FOSTER RAIL

Future of Surface Transport Research Rail

Coordination and Support Action

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Deliverable D6.6

Good examples in the activities

WP	6	Monitoring to improve rail research innovation
Task	6.1	Monitoring of ongoing relevant projects
Task	6.3	Case studies

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[1] Dissemination level: **PU** = Public, **PP** = Restricted to other programme participants (including the JU), **RE** = Restricted to a group specified by the consortium (including the JU), **CO** = Confidential, only for members of the consortium (including the JU)

[2] Nature of the deliverable: **R** = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other

Table of Content

Executive Summary

An important part of the FOSTER RAIL project is the monitoring of rail research activity. Previously, the rail sector did not know the market impact of previous research and a great deal of research funding has been wasted on research that has had no demonstrable impact. Therefore, the ERRAC Evaluation Working Group (EWG) continued to evaluate completed rail projects within WP6 of FOSTER RAIL project.

Meantime, considering the lessons learnt from previous project evaluations, the EWG proposes to monitor relevant ongoing projects (within task 6.1) and develop significant case studies (within task 6.3). This Deliverable outlines the results of activities carried out within Task 6.1 and 6.3 of Foster Rail project (during months 1-36), and describes the monitoring of relevant ongoing rail projects and case studies of previous rail research.

Section §3 presents both the overall WP6 methodology and the monitoring methodology. The activities defined within Tasks 6.1 and 6.3 are new for ERRAC Evaluation Working Group, requiring thus some preparation and pilot actions. The group aims to better define and improve these activities (i.e., monitoring of ongoing projects and development of case studies) for the duration of FOSTER-RAIL project.

The ***monitoring methodology*** is based on the analysis of relevant ongoing rail research project with respect to foreseen implementation and exploitation of results, according to initial objectives and contracted research work. A questionnaire was developed to facilitate the discussions with the project coordinators and better clarify all aspects relating to implementation and market uptake.

The monitoring activities are detailed in Section §4 and the recommendation letters sent for the projects which were analysed and discussed are attached in Appendix 1. The Evaluation Working Group has selected relevant projects which were discussed and analysed during Foster Rail project. The monitoring process was completed for all the selected relevant projects.

The next section presents the approach and results related to ***'Case studies'***. Five projects were selected and further developed as case studies, with focus on their implementation and market uptake. Two examples of in-depth analysis and presentations for this scope are attached in Appendix 2. (ALJOIN project with a strong market uptake, and INTEGRAIL project with a weak market uptake respectively).

Section §6 shows the dissemination activities related to the Evaluation Working Group results, including both the evaluation of past research and case studies.

The final section makes conclusions on the activities and results achieved within the FOSTER-RAIL project, the lessons learnt being taken forward for further monitoring activities and development of relevant case studies, so that the EWG work would better support project coordinators towards implementation of results and market uptake.

From WP6, ERRAC Evaluation Working Group (EWG) has developed guidelines to provide ERRAC Work Package leaders, and others who are proposing research topics, activities and actions at National and European level, with the information needed to ensure strong market uptake. This has resulted in improvement in the impact of the rail research proposed by ERRAC.

List of tables

List of figures

1. Introduction

The Foster Rail project has been developed to assist ERRAC and other land-transport related ETPs to define future research needs for their strategies and programmes, so as to realise the Objectives of the Europe 2020 Strategy and work towards the aims of the White Paper 2011[3].

The CSA project itself comprises 8 Work Packages which, including project management and dissemination activities, interact to; enhance cooperation and communications between ETP, national platform and the Shift[2]Rail Joint Undertaking, define the a rail business scenario for 2050, assess existing strategies and roadmaps, develop these further to contribute to 2050 strategy fulfilment, assess the strategic and innovative impact of previous and new funded projects and programmes in terms of market impact and uptake. Work Package 6 (WP6) "Monitoring to improve rail research innovation" undertakes specifically the final actions mentioned.

WP6 (in both current Foster Rail and previous ERRAC Road Map projects) supports the ERRAC Project Evaluation Working Group (EWG). It addresses the strengthening of the effectiveness of research and innovation capacities of the rail sector in Europe by determining the implementation of previous research and monitoring of rail research projects from relevant programmes.

The EWG has previously used the evaluation method developed to evaluate past research projects from over 170 projects in the ERRAC rail projects database, which is continuously enlarging.

The EWG helps to identify, check and support proposals that clearly fill a gap in the roadmaps and support ERRAC strategy particularly for strategic proposals for the good of the sector.

Previously, the rail sector did not know the market impact of previous research and a great deal of research funding has been wasted on research that has had no demonstrable impact. This needed to change.

WP6 of Foster Rail aids this effort through 3 Tasks:

- **T6.1 Monitoring of Ongoing relevant Projects**
- T6.2 Evaluation of Past rail projects
- **T6.3 Case Studies**

Specifically, Task 6.1 focuses on the selection of important ongoing projects and monitoring them to determine their progress towards the impacts considered within their initial grants.

Task 6.3 focuses on those chosen projects to develop detailed case studies to determine best practice and also the barriers to market uptake and implementation. Alongside this, Task 6.3 aimed to present the case studies at workshops and similar events to foster innovation aspects and highlight related issues.

Both Task 6.1 and 6.3 have been conducted over 36 months.

Deliverable 6.6 Report outlines the overall results achieved by Task 6.1 and Task 6.3 activities during the Foster Rail project duration. Good examples were highlighted within FOSTERRAIL each year to M12, M24 and M36 with reasons for success, good criteria and best practice being identified.

[3] "Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system"

2. Objectives

One of the strategic objectives of FOSTER RAIL is to assess rail research projects from relevant research programmes. An important aspect of this is monitoring transport research projects in order to foster innovation and promote market uptake, innovation leading to implementation.

WP6 is dedicated to monitoring of transport research projects and organisation of workshops to foster innovation and market aspects. This WP addresses the strengthening of the effectiveness of research and innovation capacities of the rail sector in by monitoring of rail research projects to determine from all publicly funded transnational research which research activities can really been implemented and have a significant market impact. This process is based on an expanded version of the ERRAC Evaluation Working Group.

New project and programme monitoring activities are undertaken, to increase the visibility of research and innovation activities, and to contribute to the dissemination of research results. In addition to the traditional evaluations of potential market-uptake of finalised projects, a new monitoring dimension/perspective may enable a more proactive contribution of the Evaluation Working Group during on-going projects. Selected key on-going projects are being validated to determine and support their progress towards the impacts promised in the proposal.

