulatory standard, whereby government, through its own procedures, adopts standards embodied in formal, legally binding regulations. One of the hallmarks of the previous three channels was their voluntary nature. Regulatory standards put the force of law behind a standard. In Europe, standardization bodies have a regulatory role.

2.4.5 Interaction between Standards Development Processes

The boundaries between these four categories of standardisation processes are not crisp. Government bodies often adopt codes or standards developed by SDOs, for example in the case of housing codes. Consortia may develop model specifications that provide input for SDO consideration. Consortia may adopt or modify an SDO standard for a particular purpose. In the case of the World Wide Web Consortium, for example, the specification XML is based on the ISO's Standard Generalised Markup Language (SMGL. ISO 8879).

2.4.6 International activities

The standardisation process of RTTT products and services follows a two-step model which aims to link the advantages of consortium approach with more regulated means of standardisation.

The common tool to achieve this goal is the design of an **ITS architecture**. In the U.S, Europe and Japan, there is a consensus, at least within the public sector, that an architecture is needed to organize the standardisation work. The basic ITS architecture aims to define the user needs concerning ITS products and services. The standards are needed to ensure a minimum interoperability of ITS products and services between states, countries if not continents, when considering the costs for industrial development. The ITS architecture stage of development varies among the different continents.

2.5 Standardisation work programme: keys to set up priorities

Creativity of scientists and researchers leading to variety of new technologies and consequently to diversity of new products/services thanks to the commercial dynamism of economical actors rapidly seizing the opportunities they see in these discoveries, all this impetus is a strong call towards the standardisation world.

Priorities must be set up in the field to avoid to spend limited resources on too much topics with the risk of dispersion and superficiality, and in some cases to waste time in dead ends.

By giving useful criteria, the following comments intend to help the choice between a wide range of possibilities in order to build a RTTT standardisation work programme that should be realistic and in line with the needs of the various actors involved in the game.

2.5.1 Public initiative

The developments in the RTTT field have mainly been initialised and driven by road authorities and road operators: the technical success of DSRC, EFC, RDS-TMC, DATEX, ... owes to their persistent action. Oriented towards the satisfaction of global needs, they did not always take into account the specific needs of each private sector (transport operators, service providers, end-users,...) missing in this top-down approach to measure the real impact of the technology in term of market and the solvability of the aimed consumers.

To state that technological performance is a fundamental argument for consumer acceptance is partly right: facing to so many telecommunications products and related services, the consumer, having a limited budget, has to choose and his choice is based on perceived advantages. This choice will imply the decision of industry and commercial providers to go on in their actions or not.

This gives a first criteria for the launching of a standardisation action: to try to foresee the market potential answer and to follow-up this answer to the techniques offered.

2.5.2 Technical viability

Traffic and travel information can be provided through many media: DSRC, RDS-TMC, GSM, ... But each of these techniques have been developed for specific purposes: DSRC for electronic tolling, RDS-TMC for traffic information, GSM for voice communication, ... and in the interest of some specific operators (motorways operators, public road operators, telecommunication operators, ...). Even if all these operators intend to enlarge the scope of their main mission to ensure additional services, some hurdles are on the way:

- because of organisational matters, for example difficulties to reach agreements with other RTTT actors becoming new partners in the targeted service
- because of limits and constraints in the technology (for instance data rate or geographical coverage,...)
- because of commercial considerations, the new activity having no priority versus the core business,

for all these reasons, the starting intention is not always followed by a real action.

The second criteria to take into account before the launching of a standardisation action could be to consider the medium and long term involvement of the related actor (s) in the proposed products and/or services.

2.5.3 Convergence of interests

With the development of new telematic services, the number of actors which have to be involved in the system highly increases. From situation where few categories of actors were involved in decision (for instance, for Variable Messages Signs (VMS), involving road operators + industry), new systems engage now more and more actors: see the example of Mayday services or After Theft Systems where are involved polices forces, road operators, service providers, telecommunication operators, devices manufacturers, automotive industry, not speaking about medical services or insurers respectively.

