



## **MARKET IMPACT EVALUATION**

ERRAC was set up in 2001 and is the single European body with the competence and capability to help revitalise the European rail sector :

- To make it more competitive
- To foster increased innovation
- To guide research efforts at the European level

## **ERRAC Project Evaluation Working Group (EWG)**

Objectives:

- Determine the market impact of previous rail research to improve use of research funding
- Ensure a strategic approach to the prioritisation of rail research

## **Project Evaluation**

- Individual projects are evaluated after they have been completed to ensure successful dissemination of project results
- To ensure that the results of previous rail research can be taken into account for future projects
- To avoid weak market uptake of results by learning the lessons of previous research
- The EWG will provide intelligence based on the project evaluations for input into future European Framework Programmes



*European Rail Research Advisory Council*

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## **ERRAC Project Evaluation Group**

### **HEROE**

EVALUATION FROM SEPTEMBER 2007

**Project acronym:** HEROE  
**FP:** 4  
**Programme acronym:** TRANSPORT  
**Project Reference:** 94/914/EC  
**Call identifier:** FP04 Encouraging modal shift and  
decongesting transport corridors

**Total Cost:** € 3,347,243  
**EU Contribution:** € 1,398,714  
**Timescale:** January 1998 – December 1999  
**Project Coordinator:** Claudio Traverso

- Presented by: L. Velardi
- Date evaluation: 11.11.07
- Market uptake: Weak
- Follow up projects:
- Other related Projects:

**Web references:**

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*European Rail Research Advisory Council*

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# **ERRAC Project Evaluation Group**

**HEROE**

Meeting of 11 September 2007



## **HEROE: Background**

(Harmonisation of European Rail Rules for Operating ERTMS)

### **Main Objective:**

The overall objective of the HEROE project was **to harmonise rules for the new ERTMS control-command system in nominal and degraded situations** by:

- facilitating a fair competition by fixing a common level of safety, particularly for degraded situations (applying a common risk analysis method).
- facilitating the transition period between existing control-command systems and ERTMS and identifying legal obstacles to the harmonisation;
- opening to all the European railways, involved or hoping to be involved in ERTMS, the results of this project by establishing prestandardised sets of rules and regulations in regard with each operating situation.

The general approach to these complex tasks was built to be very practical and closely linked with actual operating situations.



## **HEROE: Background**

(Harmonisation of European Rail Rules for Operating ERTMS)

### **Secondary Objective:**

- to determine the new ERTMS rules and regulations, especially for drivers and signalmen and rail traffic management;
- to determine ways to harmonise rules and regulations during the transition period to the new technology;
- to study safety problems related to rules and regulations;
- to test the results;
- to write prestandards and disseminate them.

The major networks dealing with ERTMS projects were involved very early in the conception of rules and regulations in order to obtain a common agreement on them.

It was realised early on that the introduction of the new technology would have required a common set of rules and norms for the human interface connected to the train-ground communication and train-station communication in case of events of failure of the system.

Therefore it was deemed useful to have the future “users” of the system, both on board and on ground, take part in the definition of new regulations and norms aimed at reducing the human risk factor, even though at the time the specifications of the ERTMS were still being defined on an on-going process and had not yet been finalised into the official specifications that were finally approved after the project terminated.



## **HEROE: Background**

(Harmonisation of European Rail Rules for Operating ERTMS)

### Details

- **FP4**
- **Project Reference:** RA-97-SC.2226
- **Total Cost:** 3,347,243 Euro
- **EU Contribution:** 1,398,714 Euro
- **Official start and end date:** 01.01.98 to 31.12.99
- **Project frozen from:** 01.03.99 to 31.12.99 **for the re-writing of ERTMS specifications**
- **Project restarted and ended:** 01.01.2000 to 06.01.2001
- **Scientific Coordinator:** Mr. Jacques PELLEGRIN (retired)  
**Address:** EEIG ERTMS USERS GROUP  
Avenue de Beaulieu,25 – 1160 Brussels - Belgium  
**Tel:** +32-2-6739933 **Fax:** +32-2--6734150

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EEIG ERTMS USERS GROUP  
Tel.: +32-2-6635609  
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\* The project was funded jointly by DG VII, CEC, (Framework IV, Transport RTD Programme) and UIC.