This deliverable presents the overall results achieved within Tasks 6.1 and 6.3 of FOSTER RAIL, and Deliverable 6.5 deals with Task 6.2 Evaluation of past rail projects.

- **Task 6.1 Monitoring of Ongoing Relevant Projects**

Uses published materials and selects important projects per year that it believes will make a contribution to the railway sector. An initial list of selected projects was determined at the EWG kick off meeting, the projects selected were: D-RAIL, MARATHON, REFRESCO and MERLIN. In addition, other relevant projects have been considered during the next two years for monitoring, alongside the initial ones (e.g., SPECTRUM, SPARTACUS).

Monitoring of these on-going projects is a voluntary basis. The objective is to determine their progress towards the impacts promised in the proposal.

The EWG could assist with implementation strategies and exploitation routes. The activity started with an Initial project. The initial assessment has the following objectives:

- determine how the projects' goal and main objectives fit the ERRAC Roadmaps and, overall, the White Paper priorities;
- consider the consortium composition and how stakeholders are represented within the project;
- review the implementation plan and expected impact.

ERRAC EWG then provides the consortium and the project officer with a letter of recommendations and other available information which may support the market uptake of the project outcomes.

- **Task 6.3 Case Studies**

The objective is to work with the project champion to highlight the impact and assess the implementation within the rail sector against the implementation plans. Relevant in-depth case studies will be undertaken to determine best practice and also the barriers to market uptake and implementation. The first case studies were decided at the EWG kick off meeting and the strong example is ALJOIN, the weak example selected to show barriers to implementation being INTEGRAIL.

3. Methodology

The overall EWG philosophy and WP6 methodology are summarised within below Figure 1.

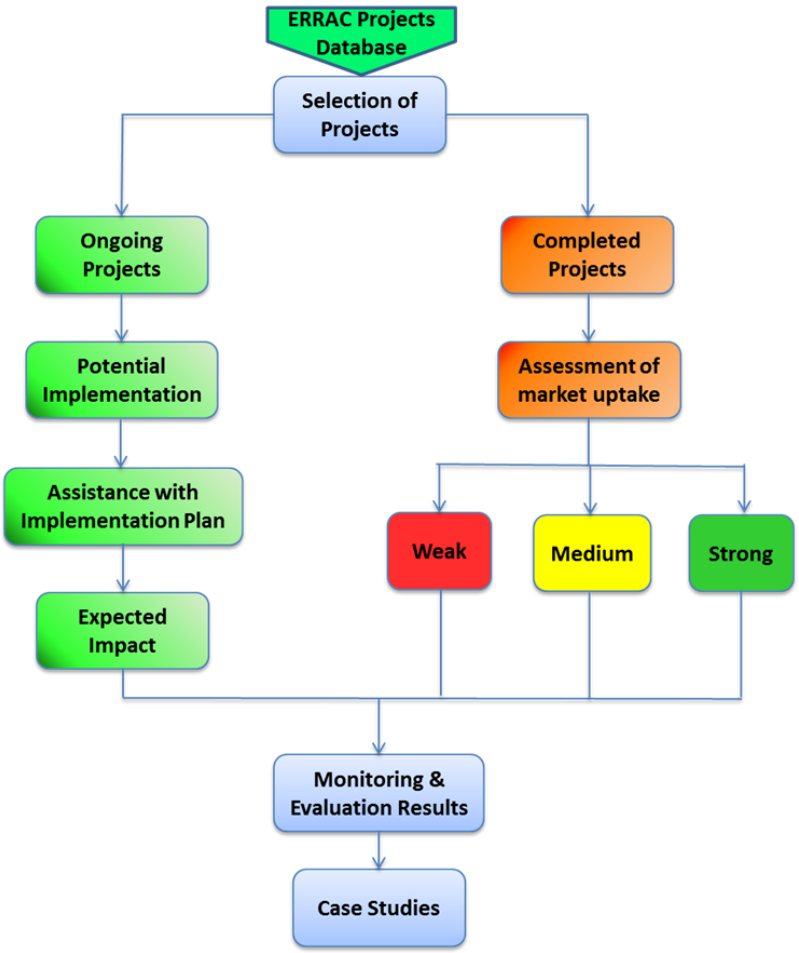

Figure 1 ERRAC EWG general methodology (past research, ongoing projects and case studies)

Overall, the WP6 focuses on the following key activities:

- Monitoring of ongoing projects
- Evaluation of past research
- Case studies

In order to support the main above activities, WP6 has to carry out other activities, namely:

- ✓ Administration of ERRAC projects database;
- ✓ Dissemination;
- ✓ Coordination with project coordinators and the EC.

The monitoring methodology is summarised below in Figure 2

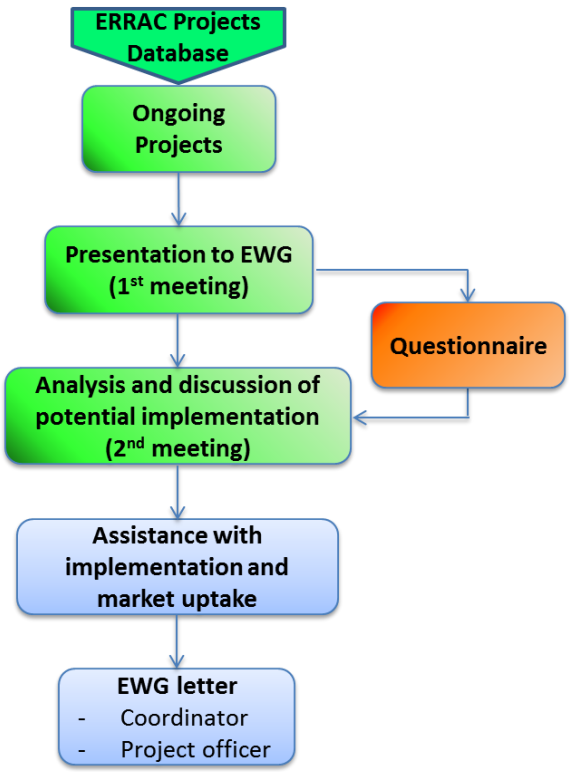

Figure 2 ERRAC EWG monitoring methodology

The monitoring of ongoing projects is a continuous process aimed to support key rail projects with respect to implementation of results and market uptake aspects.

