



**Conférence Européenne
des Directeurs des Routes**

**Conference of European
Directors of Roads**

Procurement of ITS



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FOR DECISION

Executive summary

Background

ITS components account for approximately 10 per cent of the investment cost of a typical major road construction project. In terms of the lifecycle of the road, however, ITS accounts for a substantially higher proportion of investment costs. This is due to the fact that ITS components have a much shorter lifecycle and much higher maintenance and operation costs (up to 20 per cent p.a. of the total investment cost) than other road construction elements (1-2 per cent p.a. of the total investment cost).

ITS solutions are sometimes developed and produced at international level. Nevertheless almost all NRAs face a rather national market when procuring ITS. If NRAs were to adopt a more European approach, they could benefit from economies of scale and common approaches.

At its spring meeting in 2006, the CEDR Governing Board decided to study the procurement of ITS in more detail.

A taskforce of ITS experts was then asked to make an inventory of the actions that would need to be taken and the positions that would need to be adopted in order to allow NRAs to adopt such a European approach to the procurement of ITS applications and/or products.

Observations

A widely accepted approach to the procurement of ITS is the use of commercial off-the-shelf (COTS) ¹ components, systems, and/or services for existing structures. In general, this is considered to be preferable to the production of customised solutions. This report focuses on the possibilities of using COTS products and procurement strategies.

NRAs would benefit from using more COTS products because they reduce both costs and risks. In order to be able to develop future COTS products, NRAs need to be given an insight into the opportunities offered by standards and the benefits of such standards. Since standardisation is a key factor in the interaction between NRAs and market parties, the standardisation process is highly relevant for NRAs.

Although some may consider Traffic Control Centres to be the most important part of the ITS infrastructure, in reality by far the greatest amount of money is spent on roadside equipment.

Procurement strategies play a vital role in the procurement of ITS components, systems, and/or services and differ from country to country. However, there is a general trend that sees NRAs changing from being 'asset managers' to being 'managers of facilities'. Consequently, three procurements strategies can be identified:

- technology-oriented procurement, which is based mainly on technical specifications,

¹ **Commercial, off-the-shelf (COTS)** is a term for software or hardware, generally technology or computer products, that are ready-made and available for sale, lease, or license to the general public. They are often used as alternatives to in-house developments.' (Source: Wikipedia, the free encyclopaedia)

- ❑ function-oriented procurement, which is based on functional specifications, and
- ❑ service-oriented procurement, which is based on service specifications and service contracts.

Quick wins and pitfalls

The use of COTS products has many benefits. They can be implemented faster, are easier to maintain, cheaper, and involve lower risks than any other solution.

A number of quick wins have been identified. For instance the use of existing functional specifications and standards will lead to greater competition and better and cheaper products and maintenance. Proven customised systems used by one NRA could turn out to be COTS systems for another NRA. NRAs can benefit by making use of each other's experience, expertise, and know-how.

There are also many pitfalls that need to be avoided or addressed in risk management processes.

Standards

Harmonisation and standardisation are of importance for NRAs because they reduce both costs and risks. ITS is becoming a safety- and mission-critical area for the networks operated by NRAs. Quality standards are needed in order to reduce the risks introduced by the COTS elements.

It is vital that NRAs exert an influence on the development of ITS through standards and harmonisation, which means that NRAs must focus more on standardisation processes.

Some conclusions

- ❑ Procurement strategies determine the extent to which COTS products can be used. Because the role of NRAs varies from country to country, NRAs will have different procurement strategies.
- ❑ In addition to the procurement report discussed at the GB meeting in Dublin in 2007, different types of procurement strategies need to be analysed in more detail, differentiating between situations and procurement strategies.
- ❑ In order to ensure better use of COTS products by NRAs, CEDR should take up and strengthen its knowledge exchange role with regard to ITS products and applications.
- ❑ NRAs should be aware of the importance of playing a more proactive role in the standardisation process.

The EB advises the GB to take the following actions:

- 1 Development of a 'CEDR guide to the procurement of ITS'.
- 2 Establishment of a knowledge base and/or a (virtual) centre of excellence within CEDR. This would support the sharing of know-how, experience, and expertise and would help NRAs to make better use of COTS products.
- 3 NRAs/CEDR are advised to play a more active role in national and European ITS organisations within the framework of the existing MoU between the Technical Group on Standards and the Project Group Capacity and Users.