## **HEROE: Background**

(Harmonisation of European Rail Rules for Operating ERTMS)

### **Partners**

<b>Organisation</b>	<b>Type</b>	<b>Country</b>
<b>EEIG</b> - ERTMS USERS GROUP	Economic Interest Group	BE
<b>NS</b> - N.V. NEDERLANDSE SPOORWEGEN	Dutch Railways	NL
<b>RAILTRACK GROUP PLC</b>	UK Infrastruct. Manager	GB
<b>DB</b> - DEUTSCHE BAHN AG – FRANKFURT	German Railways	DE
<b>RENFE</b> - RED NACIONAL DE LOS FERROCARRILES ESPAÑOLES	Spanish Railways	ES
<b>FS</b> - FERROVIE DELLO STATO	Italian Railways	IT
<b>GEC ALSTHOM</b> TRANSPORT S.A.	Rail Signalling Industry	FR
<b>INRETS</b> - INSTITUT NATIONAL DE RECHERCHE SUR LES TRANSPORTS ET LEUR SÉCURITÉ (SNCF)	Rail Research Centre	FR
<b>TER</b> - TÜV EURO RAIL	Software Testing & Certification Company	DE
<b>TIFSA</b> - TECNOLOGIA E INVESTIGACION FERROVIARIA S.A	Rail Research Centre.	ES
<b>UNIROMA1</b> - UNIVERSITÀ DEGLI STUDI ROMA "LA SAPIENZA"	University (Transp.Research)	IT
<b>SNCF</b> - SOCIÉTÉ NATIONALE CHEMINS DE FER FRANÇAIS	French Railways	FR
<b>ERRI</b> - FOUNDATION EUROPEAN RAIL RESEARCH INSTITUTE	Rail Research Institute	NL



## HEROE: Background

(Harmonisation of European Rail Rules for Operating ERTMS)

### Partners interviewed

#### Organisation

EEIG - ERTMS USERS GROUP

NS - N.V. NEDERLANDSE SPOORWEGEN  
RAILTRACK GROUP PLC

DB - DEUTSCHE BAHN AG – FRANKFURT  
RENFE - RED NACIONAL DE LOS FERROCARRILES ESPAÑOLES  
FS - FERROVIE DELLO STATO

GEC ALSTHOM TRANSPORT S.A.  
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LES TRANSPORTS ET LEUR SÉCURITÉ (SNCF)

TER - TÜV EURO RAIL

TIFSA - TECNOLOGIA E INVESTIGACION FERROVIARIA S.A

UNIROMA1 - UNIVERSITÀ DEGLI STUDI ROMA "LA SAPIENZA"

SNCF - SOCIÉTÉ NATIONALE CHEMINS DE FER FRANÇAIS

ERRI - FOUNDATION EUROPEAN RAIL RESEARCH INSTITUTE

#### Name of interviewee

#### Country

<input checked="" type="checkbox"/> Franco Quagliotti	BE
<input checked="" type="checkbox"/> Robert Dijkman	BE
<input type="checkbox"/> Nico Prangma	NL
<input type="checkbox"/> Steve Roberts	UK
<input checked="" type="checkbox"/> Nick Wright	UK
<input type="checkbox"/> Rainer Meffert	DE
<input type="checkbox"/> Antonio Dominguez Chala	ES
<input checked="" type="checkbox"/> Antonio Garofalo	IT
<input checked="" type="checkbox"/> Giulio Margarita	IT
<input type="checkbox"/> Stephen Shirlaw	FR
<input type="checkbox"/> M. El Koursi	FR
<input checked="" type="checkbox"/> A. Vom Hoevel	DE
<input type="checkbox"/> O. Gonzales	ES
<input checked="" type="checkbox"/> Stefano Ricci	IT
<input checked="" type="checkbox"/> Dominique Ligeir	FR
<input checked="" type="checkbox"/> Bogdan Godziejewski	NL





## **HEROE: Background**

(Harmonisation of European Rail Rules for Operating ERTMS)

### **Major Validation Sites**

No ERTMS trial sites being available, **the HEROE project was validated on a RENFE test simulator** in Madrid that it was decided to upgrade for the purpose.