The monitoring methodology comprises the following stages:

1. Using published and available materials, the EWG selects relevant ongoing projects to be monitored;
2. The project coordinator is contacted by the EWG, the monitoring process is explained and he/she is invited to a meeting for this purpose. However, the monitoring is done on a voluntary basis, so project coordinators may refuse to take part to this process;
3. The project coordinator and/or project key partners meet the EWG and present the project with a focus on implementation and exploitation of results, as it was granted;
4. The EWG conducts an initial assessment to analyse project goal, consortium/ stakeholder composition and implementation impact, on the basis of: i. available documentation (e.g., project grant, deliverables, project website, etc.); ii. presentation given by the project representatives and subsequent discussion with them;
5. If the previous phase is not relevant enough for the EWG to make conclusions and provide recommendations, a questionnaire is used to better define the foreseen implementation and exploitation of project results (i.e., industrial application, technical harmonisation; to identify customer/ implementer and understand climate for implementation, etc.);
6. Considering the feedback from the initial meeting and the questionnaire, the EWG concludes the monitoring phase or asks for a 2nd meeting if some aspects are still unclear after steps 4 and 5;
7. The project representatives meet the EWG for the 2nd time if necessary to better clarify some details relating to the implementation of results or other key aspects (e.g., partnership, advisory groups, etc.);

8. Finally, the EWG concludes the monitoring phase with a set of comments and recommendations in relation to all the requisites for a successful implementation and market uptake. The EWG writes a letter including these comments and recommendations, which is further addressed both to the Project Coordinator and to the EC relevant representative (the Project Technical Officer).

The questionnaire developed by the EWG for monitoring of ongoing projects is presented below.

1. Defining the targeted implementation results in the project

a. Industrial applications

i. Technology / product / software
ii. Business model
iii. Process
iv. Operations

b. Input to technical harmonisation

i. Technical Specification for Interoperability
ii. Regulation
iii. Standardisation

c. Other – please specify

2. Identifying the customer/implementer

a. ***Who will fund the implementation?***
b. ***Who will be responsible for the implementation?***
c. ***What drives the implementation/investment?***
d. ***Is there a secondary customer?***
e. ***What is the targeted scale of implementation?***

3. Understanding the climate for implementation

a. Who are the other major stakeholders impacted by the implementation?

i. Financially
ii. Politically
iii. Other – please specify

b. Are there regulatory issues influencing the implementation?
c. Are there funding issues influencing the implementation?
d. Relationship with potential interest groups positively or negatively impacting the implementation?

4. Understanding the relevance of the consortium composition in view of market implementation

Clarifying the ability of the consortium regarding the delivery of the expected results to the customer.

i. Are all the categories of stakeholders necessary for a proper market uptake represented in the consortium?
ii. To what extent does the project lead to proprietary solutions?

5. Understanding the process between the end of the project and the launch of market implementation

a. Steps involved as part of the industrialisation of products
b. Requirements regarding certification of products or processes

c. Requirements regarding retrofitting or modification of other assets and/or technical specifications/standards.

d. All the supporting documentation, trainings, handbooks, etc.

6. Understanding how this process should be managed

a. Who will take responsibility to drive the process?

b. Who will pay for it?

c. Which other stakeholders need to be involved?

7. Recommendations to boost implementation

Ideally, an efficient monitoring process would mean that the EWG to meet and discuss with the representatives of relevant ongoing process twice, at critical times during the project period, namely:

- 1st monitoring phase – after the start of the project, in the first 6 months, if possibly;
- 2nd monitoring phase – prior to the project completion, in the final 6 months of the project.

4. Monitoring of ongoing projects

The main activity of **Task 6.1** is the monitoring of relevant ongoing projects.

Over the lifetime of FOSTERRAIL and using published materials, ERRAC EWG selected relevant ongoing projects that it believes will make a contribution to the railway sector. The list of selected projects was determined at the EWG kick off meeting; those initially identified were D-RAIL, SPECTRUM, MERLIN, and REFRESCO. On-going projects have volunteered to be monitored to determine their progress towards the impacts promised in their proposal.

Coordinators of chosen projects were invited to present their newly-started projects relevant to rail sector (preferable between month 6 and 12 of the project) for an initial assessment.

The initial assessment mainly analyses the following aspects:

- how the projects' goal and main objectives fit the ERRAC Roadmaps and, overall, the White Paper priorities;
- the consortium composition and how stakeholders are represented within the project;
- the implementation plan and expected impact.

ERRAC EWG is also analysing the above aspects and providing the consortium and the project officer with a letter of recommendations and other available information which may support the market uptake of the project outcomes (related previous projects, contacts, etc.). This feedback is being formatted into a dedicated template which will be developed as part of the monitoring methodology.

Within 6 months prior to project completion, the coordinators of the chosen projects are invited to present the projects results. Where possible, ERRAC EWG is to invite representatives of stakeholders and third parties which may be interested in the project outcomes.

It was noted in the FOSTERRAIL proposal that the EWG could assist with implementation strategies and exploitation routes.

However, the activity of Task 6.1 was strongly influenced by the gap in rail research funding during the duration of Foster Rail project, which was due to:

i. the transition period from FP7 to H2020;
ii. the establishment of the S2R joint undertaking and subsequent delay caused to the new calls under this new programme.

Therefore, most of the projects still ongoing when the ERRAC EWG started the monitoring activity have been completed and the number of newly funded projects was very small. The ERRAC EWG made efforts to engage with the coordinators of the newly funded projects, however this was difficult because, being considered a too premature action and feedback to the coordinators and the EC.

A summary of the monitoring activities of selected relevant projects is shown below in Table 4-1.

Table 4-1 Monitoring of Relevant Rail Projects

Project	Monitoring Status	Planned activities
D-RAIL	Meeting in the starting phase. Finalised and EWG recommendation letter sent.	Meeting in the final phase.

MARATHON	Meeting in the final phase. Questionnaire feed backed. Finalised and EWG recommendation letter sent.	To be evaluated in the future.
REFRESCO	Meeting in the starting phase. Finalised and EWG recommendation letter sent.	Meeting in the final phase.
MERLIN	Meeting in the starting phase. Finalised and EWG recommendation letter sent.	Meeting in the final phase or mid-term.
D-RAIL	Meeting in the final phase. Finalised and EWG recommendation letter sent.	To be evaluated in the future.
SPECTRUM	Meeting in the final phase. Finalised and EWG recommendation letter sent.	To be evaluated in the future.
REFRESCO	Discussion with key partners and coordinator in the final phase. To be further monitored.	To be evaluated in the future.
SPARTACUS	Meeting at mid-term of the project, before starting the demonstration phase. Finalised and EWG recommendation letter sent.	To be evaluated in the future.