The success of the deployment of these services highly depends on the convergence of the interests and strategies of all the actors. Levels of convergence, real agreements seems to be the key criteria to detect if such systems and services will at least exist and in which future.

This is the third criteria to stress on: observe with deep attention the consortia created and try to assess their representativity and their credibility in order to evaluate the interest in launching any standardisation action in the field.

2.5.4 Technology stabilisation

The speed of the technological evolution risks to leads to inconstance or unfaithfulness: RDS-TMC was operational just a few months ago when DAB began to attract the attention, diverting some actors from it, UMTS, WAP are in all minds, when there is on the shelf what is needed at the moment, etc... Industry is creating its own uncertainties when announcing that its previous technologies are already obsolete, even before reaching enough return on its investment...

As a result, the deployment of systems and services (and the corresponding markets) is constantly delayed. Another criteria to take in consideration for the opportunity of a standardisation action is the evaluation of the capacity to hinder what has been previously supported to estimate the lifetime of a product/service.

2.5.5 Migration path

The announcement of new systems must not hide the fact that much time is necessary to make the new system operational both on technical level and also on financial level (renewal of equipment).

This is a criteria that should require attention, in term of standardisation. The longer the migration path, the more justified is an effort on the standardisation of the « old » system.

2.5.6 Multi-functionality

The more a system will be open to different functions, the more services will be based on it, available to the use of various actors, the more, on an economical point of view, such system will find a large market and will have an important durability.

This kind of criteria is to take into account for the related standardisation.

2.5.7 Synthesis

As a conclusion to this paragraph, one can say that standardisation is not a panacea nor an insurance against the risks of the market and the versatility of consumers. Standardisation can be seen as one of the factors to lead to success of products and services and to induce the enlargement of their market: but standardisation must stay independent of any pressure, any fashion phenomenon, any consortium or forum created to build at any price, quasi or « de facto » standard not based on a real consensus, concept which is the real wealth of the standardisation process.

Standardisation goes forward at its own pace: in the RTTT field, this pace seems to require an adaptation to the speed of the technological evolution, but the action must not be governed by haste and in any case, in front of the proliferation of products and services, should be engaged applying a frame of various criteria to rule its progression.

Indeed, standardisation is not based only on technical matters: as the previous criteria clearly show, it is embedded in political, economical, financial and organisational matters, that should be taken in consideration to stick to its objectives.

Remark: *to illustrate the previous comments, we tried to describe in the Annex 3.8, through a case study analysis in the fields of EFC and DRSC standardisation, the difficulty of the process seen on the technical and commercial levels and especially the consensus necessity: this case study is performed on the international/European/national stages, comparing the different approaches.*

2.6 Economical impact

The economical impact of standards can be considered from two complementary points of view:

- benefits for the European community on a socio-economic level, taking into account the global consequences on safety, effectiveness, productivity and environment
- benefits for European industry, including its prospects in non-European markets.

2.6.1 Benefits for the community

The EU action programme in telecommunications estimated, a few years ago, at 5 to 10 % (one billion Ecus a year) the savings in the equipment market alone realised through the adoption of common European standards.

This figure is one of the very few figures existing on the benefits of standardisation. Some people think this sort of computation very futile, because, considered by itself, the overall expenditure committed world wide to standardisation, which must reach several billion ecus per year, proves its importance.

This latter figure is not exaggerated: indeed, we estimate that the **cost of a standard** of medium difficulty needing the combined efforts of 10 persons during 3 years for 5 % of their working time is about **0,5 Mecus**, that is, for RTTT only, at a rate of 5 to 6 standards a year about 3 Mecus.

Facing this lack of figures, we tried another approach: starting from available figures from a survey on ITS benefits, survey performed for the World Road Association by its C16 Committee on ITS, we did not considered the standardisation activity through its quantitative benefits, but on a **qualitative level**, searching the fields where it can bring benefits, assuming that they were proportional to those of the ITS activity, where standards are relevant.