The trials were done in Madrid **with 3 drivers from different companies (RENFE, SNCF, NS)** and tests were done on different operational scenarios, and even if the tests were not complete due to the lack of time, they provided useful feedback.

The **Operational Rules Group (ORG)** that was set up by EEIG-ERTMS, after the HEROE project ended, built on these results and used the same simulator in Madrid and also a test simulator situated in France.

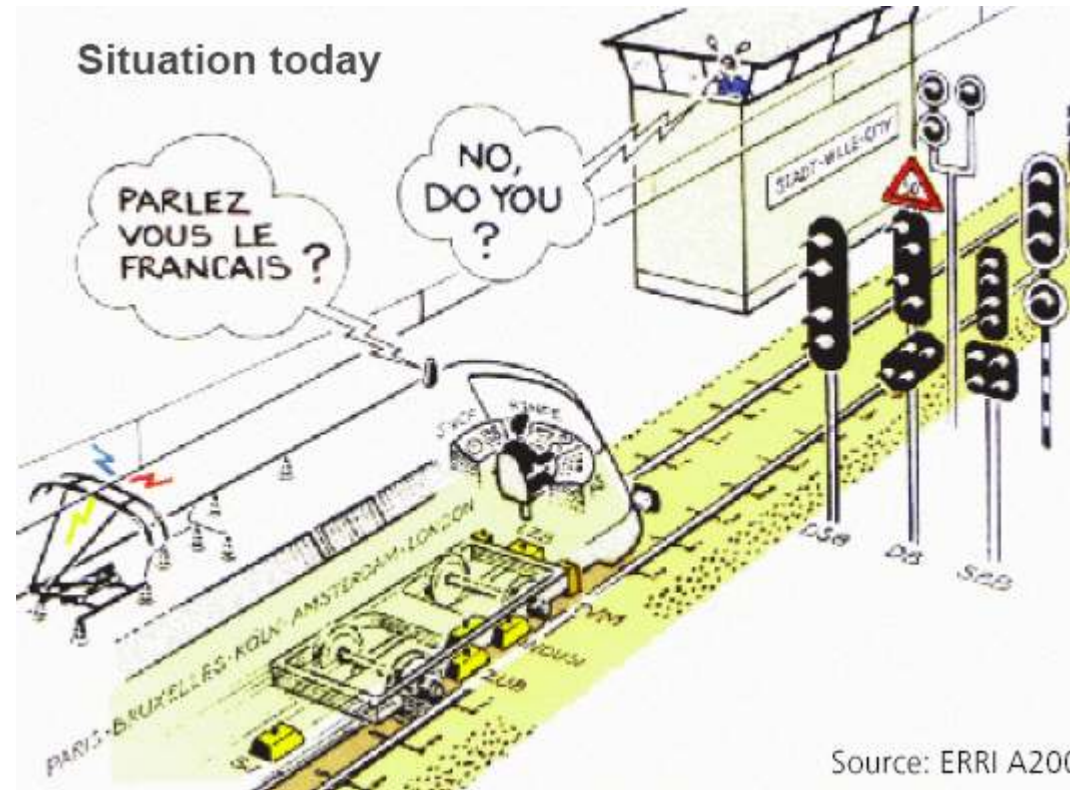
Real trials were carried out later in Italy on the Rome- Florence line and, in 2005, on the Rome-Naples High Speed line, the only infrastructure in Europe at the time in which the ERTMS/ETCS system was implemented and put into operation for commercial services.

The Operational Rules Group was set up within the EEIG-ERTMS (private interest group) founded initially by the French, Italian, German and Dutch rail industry members with the later addition of UK and Spain. They obtained contracts from the EC to continue work initiated by the HEROE project members and went on to elaborate the System Requirement Specifications (SRS) with UNISIG for ERTMS/ETCS which came out in final version in 2001.