The monitoring processes of the selected projects have been completed with letters including the EWG comments and recommendations, which were sent to the project representatives and the EC project officer. The letters are attached within *Appendix 1* EWG recommendation letters to projects' coordinators and/or EC project officers.

For supporting the monitoring activities (both for the selected projects and in general, within broader dissemination events), the EWG has also analysed the approaches on Technology Readiness Levels (TRL) and Market Readiness Levels (MRL) in overall European Rail Research area. The EWG has further harmonised and adapted the 'standard' definitions, to be fully compatible with and suitable for the rail sector.

The definitions for TRL and MRL proposed by the EWG for railway innovation are presented below in Table 4-2.

Table 4-2 ERRAC EWG approach on TRL and MRL

Technology Readiness Level (TRL)	Market Readiness Level (MRL)
TRL 1 Scientific research begins translation to applied R&D lowest level of TRL. Published research that identifies the principles that	**MRL 1** Some basic ideas of implementation exist together with vague ideas on benefit of use. No real customer is identified. No

underlie this technology. References to Who, Where and When.	ideas of how to market, sell, manufacture and put into operation exist. It is known that several potential customers are uninterested or even against implementation.
TRL 2 Invention begins - once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or analysis to support the assumptions. Examples are limited to analytic studies.	**MRL 2** Implementation requires co-operation and co-financing among several independent entities not used to co-operate or unwilling to co-operate. Barriers to implementation not known. No business case exists. Basic understanding of the competitive situation the implementation will face exists**.**
TRL 3 Active research and development is initiated including analytical studies and laboratory studies to physically validate predictions of separate elements of the technology. Examples include components that are not yet integrated. This level should constitute "proof of concept" of the intended application.	**MRL 3** Draft business cases are developed. Identification of real end customer done together with understanding of their needs and motivation for implementation. Understanding of surrounding conditions for implementation starts to materialize.
TRL 4 Basic technological components are integrated to establish that pieces will work together. This validation must be devised to support the concept that was formulated earlier, and should also be consistent with the requirements of potential system application. This validation is" low -fidelity" compared to the intended application.	**MRL 4** Agreement with lead customer/implementer and supplier exist meaning that provided successful technical realisation this core group will execute the realistic demonstration of the research project delivery
TRL 5 Fidelity of technology improves significantly. The basic components are integrated with reasonable realistic supporting elements so it can be tested in a simulated environment.	**MRL 5** Full understanding on surrounding conditions for implementation exists. Full understanding of the commercial "state-of-the-art" the implementation will face exists.
TRL 6 Representative model or prototype system is tested in a relevant environment. Example includes testing a prototype in a high-fidelity laboratory or in a simulated operational environment.	**MRL 6** Agreement between project partners exists, stipulating how the project result should be exploited after the finalisation of the research project, either collectively or individually.
TRL 7 Represents a major step up from TRL 6 requiring demonstration of an actual	**MRL 7** Real end customer is involved in defining requirements and conditions for realistic

system prototype in a real operational environment.	operational demonstrators. The competitive situation the implementation will face is understood and under control.
TRL 8 Technology is proven to work. Actual technology completed trough test and demonstrations. Technologies are in commercial use outside the railway domain.	**MRL 8** No barriers from legislative or standardization point of view exist. Manufactures are established and ready to deliver. Incorporation of the technology within a wider system is determined and requires no extra work.
TRL 9 Technology proven in successful railway operation. Wide implementation can be launched from a technical point of view.	**MRL 9** It is almost certain that customers will start implement the technology after initial demonstrators either because of strong business case or from obligations from standards or legislation or end customer demand (passenger).

The EWG aims to further extend this approach and develop a support tool to allow the researchers in rail sector to self-assess their own research initiatives and results.

5. Case studies

Within **Task 6.3, t**he EWG worked with the project champions to highlight the impact and assess the implementation within the rail sector against the implementation plans.

Specifically, four in-depth case studies are being undertaken on four of the projects throughout their life, to determine best practice and also the barriers to market uptake and implementation.

The first actual case studies were decided at the EWG kick off meeting and the strong example was ALJOIN, the weak example selected to show barriers to implementation being INTEGRAIL.

The in-depth analysis of these case studies has been carried out and presented, the main outcomes being summarised below (detailed presentations are included in Appendix 2.).

- **Case study: ALJOIN project**

ALJOIN project was initially developed as a case study template in line with the EWG recommendations and evaluation methodology. Its presentation included in Appendix 2. From the case study it can be seen that projects with a ***strong market uptake*** listed previously answered a clear need for a harmonized solution and had a clear and positive business case. Usually the project had no competition tensions with all the partners pulling in the same direction and as the research was pre-competitive it was without strategic issues between partners' interests. The project clearly defined the ownership of implementation of project results, which were in the hands of one relevant stakeholder. This was an undivided business case. It is to the credit of the projects with strong market uptake they were able to convert results into international standards. As major users were involved in the initial requirements definition and assessment of results a broad consensus was established from the beginning. It is also clear that the project had the continuity and ability to build up results on its predecessor, expanding the scope and gradually solving problems in a systemic approach.

Using the ALJOIN Case study as an example, the key project drivers were the identified requirements to address the research needs and safety concerns over the performance of aluminium welds in rail vehicles. Recommendation 57 in the Rt Hon Lord Cullen PC Inquiry Report in the aftermath of the Ladbroke Grove accident stated:

In the case of new vehicles constructed of aluminium, consideration should be given to:

a) the use of alternatives to fusion welding;

b) the use of improved grades of aluminium which are less susceptible to fusion weld weakening; and

c) the further development of analytical techniques.

In addition with ALJOIN the actual implementation facilitated the impact assessment of the project and impact was assessed for safety, standards and from the scientific perspective:

- ***Safety***

The results have improved the crashworthiness of aluminium rail vehicles and as such, can contribute to a reduction in fatalities and injuries in potential future accidents involving this type of vehicle. According to DfT's Highways Economics Note No. 1, the value of preventing a statistical fatality is £1.428m (2005 prices); There were 31 fatalities in the Ladbroke Grove accident. Therefore, the cost of this research (£1.37m) is less than the statistical value of 1 fatality.