Remark: *The following ITS benefits draw principally from the results of field tests and trials in North America, Europe and Japan. These benefits are grouped according to the measures of effectiveness: safety, efficiency, productivity and environmental. Many of these results are obtained from small-scale field trials and must be interpreted with caution, always keeping in mind local circumstances. For instance, focusing on efficiency benefits on UTC (Urban Traffic Control), for which the average figure is 10 % (see below), the figure reached in Torino is more than 20 % thanks to a very efficiency scheme (5T project).*

2.6.1.1 Safety benefits

These benefits are measured in terms of percent reduction in accidents:

- | | |
|------------------------------|--------------|
| ■ ramp metering | 24 % to 50 % |
| ■ speed enforcement cameras | 20 % to 80 % |
| ■ collision warning | 33 % to 40 % |
| ■ weather monitoring and VMS | 30 % to 40 % |

■ driver monitoring	up to 41 %
■ emergency response	7 % to 12 %
■ adaptive signal control	18 %
■ traffic signals	75 % to 78 %
■ dynamic route guidance	1 %
■ incident and emergency management	15 %
■ crash avoidance systems	up to 17 %

If safety benefits are measured in terms of percent reduction in rescue time:

■ incident and emergency management	20 % to 43 %.
-------------------------------------	---------------

Example of quantitative evaluation that could be performed:

In France in 1995 and 1996 (source: INRETS file 1/50) there were around 200 dead and severely injured people due to rear collision on highways, national and secondary roads: assuming that a collision warning system avoids 35 % of accidents, as stated above, and that standardisation in this matter could lead to a wide spread and use of these sets, let us say in 50 % of the cars, that lead to 35 persons saved from this kind of accident and for the national economy, 25 MFF or 3.7 Million Ecus (taking a cost of 0.7 MFF/ involved person).

2.6.1.2 Efficiency benefits

These benefits are measured in terms of percent reduction in travel delay:

■ ramp metering	13 % to 48 %
■ traffic signals	10 % to 20 %
■ Incident management	10 % to 40 %
■ In-vehicle navigation	4 % to 20 %
■ RDS-TMC	3 % to 9 %
■ urban traffic control	10 %
■ re-routing through VMS	up to 20 %
■ fleet management	5 %
■ electronic toll collection	30 % to 70 %
■ intermodal tracking and tracing	up to 20 %
■ bus-tram priority	7 % to 19 %
■ dynamic route guidance	5 % to 15 %

If efficiency benefits are measured in terms of percent increase in throughput:

■ freeway management	17 % to 25 %
■ ramp metering	8 % to 22 %
■ electronic toll collection	200 % to 300 %
■ collision avoidance	30 % to 60 %

2.6.1.3 Productivity benefits

These benefits are measured in terms of percent in cost reduction

■ fleet management system	5 % to 25 %
■ driver monitoring (reducing damage)	up to 40 %
■ ITS infrastructure for transit	8 %
■ electronic toll collection	34 % to 91 %

2.6.1.4 *Environmental benefits*

These benefits are measured in terms of percent reduction of emission

■ urban traffic control	26 % to 30 %
■ in-vehicle route guidance	5 %
■ signal optimisation	10 % to 16 %
■ re-routing through VMS	5 % to 10 %
■ re-routing through telephone call-in	2 % to 33 %
■ dynamic route guidance	5 % to 16 %
■ electronic toll collection	45 % to 83 %

If environmental benefits are measured in terms of percent reduction of fuel usage

■ electronic toll collection	5 %
■ fleet management	about 4 %
■ in-vehicle route guidance	5 %
■ dynamic route guidance	13 %
■ traffic signal control	6 % to 13 %
■ freeway management	about 42 %

2.6.2 **Industrial prospects**

The ISFORT Study performed in June 1997 on Transport Telematics (TT) in Europe is not outdated and still interesting through its main conclusions, we remember below:

« The report shows that:

- thanks to the EU support, a set of technological opportunities has been created
- the market potential for these opportunities is very interesting
- some of these opportunities are becoming commercial supply, but with a rather cautious approach
- the TT market as a whole has not yet started and there are many uncertainties on the possibility that there will be actually a start-up.