## HEROE: Background

(Harmonisation of European Rail Rules for Operating ERTMS)

- The European railways are major users of traffic management systems. For the purposes of control-command, at least 13 management systems are used by the networks belonging to the European union. Each control-command system is linked with its proper set of rules and regulations in order to always ensure a high safety level for the users of the railway.
- Because of the strong dependence of rules and regulations upon signalling systems, operational interoperability are achieved within the framework of bi- or multilateral agreements.
- The aim of HEROE was to overcome this problem and create a European standard set of rules



Source: ERRI A200

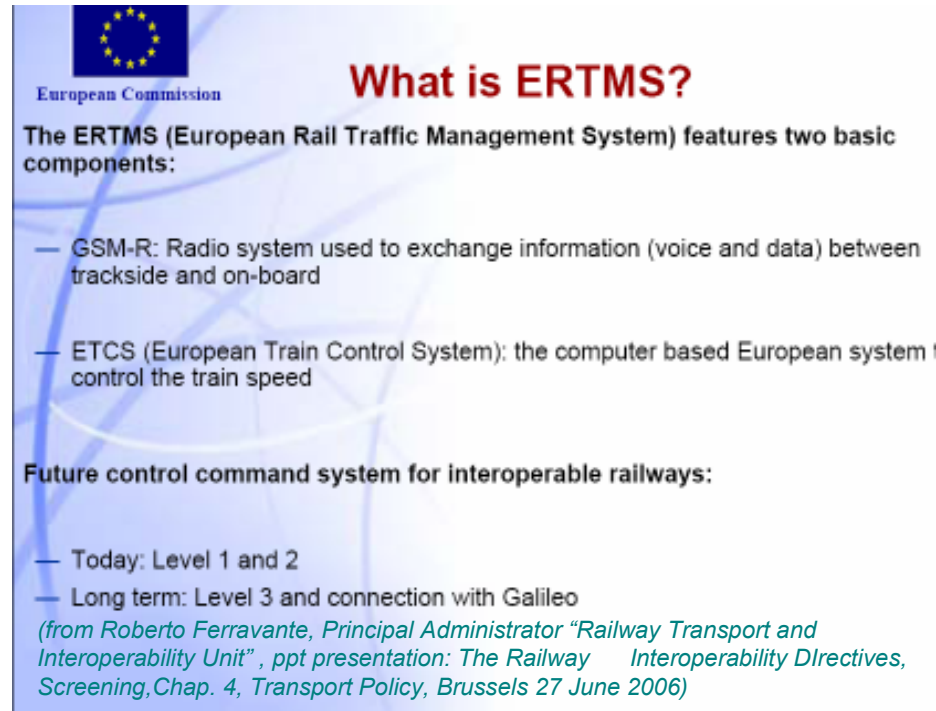
## HEROE: Background


(Harmonisation of European Rail Rules for Operating ERTMS)

### Project description:

The HEROE project was structured in order to:

- draw up appropriate rules in view of ERTMS operation, to allow an operational interoperability as broad as possible
- propose to the railways but also to the supervision authorities some keys to solve the most fundamental safety issues that would be set by progressive ERTMS implementation
- set a joint approach to the safety analyses for the main sub-system which could permit to harmonize the safety standards



  
European Commission

### What is ERTMS?

The ERTMS (European Rail Traffic Management System) features two basic components:

- GSM-R: Radio system used to exchange information (voice and data) between trackside and on-board
- ETCS (European Train Control System): the computer based European system that control the train speed

Future control command system for interoperable railways:

- Today: Level 1 and 2
- Long term: Level 3 and connection with Galileo

*(from Roberto Ferravante, Principal Administrator "Railway Transport and Interoperability Unit", ppt presentation: The Railway Interoperability Directives, Screening, Chap. 4, Transport Policy, Brussels 27 June 2006)*