- ***Standards***

The output from ALJOIN has directly contributed to 2 European Standards, EN 15085 "Railway applications - Welding of railway vehicles and components" and EN 15227, "Crashworthiness of Rail Vehicle Bodies".

- ***Scientific***

The study has improved the fundamental understanding of the issues related to aluminium structures for rolling stock. 2 Journal papers, 2 specialised publications and 9 conference papers have been produced. A dedicated International Conference on Aluminium Crashworthiness held at the National Railway Museum in York on 07 September 2005. The work has received 2 prestigious awards: IMechE safety and railway innovation.

From the ALJOIN Case Study the following lessons were learnt:

- There was industry recognition of a problem affecting the core of their business and their commitment to find a solution drove the success of the project. In this case the safety concerns were particularly critical for modern rail vehicles using aluminium.
- A coordinated response to a research need identified as a consequence of a tragic event led to the understanding of fundamental issues related to Aluminium joining technologies and their crashworthiness. This emphasized that a strong need for research is beneficial to success.
- The quality of the work also contributed to the success of the project as has the dissemination of its result beyond the lifetime of the funding. This is an important lesson that shows that results from research cannot be self-promoting and appropriate post-project dissemination is critical to maximise the benefits.

➢ **Case study: INTEGRAIL project**

INTEGRAIL project was selected as a case study with a ***weak market uptake***, to identify and highlight the barriers to implementation and show the lessons learnt to currently ongoing research and serve as guidance to consortia developing new proposals.

The case study was being prepared in a format similar with ALJOIN, but with specific focus on failure causes, and the EWG tried to explain and highlight the causes for the weak implementation of the project results.

The method used in the in-depth case study analysis was to compare the objectives from the project with key drivers for market uptake as found in the evaluation work of more than 10 years. Where poor matching were found the market uptake was low or none existent. If a similar matching process had been carried out prior to launching the project, the market failure could have been avoided.

The analysis on the causes of a weak market uptake considered the following Key drivers for market uptake:

1. Business case: there needs to be a strong incentive for implementation, which is normally expressed in a business case. This should preferably be a complete case i.e., the one who takes the cost should also take the benefit.
2. Strategy: there needs to be a strategic or commercial interest among project partners and implementers at large that application will be beneficial to the rail sector.
3. Continuation: there needs to be post-project capacity to continue towards the real implementation necessary for delivery of whatever is needed from one or a few sources. Intellectual property rights must be agreed on and accepted.
4. Understanding: the complete implementation infrastructure must be understood and facilitated during the project lifetime. Implementation in relation to TSI, EU standards, follow on cost, approvals from external authorities etc.

5. Cost of implementation: the full cost of implementation needs to be estimated at least on a base scenario.

The EWG has compared and assessed the project initial objectives with the above key drivers, and concluded thus by finding that none of them was evident in the InteGrail project. The market failure could therefore have been foreseen had a proper analysis taken place before launching the project.

looking for opportunities to finalise the presentation in the right format and present this case study (i.e., events in relation with rail or general transport research).

In addition to the above two examples, other three projects with strong market uptake were selected and analysed in-depth as case studies, to identify and understand the drivers and conditions for successful implementation and market uptake. The selected projects were:

- TIGER and its follow-up, TIGER Demo:
  - TIGER: Transit via Innovative Gateway concepts solving European Intermodal Rail needs;
  - TIGER Demo: Trans-Rail Integrated Goods European-Express Routes Demonstrators;
- BRAVO: Brenner Rail Freight Action Strategy Aimed at Achieving a Sustainable Increase of Intermodal Transport Volume by Enhancing Quality, Efficiency, and System Technologies.

TIGER and TIGER Demo have been presented in various dissemination events, and the EWG supported the coordinators with aspects related to implementation and exploitation.

BRAVO project is a typical example of project which was conceived on the basis of a real and critical market demand, being therefore timely and successfully contributing thus at the actual solution on Brenner corridor, which has one of the highest traffic in Europe.

6. Dissemination of results

Also within **Task 6.3**, work was carried out to scope and organise workshops to foster innovation aspects and highlight implementation related issues such as IPR, licenses, funding etc.

The most relevant activities in this direction are listed below.

1. Presentation of case study (ALJOIN) at ***Horizon 2020 information and networking day***, London, 8th November 2013;
2. Presentation of EWG approach with respect to Technology Readiness Levels (TRL) and Market Readiness Levels (MRL) in railway innovation at the ***ERRAC Plenary,*** Brussels, 15th November 2014;
3. Presentation of EWG activities and results at the ***SPECTRUM Project General Assembly and Workshop***, Newcastle, 21st May 2014;
4. Paper on EWG activities and results, and oral presentation at ***TRA2014 Transport Research Arena 2014***, 14-17 Apr 2014, Paris:

   "Monitoring of rail research projects to improve market impact and implementation"

   Mark Robinson, Dan Otteborn, Cristian Ulianov
5. Presentation of EWG activities and results at the ***RailNewcastle Conference 2015***, Newcastle, 15-17th July 2015;
6. Presentation of EWG activities and results at the ***UIC Research & Innovation Coordination Group (RICG) Workshop***, Paris, 9th February 2016.

7. Conclusions and way forward

Monitoring of projects is a proven method for strengthening of the effectiveness of research and innovation capacities of the rail sector in Europe by promoting the innovation in on-going projects and learning the lessons of previous research. There is no Innovation without Improvement and Implementation.

FOSTER-RAIL takes responsibility for the changing needs and innovations for Research and Technological Development in the rail sector. In addition it should evaluate the impact of its activities with the aim of facilitating and managing the better implementation of the priorities set by the SRRIA, keeping in mind the transport research priorities as described in the FP7 Transport Work Programme and Horizon 2020. Its work will support European Union initiatives, in both the Transport Policy and Industrial domains.

The main impact will be a strengthened cooperation of all minor and major stakeholders involved in rail transport and urban mobility in Europe whereby it will be possible to reach the goals stated as objectives, such as value for money and increase the use of the railways by enhancing its' competitiveness in all respects, at the same time enhancing the competitiveness of the European rail industry, by the promotion of rail research and technological, scientific excellence together with investment in rail infrastructures in an enlarged Europe (and considering those beyond the EU borders).

The impact of research activities should be evaluated on the basis of performance criteria of this mode of transport, its transport means, rolling stock, its infrastructure and its supportive facilities.