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1. Definition of the issue (problem)

ITS components account for up to 10 per cent of the investment costs of a typical major road construction project. However, although the (technical) lifecycle of a structure (tunnel) may be as much as 100 years, the economic lifecycle of a typical piece of ITS equipment may be less than 10 years. Furthermore the maintenance and operation costs of ITS equipment will also by far exceed those of non-ITS equipment. One may therefore conclude that for NRAs, ITS accounts for much more than 10 per cent of investment costs over the lifecycle of the road and can reach up to 40 per cent.

ITS solutions do not obey national borders, but are sometimes developed and produced at international level. Nevertheless almost all NRAs face a rather national market when procuring ITS.

If NRAs were to adopt a more European approach, they could benefit from economies of scale and common procurement methods. Although this strategy seems very promising in theory, it is not easy to achieve in practice. The first step is, therefore, to draw up an inventory of the actions that would need to be taken and the positions that would need to be adopted in order to allow NRAs to adopt such a European approach to the procurement of ITS applications and/or products.

At its spring meeting in 2006, the CEDR Governing Board decided to study the procurement of ITS in more detail.

1.1 Methodology

A task force was set up to make this inventory. This team, which comprised 6 NRA experts, represented the various roles associated with the procurement process: infrastructure planning and development, ITS, procurement, and project management.

One widely accepted approach is the use of commercial, off-the-shelf (COTS)² components, systems, and/or services for existing structures. In general this is considered much more preferable to the production of customised solutions. CEDR's experts focussed in their work on the possibilities of using COTS products and procurement strategies.

Since standardisation is a key factor in the interaction between NRAs and market parties, NRAs need to be given an insight into the opportunities offered by standards and the benefits of such standards.

Because NRAs involvement in procurement can differ, it became necessary to distinguish in this inventory between the various roles of NRAs with respect to procurement processes and policies. The role that the market is allowed or required to play was also taken into account.

² **Commercial, off-the-shelf (COTS)** is a term for software or hardware, generally technology or computer products, that are ready-made and available for sale, lease, or license to the general public. They are often used as alternatives to in-house developments.' (Source: Wikipedia, the free encyclopaedia)

1.2 Line of reasoning

The following line of reasoning was used.



The first step was to come up with a definition of 'COTS'. The next step was to define a reference framework. This framework was then used to identify relevant issues. The relevant issues were then clustered into key issues. An analysis of both definitions of COTS in relation to the reference framework and the clustered key issues revealed that there are a number of possible strategies that could be pursued by NRAs. Based on this information, conclusions were reached, recommendations were made regarding positions to be adopted and actions to be taken, and quick wins and pitfalls were identified.



2. Possible way forward (solutions)

2.1 Definition of COTS

Wikipedia gives the following definition of COTS:

‘Commercial, off-the-shelf (COTS) is a term for software or hardware, generally technology or computer products, that are ready-made and available for sale, lease, or license to the general public. They are often used as alternatives to in-house developments.’

The road directors believe that the use of COTS products, systems, and services will lead to lower costs, lower risks, and faster implementation.

This report focuses on these consequences of using COTS products for two reasons: firstly, because they are the main reason why NRAs want to use COTS products and secondly, because they reflect one of the main trends in procurement (i.e. the shift from technology-oriented procurement towards function- or even service-oriented procurement).

NRAs have different experiences with COTS products. One organisation had never even heard of the term ‘COTS’ at all. For other NRAs, COTS products will soon no longer play a significant role since they have started to launch tenders with functional specifications and will soon start using service contracts for integral projects.

On a component level, most NRAs have been buying COTS products for many years (e.g. CCTV cameras, signals, VMS).

NRAs try to include COTS products in their procurement strategies in order to reduce costs and risks and accelerate implementation.