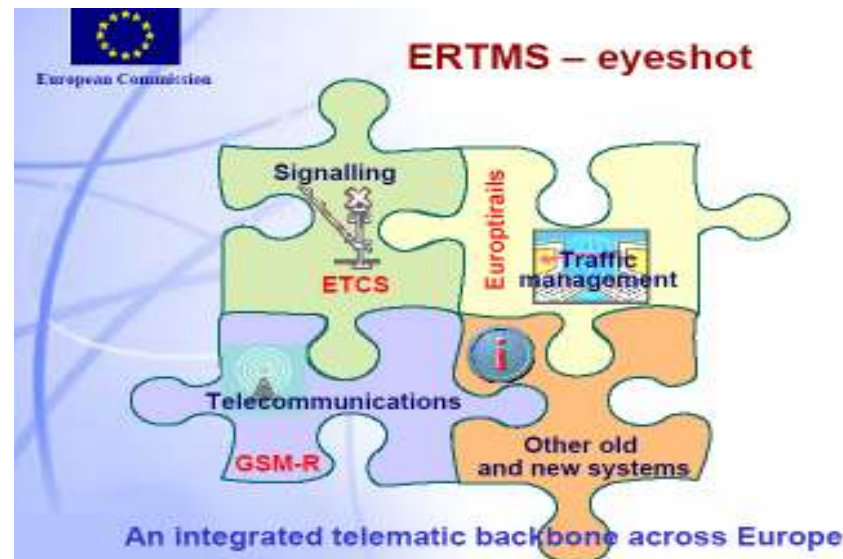
## HEROE: Background

(Harmonisation of European Rail Rules for Operating ERTMS)

### Project description :

At the beginning, the project was divided into 7 work- packages:

- - 1 management of the project,
- - 2 study of the current state of art.
- - 3 determination of new ERTMS rules and regulations, especially for the driver and the signalman,
- - 4 ways to harmonise rules and regulations during the transition period,
- - 5 study of safety problems related to rules and regulations,
- - 6 tests of the results
- - 7 writing of pre-standards and their dissemination



(from Roberto Ferravante, Principal Administrator "Railway Transport and Interoperability Unit", ppt presentation: The Railway Interoperability Directives, Screening, Chap. 4, Transport Policy, Brussels 27 June 2006)



## **HEROE: Background**

(Harmonisation of European Rail Rules for Operating ERTMS)

### **Project description :**

After the re-start of the project the Work Packages were organized into 5 groups:

- WP0 Management and administration
- WPA statement of ERTMS rules and regulations
- WPB assessment and tests of rules and procedures, from the point of view of safety
- WPC description of actual rules and regulations associated with ERTMS implementation
- WPD pre-standardisation for ERTMS rules and dissemination of results

At the time the project started the System Requirement Specifications (SRS) for ERTMS were still being defined within EEIG-ERTMS, and only the Functional Requirement Specifications (FRS) were available, though not in the finalised version. **HEROE paved the way for the definition of the SRS, initiating a task that supplied methodology, a picture of the state of the art and a functional analysis** that was brought ahead by the Operational Rules project, which also saw the participation of EEIG-ERTMS as active member, and which used the finalised version of SRS made by UNISIG.



## HEROE: Background

### Achievements:

The HEROE project can be said to have achieved its goals in that it created a platform analysis and methodology for rules and regulations that fed into the Operational Rules Group (EEIG-ERTMS) project and served as a building block for the definition of the norms which were later integrated into the TSI OPE (Operations) for interoperability related to ERTMS.

HEROE acted as a pilot project even though the project itself did not provide the definitive set of regulations, because this was too premature, seeing that the final specifications of the ERTMS system were implemented later on by UNISIG in 2001.

Among the reasons it did not complete all the work, was that

- **the ERTMS specifications were re-written during the project**, which caused a suspension for a year,
- **the project had a time constraint of two years, set by EC, which would otherwise have denied the funding**, and therefore even if the project needed more time, it had to be closed on schedule and so many trials were left for the next project to take up.

**Not all the results of the HEROE project were adopted since they referred to specifications that were in the making and that were later partly superseded by the final ERTMS SRS UNISIG specifications, absorbed into the TSI OPE in 2002.** These are now being implemented through the activities of the European Railway Agency (ERA).





## **HEROE: Background**

### **Achievements:**

An attempt at building a Drivers Rule book was made though the Rule writing Team found many of the rules proposed could not pass the integrity check, etc. At the end of the project it was decided not to adopt the Drivers Rule book and that it would be left to the decision of each railway undertaking for what rules to adopt.

A Functional Analysis was carried out to analyse all the possible case situations in railway operations and this was later used as input for the Operational Rules project in EEIG/ERTMS.