One important characteristic cuts across all the European railway businesses: the European railways need to provide improving value for money for more attractive rail services. In some cases that will be necessary to provide funds for re-investment; in others it is a necessary condition for survival. To ensure that the railways deliver better value for money must, therefore, be at the heart of the research programme and this can only be achieved by monitoring.

FOSTER-RAIL provides a vision of rail research in order to increase the attractiveness of investment rail research, as the promoters of research in railway transport will be increasingly aware market uptake through evaluation (WP6) and therefore of the benefits in terms of the improvement of their rail transport system and to their transport networks as a whole.

The discussion of ERRAC EWG in dissemination events and workshops made it clear that:

1. Projects should search for viable solutions in terms of applicability and cost implications, and develop real business cases;
2. There is a real need to think of future market uptake and what happens after project ends: the project as an enabler and not an end to itself;
3. Scope, inputs and deliverables should be clearly defined at project at inception;
4. Ownership of project results and deliverables should be clarified at inception;
5. The project needs committed partners really interested in finding and applying viable solutions (e.g. for new products, involve companies that actually make them to avoid barriers to implementation);
6. Possible problems/ barriers to implementation should be considered to avoid split of interest and weak market uptake, taking account of implications for strategic interests of key players to *avoid strategic, commercial, technological and operational constraints (e.g. not to devise technical solutions that incur extra costs to another party, without involving* them);
7. The project should set-up a Steering Group of experts/stakeholders familiar with context at play, to be in charge of advisory aspect and exploitation of results once the project has ended;
8. There is a need to plan for knowledge retention and dissemination at inception;

9. Clear communication channels and frequency of exchange should be encouraged;
10. A regular review on post-project progress (possibly electing a project responsible/promoter) should be conducted.

Appendix 1 EWG recommendation letters to projects' coordinators and/or EC project officers

Project acronym	Project title
D-RAIL	Development of the Future Rail Freight System to Reduce the Occurrences and Impact of Derailment
MARATHON	Make Rail The Hope for protecting Nature
REFRESCO	Towards a Regulatory Framework for the Use of Structural New Materials in Railway Passenger and Freight Carbodyshells
D-RAIL (2nd / final letter)	Development of the Future Rail Freight System to Reduce the Occurrences and Impact of Derailment
MERLIN	Sustainable and intelligent management of energy for smarter railway systems in Europe: an integrated optimisation approach
SPECTRUM	Solutions and Processes to Enhance the Competitiveness of Transport by Rail in Unexploited Markets
SPARTACUS	Satellite Based Asset Tracking for Supporting Emergency Management in Crisis Operations

➢ **D-RAIL Letter**

ERRAC *European Rail Research Advisory Council*

RECOMMENDATIONS FROM ERRAC EVALUATION WORKING GROUP (EWG)

To: D-RAIL consortium

Subject: Feedback from D-RAIL project pre-evaluation on 31st May 2012, CER Brussels

D-RAIL *("Development of the Future Rail Freight System to Reduce the Occurrences and Impact of Derailment")* is a 3 years FP7 funded project which started in 2011 and is jointly coordinated by the International Union of Railways (UIC) and Newcastle Centre for Railway Research (NewRail).

D-RAIL consortium, represented by Bjorn Paulsson (UIC) and Gordana Vasic Franklin (NewRail), has presented the structure of the project, the first outcomes and planning of future activities as well, to the Evaluation Working Group of ERRAC on the 31st May 2012, at CER Brussels.

Considering the project's objectives, planning of work and future challenges, the Evaluation Working Group has analysed its potential with respect to the implementation of results and market uptake. As a result the EWG would like to make the following ***recommendations to D-RAIL consortium:***

- Some commercial aspects should be better addressed to justify further investments in technology developed for reducing the occurrence of derailments (example: the cost of such investments might be higher than derailments' cost).
- The project has a consistent and experienced partnership and a good knowledge of the state of the art of derailments problem. However, considering the large number of related projects, a permanent communication of results and update of information is needed between all these ongoing projects.
- Some basic instruments for the implementation of results are mentioned in WP8 of D-RAIL. However, the EWG considers that the implementation process would be more efficient if a supplementary dedicated workpackage would be added, i.e. "WP9 Implementation support". Since the new framework programme "Horizon 2020" prioritises the implementation of results, providing supplementary funds for this purpose, the EWG suggests that D-RAIL could request funds for a new workpackage to deal with implementation issues.
- Considering D-RAIL partnership it was observed that most of the implementation support is expected from Infrastructure Managers. EWG recommends to D-RAIL

ERRAC Evaluation Working group Chairman
Luisa Velardi, Ferrovie dello Stato

ERRAC WP06 Secretariat
Léa Paties, UNIFE

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consortium to address this gap, eventually by initiating a collaboration with the International Union of Wagon Keepers (UIP) – Mr. Holger Segerer (Holger.Segerer@uiprail.org) from UIP was recommended as contact person on behalf of EWG (Dan Otteborn).

- The European Railway Agency (ERA) should be permanently updated with the project's results and consulted on potential possibilities of implementation (e.g. is ERA prepared to mandate the onboard monitoring equipment; who will support the investment?).
- The work to be carried out in WP3 and WP4 should analyse and make the difference between various monitoring systems (on loco/ on train/ on each wagon, infrastructure/ rolling stock onboard systems, etc.). Business cases should analyse and define which stakeholders will support the costs for each different system (divided business cases are difficult and risky – to be taken into consideration). D-RAIL consortium should also take care of issues regarding the testing of novel solutions before these are proposed for implementation.
- Overall, the investment issues are considered to be the most sensitive and critical for the implementation of D-RAIL results. Therefore, the partners should focus and address these issues in advance.

The EWG were very impressed with the D-RAIL project and commend their initiatives and approach to towards implementation. D-RAIL are unique in preparing for implementation and writing this EWG coordination into the description of work. This 2 way communication could be helpful both for project coordinators in improving the implementation activities, and for the EWG to enhance its activity and disseminate its knowledge. Therefore, the EWG would like to encourage other project coordinators to get involved in such pre-evaluation process as well.