Potentially, the Advanced Transport Information Systems (ATIS) and secondary Advanced Commercial Vehicles Operation (ACVO) are the heart of the TT market: if they will take-off, they will change the whole TT scenario, attracting resources for the whole market. Otherwise the TT market could grow somehow from the quantitative and the qualitative point of view with no radical changes, and, probably, without fully exploiting the TT technical potentialities and benefits ».

ISFORT considers two main types of TT applications:

- « **small quantity** » market applications: Interurban traffic management systems (ITMS), advanced public transport systems APTS), electronic fee collection (EFC)
- « **mass market** » and almost mass market applications that are ATIS, advanced vehicle control systems (AVCS) and ACVO.

The « **small quantity** » market applications have already reached the development stage of the life cycle, with a market potential of around 26 Gecus. The market potential is in the order of some thousands:

- 1165 cities
- 9,600 public transport companies
- less than 50 motorways operators

These « small quantity markets » are mainly (more than 60 %) based on demand of public administrations.

The « **mass market** » applications represent a big market potential in the order of 90 Gecus for ATIS development, 22 Gecus for ACVO, plus an annual market of 21 Gecus for ATIS and 9 Gecus for ACVO (all these figures are extracted from the ISFORT study).

« The potential size of the mass market is very interesting but it should not be overestimated, because of some uncertainties:

- potential customers are not clear in their intention to pay for RTTT terminals and services (see the experiences of Mediamobile, Tegarom and Passo where realisations lag far behind forecasts)
- many needs are covered by « not RTTT solutions », generally free or paid by public authorities

Besides, the RTTT specific approach of the market, some perturbations could come from two other scenarii, named by ISFORT, « **personal mobility scenario** » and « **multifunctional scenario** »:

- in the « **personal mobility scenario** », affecting the terminal market, the single light terminal (PDA concept) will gather GPS, GSM, ... Car manufacturers and their electronic equipment manufacturers will lose centrality to the benefit of information technology vendors
- in the « **multifunctional scenario** », affecting the service market, the « information broker » will take the lead, and make the TT provider lose his margins and part of its critical role, by covering the consumer by hundreds of offers of TT based services.

The small quantity applications will continue to develop not very fast, while the mass market applications, apart from AVCS, will develop following a niche model and waiting for better moments. There is still the need to support TT diffusion, not through R&D, but through real market developments, with the choice between three approaches:

- public administration driven process, with the guarantee of some basic services for free
- market driven approach, requiring some solid market outlook and if the perceived risks are too high, presenting the danger of never starting
- public-private co-operation, creating some constraints to the private operators, because the information diffused is not independent from the data collection infrastructure..

On the standard point of view, it can be underlined that the market can accept a small number of suppliers with **standardised solutions** or a large number of suppliers with ad-hoc solutions. Of course the first hypothesis, based on a **small number of standard solution suppliers**, plus a network of a large number of VAR (Value Added Resellers) which customise the standard solution, would be more efficient by lowering TT costs.

One can be pessimistic in the occurrence of this solution: many hurdles on the way, that are in particular:

- market segmentation
- already installed systems
- lacks of leaders
- number and segmentation of supply players
- implicit national and local barriers

make highly improbable a bottom-up mechanism in which the market should create spontaneously standards and architecture at the European level. On the other hand, a top-down approach is very difficult, even if initiated by the Public Administration, because of

- objective requirements fragmentation
- installed base constraints
- conflicting interest of involved organisation and suppliers.

2.7 Conclusion

From this chapter, a conclusive comment can be done.