2.2 Benefits of COTS products

The use of COTS products has many benefits:

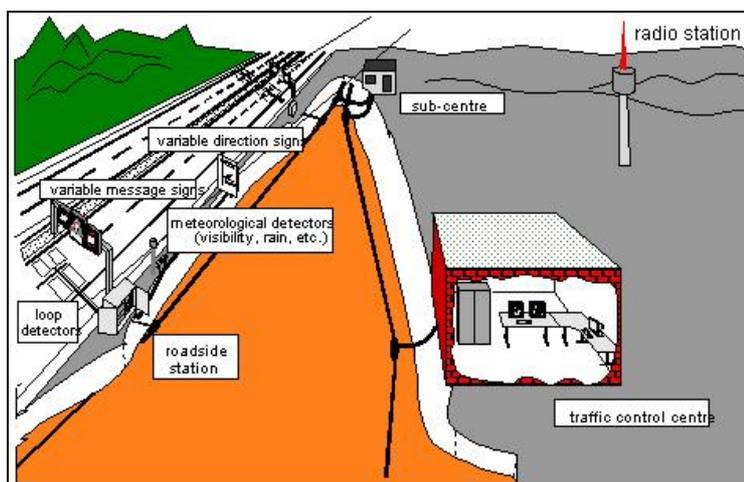
- ❑ COTS products are based on proven technology and can be implemented fast.
- ❑ It is possible to respond quickly to political questions and issues that need fast implementation.
- ❑ COTS products are easier to maintain.
- ❑ COTS products have standardised spare parts. A NRA doesn't have to own a stock of spare parts.
- ❑ Low- and high-end solutions are available and possible.
- ❑ Feedback to the industry improves products.
- ❑ Benchmarks are possible when the products are compared in common situations.
- ❑ There is less chance of forgetting something in a specification; most of the requirements are already included in the COTS products.
- ❑ Quick delivery of COTS products is possible; it is not necessary to reserve production slots. This is an advantage over customised products. Most suppliers won't even produce customised products unless the NRA pays or buys enough.

2.3 Costs of ITS

With regard to the costs of ITS, two aspects are relevant:

- the area of ITS on which most of the budget is spent, and
- the lifecycle costs of ITS in relation to the lifecycle costs of the overall infrastructure.

Although Traffic Control Centres are generally considered to be the most important part of the ITS infrastructure, they actually account for only a small proportion of overall ITS costs. Most money is spent on roadside equipment.



Roadside systems

On the other hand, some small systems may have a considerable effect on overall infrastructure costs, e.g. a low-cost software tool that has a high impact on the efficient use of the existing road capacity. In general, one strategy for NRAs might be to find out how their ITS budget is being spent and to try and find out how costs and risks can be reduced and implementation accelerated.

ITS generally accounts for approximately 10 per cent of the cost of a typical major road construction project.

The (technical) lifecycle of a structure is estimated at 100 years for tunnels, 50-70 years for bridges, and about 15 years for bituminous layers. However, the economic lifecycle of ITS equipment is less than 10 years and the annual maintenance and operation costs for ITS account for approx. 20 per cent of the total cost, compared to 1-2 per cent for non-ITS road construction components.

This means that the total life-cycle cost of ITS components can account for 30–50 per cent of the total budget over the entire lifecycle of the infrastructure.

2.4 Procurement strategies

In view of the fact that the roles and responsibilities of NRAs differ considerably from country to country, procurement strategies may also differ around Europe. However, there is a general trend that sees NRAs changing from being 'asset managers' to being 'managers of facilities'.

The procurement process of the 'asset manager' focuses on buying ITS products and services. The 'asset manager' can benefit directly from COTS products.

The procurement process of the 'manager of facilities' focuses on the procurement of complete projects based, for instance on DBFM contracts. In this type of procurement process, it is only possible to specify interfaces and specific standards; the purchaser never in fact sees the underlying components. In this case the purchaser can only benefit indirectly from COTS products, but can influence COTS products by drawing up specifications and requirements.

A number of NRAs have successfully implemented the use of open standards for interfaces in combination with functional specifications.

Procurement strategies within a NRA may also vary from project to project. In this case, the capabilities of the organisation and the complexity and risks of the project will lead to a specific procurement strategy.

Consequently, three procurements strategies can be identified:

- ❑ technology-oriented procurement, which is based mainly on technical specifications,
- ❑ function-oriented procurement, which is based on functional specifications,
- ❑ service-oriented procurement, which is based on service specifications and service contracts.

The procurement strategy will have a considerable effect on the options regarding specifications for COTS products in a tender. The use of high-level functional specifications or service contracts will limit the options. The 'deliverable' is seen as a 'black box' in which performance, input, and output are specified. Specification of COTS elements within the 'black box' is hardly possible and not preferable.