ERRAC Evaluation Working group Chairman
Luisa Velardi, Ferrovie dello Stato

ERRAC WP06 Secretariat
Léa Paties, UNIFE

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➢ **MARATHON Letter**

European Rail Research Advisory Council

Mr Blaise de Vadder
Mr. Ludger Rogge
EUROPEAN COMMISSION
Directorate General for Research and Innovation
Office COV2 – 07/011
Office COV2 – 07/59
B 1049 Brussels

Re: ERRAC Evaluation Working Group - FOSTER RAIL
Task 6.1 Monitoring of Ongoing Relevant Projects

MARATHON FP7 project

Dear Sirs,

In accordance with FOSTER RAIL, Project number 605734, contractual obligations, work package 6. The Evaluation Working Group is entrusted to select and monitor relevant ongoing projects (Task 6.1) and formulate an opinion on these projects in the following areas:

A. How the projects' goal and main objectives fit the ERRAC road map and, overall, the white paper priorities.
B. The consortium composition and how stakeholders are represented within the project.
C. The implementation plan and expected impact.
D. Progress towards the contractual obligations in regards to impact.
E. Recommendations on how to increase the market up-take and consequently the impact.

Work Package 6 Evaluation Working Group have now completed the first on-going project monitoring session for MARATHON and concluded the following:

A. How the project goal and main objectives fit the ERRAC road map and, overall, the white paper priorities

The Marathon overall objective is *"To improve the performance and appeal of rail freight service for the customer"*.

The Evaluation Working Group is of the opinion that:

The objectives of the MARATHON project are perfectly in line with the ERRAC roadmap and the priorities of the white paper.

ERRAC Evaluation Working Group Chairman
Dan Otteborn

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B. The consortium composition and how stakeholders are represented within the project.

The consortium consists of 19 partners representing relevant freight traffic operators, freight forwarders, manufacturing industries, universities and branch organisations.

The Evaluation Working Group is of the opinion that:

The consortium is well constituted and well suited for performing the project aims including market uptake of results.

C. The implementation plan impact and expected impact

The project has its focus on the following five main drivers:

- Rail freight capacity increase.
- Increase in commercial speed for freight trains for accessing higher value slots for better services to the customers
- Traffic bundling for economies of scale: standard trains can easily be assembled disassembled as market conditions and operational circumstances may require
- Operating cost reduction
- Energy savings and sustainable mobility

The reduction of operational cost is estimated between 30 to 50% by introduction of faster, longer and heavier trains.

The Evaluation Working Group is of the opinion that:

- Unlike most other EU financed research projects the MARATHON project includes work packages directly aimed at securing market uptake. These are WP 1 Market uptake, WP 4 Business case simulation and evaluation. The deliverables include a proposed TecRec, which is a forerunner of an EN standard and additionally a handbook describing the handling and use of the system.
- The above described elements of an implementation plan are supported through the impressive full-scale demonstrators.
- The expected impacts are substantial not only in terms of direct cost reduction but also from the fact that additional capacity could eliminate or postpone very expensive investment in building of new lines, while providing such capacity in much shorter time as required by the market place.

D. Progress towards the contractual obligations in regards to impact

A full-scale demonstration was performed on January 18 by running a MARATHON train between Lyon and Nimes in France. Data accumulated during this full-scale demonstration strengthens the belief in achieving the 30 to 50% cost reduction. During the Trial it has been

ERRAC Evaluation Working Group Chairman
Dan Otteborn

➢ **REFRESCO Letter**

European Rail Research Advisory Council

Mr. Ludger Rogge
EUROPEAN COMMISSION
Directorate General for Research and Innovation
Office COV2 – 07/011
Office COV2 – 07/59
B 1049 Brussels

Re: ERRAC Evaluation Working Group - FOSTER RAIL
Task 6.1 Monitoring of Ongoing Relevant Projects

REFRESCO FP7 project

Dear Mr. Rogge,

On behalf of the ERRAC evaluation working group (FOSTER RAIL WP6), I am contacting you regarding the ERRAC activities on the evaluation of ongoing research projects.

As you may be aware, ERRAC has been successfully evaluating past research projects since 2006. In 2013, the ERRAC Evaluation Working Group, in the framework of the FOSTER RAIL project, launched an activity on monitoring ongoing research projects.

I am therefore happy to send you the first report of the group further to the evaluation of the project REFRESCO.

I am looking forward to hearing from you soon. The ERRAC evaluation working group remains at your entire disposal for further information.

Yours sincerely,

Dan Otteborn
Chairman ERRAC Evaluation Working Group

ERRAC Evaluation Working Group Chairman
Dan Otteborn

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ERRAC Evaluation Working group

FOSTER RAIL - Monitoring to improve rail research innovation - *Monitoring of ongoing projects*

REFRESCO – "Towards a REgulatory FRamework for the usE of Structural new materials in railway passenger and freight CarbOdyshells" (Grant Agreement number 605632).

Coordinator: Ross Hanley, UNIFE (ross.hanley@unife.org)

Project Officer: Ludger Rogge, DG Research and Innovation

In accordance with the FOSTER-RAIL project (Grant Agreement number 605734), the partners of the ERRAC evaluation working group (FOSTER RAIL WP6) are responsible for monitoring relevant on-going projects (Task 6.1) and formulating an opinion on these projects in the following areas:

A. The consortium composition and how stakeholders are represented within the project.
B. The implementation plan and expected impact.
C. Progress towards the contractual obligations in regards to impact.
D. Recommendations on how to increase the market up-take and consequently the impact.

The Evaluation Working Group has now completed monitoring of the second on-going project, REFRESCO and concluded the following:

A. How the project goal and main objectives fit the ERRAC road map and, overall, the white paper priorities.

The overall objectives of REFRESCO are to "set the framework for the implementation of new materials in the railway sector through the evolution of certification process for rolling stock. REFRESCO will generate recommendations and provide the information needed to adapt the regulatory framework of railway carbody structures to the introduction of new materials."

The Evaluation working group is of the opinion that the objectives of the REFRESCO project are perfectly in line with the ERRAC priorities and objectives as well as with those of the European Commission's White Paper[1].

[1] http://eur-lex.europa.eu/legal-content/EN/ALL/;ELX_SESSIONID=BSQhTftD9jrJb1tTfnpZTK1LJQL4Gpd7lJJ7f8C80Xx6db5mG2BN!1962263515?uri=CELEX:52011DC0144

ERRAC Evaluation Working Group Chairman
Dan Otteborn

European Rail Research Advisory Council

B. <u>The consortium composition and how stakeholders are represented within the project</u>.

The consortium consists of 18 partners gathering manufacturers, railway undertakings, universities and sector organisations, including one certification body.