Three kinds of actors are involved in the RTTT market: authorities, industry and consumers, whose interests are in convergence.

To make the RTTT market take-off and to lead the consumer to adopt the products/services proposed by authorities and industry, he must have a clear view of the benefits he can draw from them. The standards are an essential tool to give him both perspectives and confidence in a complex and fast evolving field, a tool helping, through partnership of the various categories of actors, to make this convergence a reality beyond their intentions.

During their informal Council in Dortmund on 23–24 April 1999, the EU's transport ministers concurred on the potential for telematics applications in the transport sector and agreed that efforts should be made to promote their introduction. There was a general consensus that rapid progress towards the large scale introduction of telematics across all modes could be best promoted through the development of **harmonised standards** at a European level in order to improve interoperability.

Chapter 3. RTTT and the standardisation process in Europe

The chapter at a glance:

- A review of the **main actors in the RTTT standardisation field**: ISO/TC 204, CEN/TC 278, CENELEC/TC 214, ETSI and their connections
- Efforts made to improve, to speed and to co-ordinate the standardisation process, in CEN (**ISSS, ICTSB, CWAs**) and ISO (**PASs and TSs**)
- A special focus on **ANEC**, the European Association for the Co-ordination of Consumer Representation in Standardisation
- A review on the **13 working groups** of CEN/TC 278 and a **detailed status report** on each of them
- Some hints about **Fora and Consortia** and their benefits
- General considerations and especially **worries** on the standardisation process: slowness, volume of output, involvement, need for financial support
- Comments on the **organisation** of the standardisation process: involvement of RTTT actors and countries, co-ordination between Working Groups, co-operation between CEN and ISO
- Benefits from the co-ordination with **RTD projects**

3.1 Actors of RTTT standardisation

At a world-wide level, the work and actions related to RTTT standardisation are handled by the International Standards Organisation (**ISO**), while at the European level, three bodies are responsible for the planning, development and adoption of European standards:

- the European Committee for Standardisation (Comité Européen de Normalisation or **CEN**), responsible for all sectors excluding electrotechnical
- the European Committee for Electrotechnical Standardisation (Comité Européen de Normalisation pour l'Electrotechnique or **CENELEC**)
- **ETSI** (European Telecommunications Standards Institute) responsible for the standardisation in the field of telecommunications and related technologies.

Each of these entities, at its level, performs the necessary actions in the RTTT standardisation domain and sets up connections with the sector organisms in charge of telecommunications and electrotechnics when the developed standards refer to these technologies.

In the § 3.1.8, special characteristics, differences and connections between CEN and ISO standardisation processes will be presented.

3.1.1 ISO

The technical work of ISO is carried out through Technical Committees (TC), which in turn establish Subcommittees (SC) and Working Groups (WG) to cover different aspects of their work.

ISO/TC 204, created in 1993, has in charge Transport Information and Control systems, covering the field of RTTT.

ISO/TC 204 has tight liaisons with other ISO TCs like TC 22 (Road Vehicles), TC 104 (Freight Containers), TC 211 (Geographic Information/Geomatics).

Besides, ISO has relationships with many international entities like CCITT (Comité Consultatif International Télégraphique et Téléphonique), IEC (International Electrotechnical Commission), ...

In particular, ISO and IEC have established a formal agreement stating the relationship between them: according to this agreement, questions related to international standardisation in the electrical and electronic engineering fields are the concern of IEC. To ensure the necessary technical co-ordination, ISO and IEC have established a Joint Presidents' Co-ordination Group (JPCG) and a Joint Technical Advisory Board (JPAB). A joint TC is responsible for standardisation in the field of information technology (JTC 1).

3.1.2 CEN

CEN is a legal association, set up in 1985, the members of which are the National Standards Bodies (NSBs) of nineteen European countries and six Associates (organisations representing social and economic interests at European level), supported by a Central Secretariat based in Brussels.