However, functional specifications and maintenance requirements will probably stimulate the use of COTS products by the contractor

Maintenance is an important issue. It can be included in service-oriented procurement or dealt with in separate contracts. Different strategies can be adopted. Maintenance can be approached in an integral way, covering both infrastructure and ITS in a single contract, or can be set up for specific systems. Here too, the different roles of NRAs determine possible strategies. However, focussing specifically on maintenance brings benefits.

Although it was not actually part of the reference model, it was found that maintenance scenarios are linked to lifetime costs and COTS opportunities.

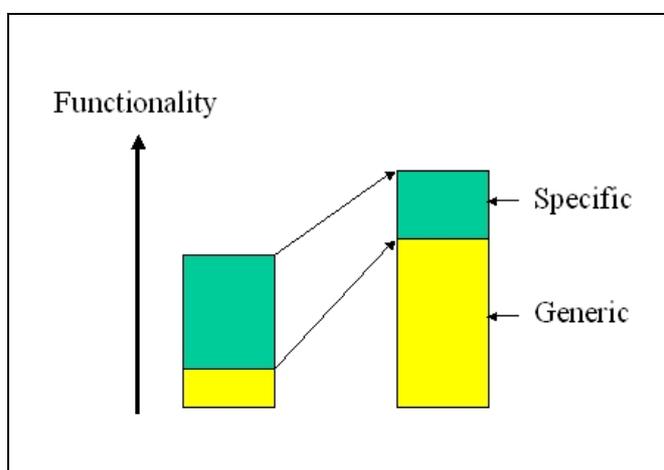
NRAs have formal procurement strategies for ITS. However, some NRAs use several formal and/or informal strategies in parallel.

2.5 Trends in ITS/COTS products

The ITS industry is innovative and continuously develops new products.

Two distinct trends can be seen in the development of ITS products and services:

- ❑ ITS products now offer more and better functions and contain even more generic³ components than in the past;
- ❑ the ITS industry manufactures standard 'core' products that can easily be customised, thereby allowing these products to be used in customer-specific applications using customer-specific interfaces and protocols.



Trend 1: Better functions, more generic parts

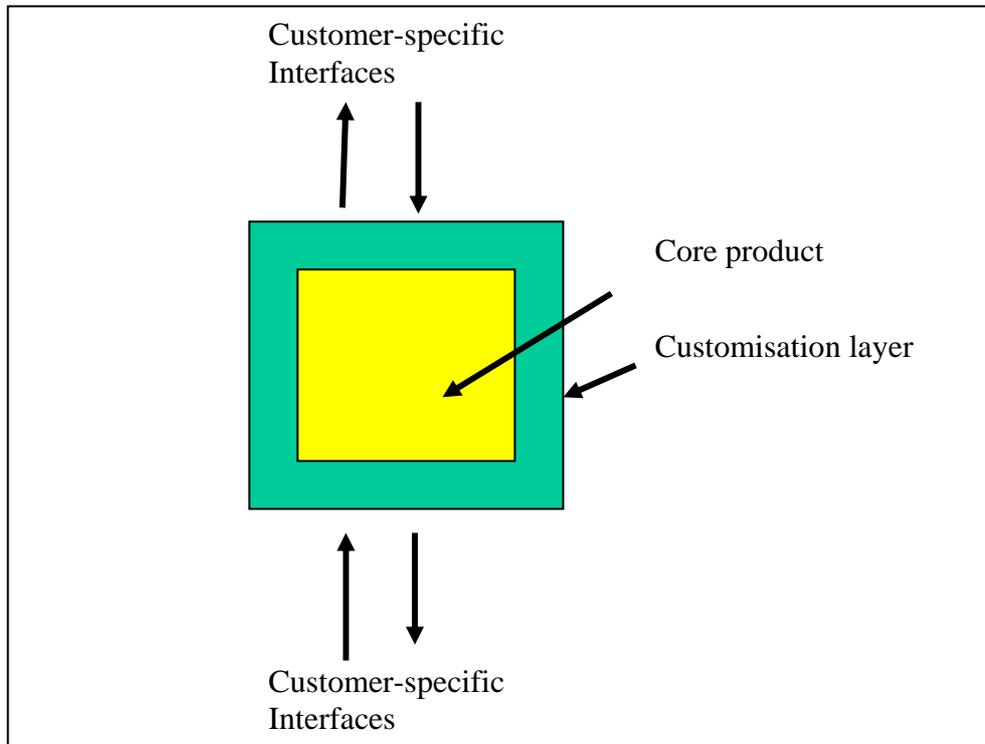
In the past, many ITS products were customised developments. Innovation in the field of ITS has led to new products that are composed of basic 'standard' industrial components, such as standard industry computer main boards with industrial-quality I/O boards, using industrial real-time operating systems and off-the-shelf middleware⁴. The manufacturer concentrates on the realisation of specific ITS algorithms.