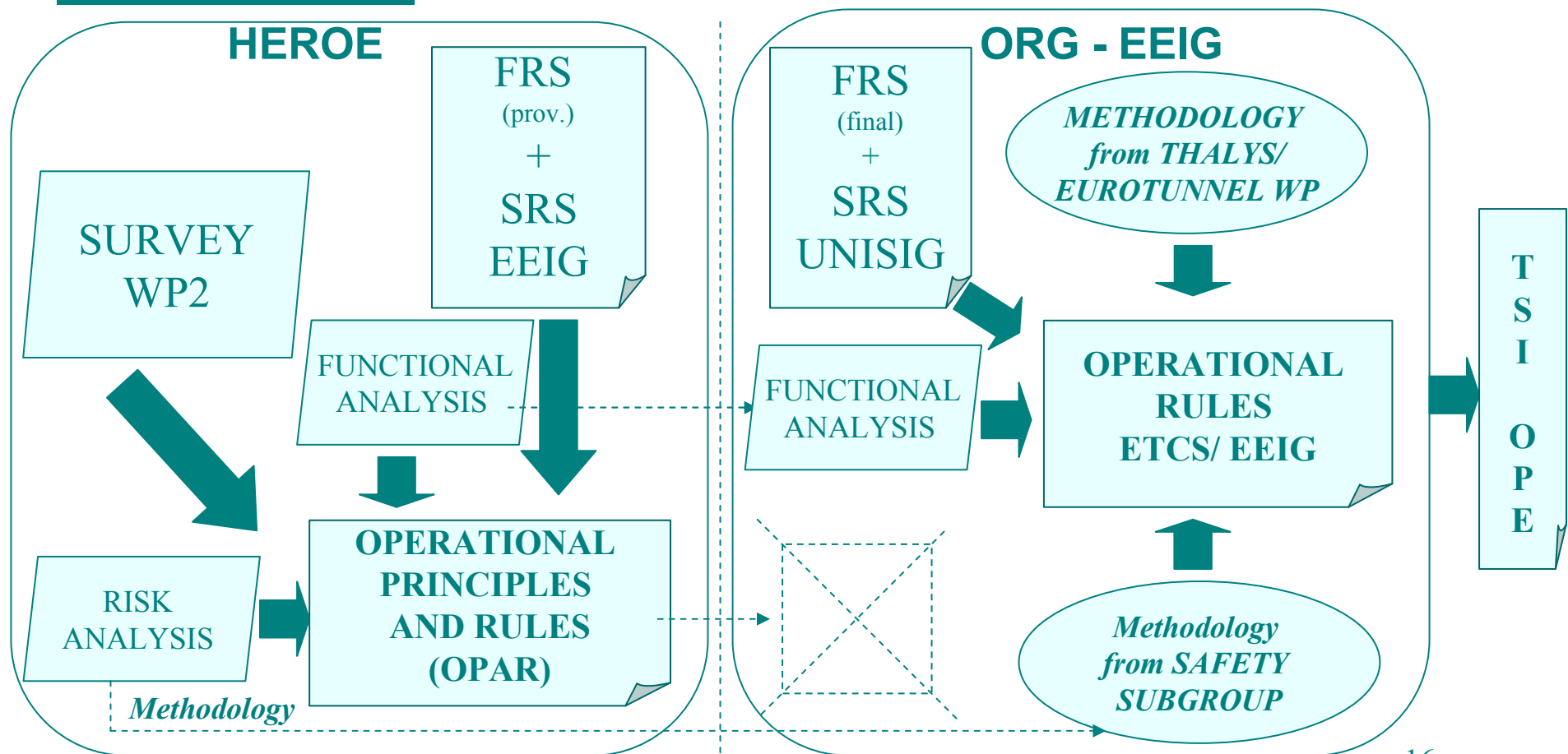
**HEROE project was basically an exercise for a next project – the ERTMS operational rules project (ORG). It helped understand better this very complex and difficult area – the Operational issues of ERTMS, and provided tools to manage a complex cross-cultural process.**

The main elements that passed into the Operational Rules Project from HEROE were:

- ❖ State of the art Survey of the existing situation in Europe
- ❖ Basic methodology (risk analysis etc.)
- ❖ Know-how of the people who passed onto the Operational Rules project
- ❖ Functional Analysis