At the same time there is a trend that seeks to overcome the lack of harmonisation of standards between the various countries by providing customisable ITS products. In this case, the industry offers 'core' products with generic ITS functions.

This 'core' product interacts with the customer's environment through a thin customisation layer that 'translates' the non-standard customer protocols into the non-standard protocols used in the core product. In this way, the industry offers its clients the benefits of COTS products, without the client having to change its own standards.

³ Generic: relating to a whole group of things rather than to one thing. (Source: Longman Dictionary of contemporary English)

⁴ Middleware; software that functions at an intermediate level between applications and operating systems of a computer. (Source: Wikipedia, the free encyclopaedia)



Trend 2: Customisable 'core' products

There are, however, some trade-offs:

- ❑ System safety: system requirements are increasing. ITS is becoming a safety- and mission-critical area for networks operated by NRAs.
- ❑ Vendor lock-in: the number of suppliers is decreasing.
- ❑ Knowledge management: it is not only becoming more difficult to maintain existing know-how and expertise within a NRA, it will also become hard to maintain knowledge about older applications/solutions.
- ❑ More and better functions: products sometimes offer more than what the NRA actually needs and can, therefore, be more expensive than necessary.

2.6 Harmonisation and standardisation

There are two reasons why harmonisation and standardisation are of importance for NRAs:

- they will reduce costs
- they will reduce risks

Harmonised functional specifications and standards will allow the market to develop competitive and innovative ITS systems and will also make the procurement processes more efficient. Existing functional specifications could be the starting point for this harmonisation process.

Since these ITS systems have to communicate with other systems, interoperability or communication standards are needed.

If NRAs were to buy larger quantities or co-operate with other NRAs, the larger volumes purchased would drive down prices even further.

However, the ITS industry is developing its own standards both at national level (e.g. in the national ITS organisations) and at European level (e.g. in CEN, ETSI etc.). The ITS industry is also implementing ICT industry standards and protocols.

ITS is becoming a safety/security- and mission-critical area for the networks operated by NRAs. Quality requirements are needed in order to reduce the risks introduced by the COTS elements (e.g. software of an uncertain pedigree) that are used in the proposed solutions. These quality requirements need to be addressed in functional requirements and interface standards.

Consequently, NRAs need to exert an influence on the development of ITS. NRAs need to be aware of and should consider participating in these processes.

They could use their influence in national and European ITS organisations to shape ongoing standardisation processes in the ITS industry. Since most ITS budgets are spent on roadside systems, it is evident that co-operation may focus on these systems once the relevance and impact has been defined. Harmonising functional specifications and the exchange of best practices and know-how can bring about significant benefits.

3 Quick wins and pitfalls

3.1 Quick wins

The following, more general, quick wins were identified:

- ❑ Wherever possible, use open standards for interface specifications and standards in general. Using open interfaces means more suppliers and easier/cheaper maintenance.
- ❑ Wherever possible, use functional specifications from other NRAs.
- ❑ Use industrially developed products, systems, or services (if possible with configurable interfaces) that can be used within non-standard environments. This way, NRAs can profit from the benefits of these products without having to adapt to a specific standard first. It is an advantage when systems or products have been implemented and tested in another country. This makes it possible to implement European standards in an evolutionary way.
- ❑ Use products that have been tested and implemented in another situation or by another NRA. This makes these products COTS products for other NRAs (see Annex 1).
- ❑ Share resources when testing COTS products. A good example is the co-operation between Belgium-Flanders and the Netherlands (see Annex 3).
- ❑ Write tenders in international languages to allow 'new' suppliers to enter the (national) market.



3.2 Pitfalls

NRAs should be aware of the following pitfalls, which should be addressed in risk management processes and COTS management:

- ❑ Part of an organisation may resist the switch to COTS products, preferring instead to stick to the 'old' specifications, mainly because they form part of the reason for their existence.
- ❑ Some common issues need attention: data definition and data management have not yet been addressed and standardised.
- ❑ Being over hasty in the procurement process may result in the procurement of products that do not meet the NRA's expectations.
- ❑ The time-to-market is constantly getting shorter; the industry is bringing new products to the market faster. NRAs should be aware that they are not part of the testing phase for bringing a new product to the market.
- ❑ Customised COTS products are very expensive unless the NRA specifically includes it in the tender specifications.
- ❑ COTS products may work in one situation, but not in others (NRAs should try to gather information about strengths and weaknesses).
- ❑ Integrating different COTS products may not produce the required result. A system of COTS components may not function as expected when connected up due to undesirable emergent properties or incompatibilities.
- ❑ Attractive all-in-one COTS solutions do not exist. This is sales talk. NRAs should be aware of the limits of each COTS product.
- ❑ COTS products are designed for large markets. This means that NRAs may have to pay more than necessary for COTS products because the product includes more functions than the NRA actually needs.
- ❑ New types of knowledge are needed to make the use of COTS solutions feasible within the NRA.

4 Comparison of possible ways forward

Sections 4 and 5 show that a European approach to the procurement of ITS could benefit the NRAs concerned.

However, in a field where differences can exist even within one NRA, co-operation can be very difficult.

Consequently, NRAs must consider the so-called 'do nothing' or 'stand alone' approach (i.e. each NRA continues to operate in isolation) and what the consequences of doing so might be.

Standardisation and harmonisation

- ❑ Opting for the stand-alone approach would mean that NRAs would only play a limited role at national level, but would be unable to join forces internationally. Given the fact that standardisation is an international affair that is dominated by an industry that holds a large stake in ITS, it is evident that this approach would lead to greater risks and higher implementation costs for NRAs.
- ❑ Another risk might be a so-called 'vendor lock'. This would mean that NRAs would no longer have a choice of supplier.
- ❑ Due to technology changes, new equipment may not longer be compatible with equipment already installed. This might even lead to higher costs in the event of a harmonisation

being imposed on NRAs from the outside (e.g. an EU regulation), not to mention the possible negative effects on road safety if the non compatibility were to increase and become visible for the road users as well.

Procurement and Market

Opting for the stand-alone approach would mean that the ITS industry's national markets would remain in place. Moreover, the lack of economies-of-scale would keep costs high for NRAs. The fragmented—and sometimes rather small markets—could become dominated by a small number of companies and possibly even the risk of a cartel.

Exchange of knowledge

Due to the fact that NRAs do not co-operate in this field, opting for the stand-alone approach would result in a duplication of all kinds of work related to COTS products and procurement. NRAs would still have to test components that are already COTS products elsewhere. Consequently, NRAs would encounter more customised solutions. This would result in higher costs, longer implementation phases, and higher risks, not to mention the possibilities of a vendor lock.



5 Proposal / Recommendation and consequences for the road directors

The aforementioned conclusions and observations lead to the following recommendations and suggestions for action.

CEDR recognises that the varying roles of NRAs and the differences in their political, economical, social, and technical situations requires varying procurement strategies for NRAs. These strategies will influence the procurement of COTS products.

Recommended actions:

- ❑ In addition to the procurement report discussed at the GB meeting in Dublin in 2007, the completion of a more detailed analysis of the different types of procurement strategies, which would differentiate between situations and procurement strategies.
- ❑ The definition of a procurement model reflecting different procurement strategies and NRA roles.
- ❑ The identification of trends in procurement, which affect procurement of COTS products (e.g. the trend in some NRAs to move from technology-oriented to function-oriented or service-oriented procurement).

Expected result:

The proposed actions would result in a 'CEDR guide to the procurement of ITS'. This guide would help NRAs identify the procurement strategies that meet their specific needs and role and, where necessary, adapt their procurement strategies accordingly.