# HEROE: Background

## Achievements: INPUTS FROM HEROE TO ORG-EEIG







## **HEROE: Evaluation**

### **Evaluation criteria:**

1. Were the results implemented in the design of the new products and services?  
Were these new products/services put into commercial operation

– **Partly.**

**The results of the ORG, based partly on HEROE initial work, were implemented into the TSIs for interoperability, Operation and Control Command, and served as a basis for the new regulations once the specifications of the ERTMS/ETCS technology were clearly defined.**

2. Is new legislation and standardization based on findings from this research project  
– **YES. Based on the findings of the HEROE project, a new project “the ERTMS Operational Rules” was launched. This took over the findings of HEROE and succeeded to deliver a first set of ERTMS operational rules which are now appended to TSI Operation, and have thus become Law**

## HEROE: Evaluation

### Evaluation criteria:

3. Are the results of the project implemented across Europe or only in a small number of Member States  
– partly, in relation to those parts that were absorbed into the TSIs and became mandatory for all European Railway undertakings (functional analysis, etc. The rulebook created in HEROE was addressing mainly the six EEIG railways (Italy, France, Germany, Netherlands, UK, Spain). There was no coordinated dissemination among non-EEIG railways.
4. Are the results of the project implemented outside Europe before being accepted in Europe – **no**
5. Did the projects increase competitiveness of the European railway sector abroad with regard to products, services, standards and system design – **no**
6. Did the project increase competitiveness of the railway transportation compared to other transport modes – **no**
7. Are the results of the project taken into consideration when preparing public tenders – **no**



## HEROE: Evaluation

### Evaluation criteria:

8. Does the implementation of the project results help facilitate cross-border operations by problem-solving in the domain of interoperability – **yes**
9. Does the implementation of the project results help facilitate inter-modal operations by problem-solving in the domain of inter-modality  
– **potentially yes: there have been calls for proposal to extend the findings to the freight cross-border operations**
10. Can benefits be assessed in financial terms – **not yet**
11. Applicability of results to future scenarios  
– **yes, since the results that were absorbed in the new TSIs**
12. Usefulness of research procedures for future projects (incl. modeling)  
- **Yes the research procedures developed in HEROE were used, as mentioned, later in the ERTMS Operational Rules project.**



## HEROE: Reasons for outcome

- **The call for proposals was too premature** and came long before the definitive ERTMS specifications were put in place. *“ERTMS specifications changed during the project, delaying for one year the results” (from the final Report)* **The result was that part of the outcomes of the project were not used at all and became obsolete even before the project ended.**
- From the self evaluation issued at the end of the project the conclusions were that the **ERTMS rules validation was a very difficult task, given that it was the first time that the Railway Undertakings teamed together with members of the industry and research institutes to attempt a structured approach to the issue.** In this sense it became an exercise of cross-cultural technological approaches and paved the way for future work, but at a high cost, with all the limitations of the inexperience of the time, given the context in which it was carried out:  
*“Each national railway has a different culture and approach of safety, and common rules are a compromise between often very different behaviours. (from the final Report)*
- **The project was underspecified and therefore met with obstacles that were related to factors external to the project that impacted greatly on its outcome.** Group members were heavily involved in other activities relating to a context of transition from one standard to another, so the task had to be taken up again after the conclusion of HEROE
- **Another big constraint was that the project was too ambitious for the two-year time span it was given and though it was frozen while waiting for the re-writing of ERTMS specifications, it was forced to end work before completion.**  
The Operational Rules Group (EEIG-ERTMS) , took on some of the outcomes of HEROE.. The final rules elaborated by the ORG finally entered the TSI Operation in 2002.



## HEROE: Lessons learnt

- **A project should be launched once the scope and the inputs it has to work on are clearly established so as to give the work team a valid basis to work upon.**
- **When dealing with operational rules and regulations, it is necessary to ensure participation of operational experts on the project and of researchers already familiar with the railway context**

*From final report: "It is necessary, but difficult, to find rules experts with knowledge on ERTMS specifications. It is a mistake to have only technical people, and operational experts are also needed."*

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