CEDR will take up and strengthen its knowledge exchange role with regard to ITS products and applications, since they may lead to better use of COTS products.

Recommended actions:

- ❑ The preparation of an inventory of roadside systems, a comparison of their functions, and an evaluation of the options for co-operation between NRAs.
- ❑ A discussion on an approach to the exchange of information about systems already being used by other NRAs, since these systems could be COTS products for other NRAs.
- ❑ The preparation of an inventory of relatively cheap solutions developed for a specific situation, since these systems could be COTS solutions for other NRAs.

Expected result:

The proposed actions would result in a knowledge base and/or a (virtual) centre of excellence within CEDR that would support the sharing of know-how, experience, and expertise and help NRAs to make better use of COTS products.

NRAs/CEDR should become more (pro-) actively involved in the many ongoing standardisation activities in the field of ITS, since these activities affect the availability of COTS products.

Recommended actions:

- ❑ Development of a clear position on interoperability and functional standards, taking into account the fact that process control issues in the industry are not different from traffic-related control issues. This would allow NRAs/CEDR to influence the standardisation processes in the ITS industry.
- ❑ NRAs/CEDR are advised to play an active role in national and European ITS organisations.

Expected result:

The EB has already approved a Memorandum of Understanding between the Technical Group on Standards and the Project Group Capacity and Users with the aim of increasing the output/effect of efforts of NRAs in the standardisation process. However, a co-ordinated involvement in the standardisation of ITS interoperability and functional standards would ensure that safety- and mission-critical quality aspects are included in standards. It would give NRAs control over developments. References to industrial standards would make it possible to use standardised industrial COTS products, thereby allowing NRAs to benefit from proven, robust solutions.

5.1 The EB advises the GB to take the following actions:

- ❑ Development of a 'CEDR guide to the procurement of ITS'.
- ❑ Establishment of a knowledge base and/or a (virtual) centre of excellence within CEDR. This would support the sharing of know-how, experience, and expertise and would help NRAs to make better use of COTS products.
- ❑ NRAs/CEDR are advised to play an active role in national and European ITS organisations within the framework of the existing MoU between the Technical Group on Standards and the Project Group Capacity and Users.



Annex 1 Glossary

Relevant acronyms

ASFINAG	Autobahn- und Schnellstraßen-Finanzierungs-Aktiengesellschaft (Austrian motorway concessionaire)
CCTV	Closed Circuit Television
CEN	European Committee for Standardization
COTS	Commercial, off-the-shelf
CPU	Central Processing Unit
CVIS	Co-operative Vehicle-Infrastructure Systems, EU 6 FP
DBFM	Design, Build, Finance and Maintain
DSRC	Dedicated Short Range Radio
DTM	Dynamic Traffic Management
EFC	Electronic Fee Collection
ERI	Electronic Registration Identification
ETSI	European Telecommunications Standardisations Institute
I/O	Input and Output
IP	Internet Protocol
ITS	Intelligent Traffic Systems
MTTR	Mean Time To Repair
NPRA	Norwegian Public Road Administration
NRA	National Road Authority
NRTS	National Roadside Telecommunications Service
OBU	On Board Unit
OSI	Open systems Interconnection, architecture model
PC	Personal Computer
PEST	Political, Economical, Social and Technological analysis
PFI	Private Finance Initiative
PQQ	Pre Qualification Questionnaire
RCC	Regional Control Centre
RWS	Rijkswaterstaat, Dutch Directorate for Public Works and Water Management
SOUP	Software of uncertain Pedigree
SWOT	Strength, Weakness, Opportunity and Threat analysis
TCC	Traffic Control Centre
TCP	Transmission Control Protocol
TECMAC	Technical Management Service Contract
TLS	Technical Specification for Roadside Stations
TORO	RWS test centre for road traffic systems
TTI	Traffic and Travel Information

Annex 2 COTS management Dos and Don'ts

Dos:

- ❑ Search for proven technologies on the market and in neighbouring countries.
- ❑ Ask suppliers for independent test reports.
- ❑ Test and benchmark new technologies and products continuously on test site before the specification and procurement phase.
- ❑ Know the limits of each piece of COTS technology.
- ❑ Exchange test results with other NRAs.
- ❑ Exchange COTS specifications with other NRAs.
- ❑ Develop common functional specifications in co-operation with other NRAs.
- ❑ Shift towards European and international standards (EN...) and open interfaces.
- ❑ Use industrially developed products that are available with a large number of (configurable) interfaces or optional features. This means that there is no need for a (single) standard.
- ❑ Try to determine whether a low- or high-end COTS solution is needed.
- ❑ Draft specifications with detailed descriptions of the intended use of the COTS products and the results that are expected in each situation.
- ❑ Be aware of advantages and limitations of different types of COTS products and technologies (e.g. loop detectors vs. optical detectors vs. laser detectors vs. ...).
- ❑ Reduce the number of typically national or local requirements.
- ❑ Using functional specifications, try to install one COTS application from each subscriber during the procurement phase and test it in all potential conditions for better selection and comparison between subscribers.
- ❑ During the contract phase: install one COTS application and test it in all potential conditions before the rollout.
- ❑ Make sure that COTS products are compatible with the rest of the installation (e.g. signal heads and traffic controller).
- ❑ Use cables and parts accepted by the supplier and respect limits of use (e.g. maximal cable length).
- ❑ Give feedback to COTS product suppliers for product improvement.
- ❑ Try to control COTS products in a central monitoring system.
- ❑ Use uniform and standardised ICT components.
- ❑ Be aware of installation and application limitations provided by suppliers: ask for installation, user, and maintenance manuals.
- ❑ Bear in mind the following aspects when drafting specifications: easy maintenance, availability, and fast delivery of spare parts.
- ❑ Make sure the COTS product supplier has a personalised after sales service.
- ❑ Write tenders in international languages to allow 'new' suppliers to enter the market.

Don'ts

- ❑ Do not stick to the 'old' specifications.
- ❑ Do not use COTS products for applications or in conditions for which they were not intended.
- ❑ Do not be over hasty when buying and implementing COTS products.
- ❑ Do not allow the supplier to test and upgrade its COTS product in the contracting phase.
- ❑ Do not try to customise COTS products in the contracting phase, which is rather costly.
- ❑ Do not use COTS products in applications for which they were not specifically intended.
- ❑ Do not buy COTS products with too many unnecessary functions.
- ❑ Do not draft specifications that exclude competition amongst subscribers.

Annex 3 Examples of international co-operation

Example 1: co-operation between Germany and Austria

After the introduction of the TLS (Technical Specification for Roadside Stations/Technische Lieferbedingungen für Streckenstationen) in Germany, the suppliers became familiar with the standard and 'exported' it and their products to other countries. In Austria, the motorway operator ASFINAG adapted the TLS to its needs and developed new main features, like the use of TCP/IP for the communication between roadside stations and TCCs and a standardised communication processor.

For the further development of the TLS in Germany it was decided to integrate the Austrian features into the standard. This means that the next edition of the TLS will include these definitions, which were previously specific to Austria. This will make the TLS a joint German/Austrian technical standard. The two countries have agreed to develop the TLS together in future. For this purpose, representatives from ASFINAG work as official members of the TLS together working group with ITS suppliers and German road operators on the updating of the TLS.

For the manufacturers, this trend leads to an enlarged market for their TLS-compliant products. For the purchasers (i.e. the road operators), it will mean a wider variety of innovative ITS products at lower costs in the future.

Example 2: co-operation between the Netherlands and Sweden

The Dutch NRA has developed a Motorway Traffic Management System.

This system is capable of executing several traffic control measures like queue-tail warning, lane-use management, and protection of road works.

The Swedish NRA was looking for a traffic control system and in particular for one with safety-related traffic control measures like queue-tail warning in tunnels. Having conducted a market study, Sweden decided to adopt the Dutch system. This system is now in operation.

For the Swedish NRA this was a COTS approach: lower costs, lower risks, and faster implementation.

Example 3: co-operation between Belgium-Flanders and the Netherlands

The Dutch and Flemish NRAs co-operate on vehicle detection systems on motorways. They exchange operational experiences and test results.

The Dutch test centre for road traffic systems, TORO, is in regular contact with the Flemish Knowledge Centre for Traffic and Transport.

The two administrations exchange specifications, test results, and experiences with loop detectors, radar detectors, weight in motion systems, license plate recognition, and new innovative detection systems such as the 'laser turtle'.

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