The opinion of the evaluation working group is the following:

- The involvement of more certification bodies could be foreseen to further guarantee the wide acceptance of the project results.
- As the project intends to influence the regulatory framework, the involvement of the European Railway Agency, CEN, CENELEC and National Safety Agencies in the REFRESCO Advisory Council was already foreseen at project inception and is already running.

C. <u>The implementation plan impact and expected impact</u>

As the implementation of the project results relies on the success of the development of new lightweight materials which is not part of the scope of REFRESCO (they will be developed at a further stage in another initiative), the overall market uptake also depends on the success of the developments to come.

The Evaluation working group is of the opinion that:

- REFRESCO will be able to propose new ways to certify new materials and propose modifications to existing legislation. The real impact should be realised if the results of REFRESCO are combined with research development as well as market acceptance of new lightweight materials on the market.
- Since REFRESCO is engaged (in WP2) in the identification of potential suitable new materials, the ERRAC Evaluation Working Group suggests the project should consider cost efficient solutions (materials, processes and maintenance) as factors in searching for new suitable lightweight materials.

D. <u>Progress towards the contractual obligations in regards to impact of the project:</u>

The ERRAC Evaluation Working Group is of the opinion that REFRESCO will succeed in its contractual obligations. However, the group would like to reiterate that the overall market uptake of the project will depend on the success of other projects outside the control of REFRESCO.

ERRAC Evaluation Working Group Chairman
Dan Otteborn

European Rail Research Advisory Council

E. <u>Recommendations on how to secure and increase the market up-take:</u>

The Evaluation working group is of the opinion that:

- The project should try to actively involve more certification bodies. The REFRESCO Advisory Council is however already a good framework for involving external regulatory partners.
- The project should consider cost efficient solutions (materials, processes and maintenance) as factors in searching for new suitable lightweight materials.
- The project should use EN Standards as a final delivery as much as possible.

ERRAC Evaluation Working Group Chairman
Dan Otteborn

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➢ **D-RAIL 2nd / final Letter**

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Mr. Blaise de Vadder
EUROPEAN COMMISSION
Directorate General for Research and Innovation
Office COV2 – 07/011
B 1049 Brussels

27 November 2014

Re: ERRAC Evaluation Working Group - FOSTER RAIL
Task 6.1 Monitoring of Ongoing Relevant Projects

D-RAIL FP7 project

Dear Sir,

In accordance with FOSTER RAIL, Project number 605734, contractual obligations, Work Package 6, ERRAC Evaluation Working Group is entrusted to select and monitor relevant ongoing projects (Task 6.1) and formulate an opinion on these projects in the following areas:

A. How the projects' goal and main objectives fit the ERRAC road map and, overall, the white paper priorities.
B. The consortium composition and how stakeholders are represented within the project.
C. The implementation plan and expected impact.
D. Progress towards the contractual obligations in regards to impact.
E. Recommendations on how to increase the market up-take and consequently the impact.

Work Package 6 Evaluation Working Group has now completed the final monitoring session for the D-RAIL ongoing project and concluded the following:

A. How the project goal and main objectives fit the ERRAC road map and, overall, the white paper priorities

The D-RAIL overall objective is to *"Reduce the occurrences and Impact of freight train derailments"*.

The Evaluation Working Group is of the opinion that:

The objectives of the D-RAIL project are perfectly in line with the ERRAC roadmap and the priorities of the white paper.

As a target for the Transport White Paper European rail freight is of strategic importance and derailments cause serious disruptions to the rail system. Hans Gunter Kersten (UIC) has shown that the UIC leaflets could be updated with the new knowledge from D-RAIL. It was proposed as

ERRAC Evaluation Working Group Chairman
Dan Otteborn

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an action to champion this initiative within UIC. It was recognised that EC project EURAXLES should also contribute to knowledge as axles were considered by this project and not by D-RAIL to avoid duplication. UIC and ERA will need to consider the outputs from EURAXLES and determine any gaps in this knowledge.

B. The consortium composition and how stakeholders are represented within the project.

The consortium consists of 20 partners representing relevant freight traffic operators, freight forwarders, manufacturing industries, universities and branch organisations.

The Evaluation Working Group is of the opinion that:

The consortium is well constituted and well suited for performing the project aims including market uptake of results.

C. The implementation plan impact and expected impact

The topic of derailment is of great importance and the continued involvement of UIC and ERA in promoting, supporting and pushing the topic was crucial for the implementation of the results of D-RAIL and improvement in prevention and mitigation of freight train derailments. This topic is important internationally and as it is a safety topic it is important to share information in order to improve rail worldwide.

NewRail indicated that there was an issue with incident reporting but the research had shown there were 2 major topics that should be targeted to have a major impact on the freight train derailments:

1. Hot axle box and axle rupture
2. Spring and suspension failure.

It was reassuring that there were up to date statistics on freight train derailments available from UIC. There may be a requirement consider the actual countries involved and ensure consistency of data collection.

Chalmers indicated that when it came to monitoring is was important to monitor the right things at the right levels. D-RAIL had led to short term impact through improved regulation. The research outputs were clear:

- Further work is needed on rail breaks – to be further promoted within UIC and S2R
- Flange climbing limits could provide inputs to regulations
- Need to consider what to do with the alarm limits for rail climb.

MERMEC has pioneered the monitoring system and pilot tested it at the field test sites demonstrating the new functions. There is need for further ICT research on data handling

ERRAC Evaluation Working Group Chairman
Dan Otteborn

systems, data analysis, harmonisation of limit values and standards for detection methods. MERMEC successfully tested a wheel checker and FAIVELEY an instability device that was effectively an intelligent sensor that could be installed on a bogie or car body. These devices have potential for implantation following further research and development.

DB has shown the integration of monitoring and supervision systems at the European level and the challenge to link operational monitoring/measurement with the asset information. The EWG consider that this has implications for regulations and harmonisation, collaboration for implementation is essential and all could benefit. The loading regime check system as well as the network of devices considered within the research based on the concepts and prerequisites could be summarised as Cooperation in Data Management. The EWG considered this as a possible new research area for D-RAIL with Intelligent Systems of H2020.

For this aspect the legal framework is a big issue, this can be addressed by having clear responsibilities and improved laws and regulations. For example CSM 1078/2012 could be upgraded and harmonised to indicate what needs to be monitored and what information should be shared. This next step is not easy and should be discussed with stakeholders including UIC and ERA.

DB considered RAMS and LCC with inputs from all of the D-RAIL research and agreed with Emmanuel Ruffin (ERA Safety Unit) conclusion that D-RAIL had the potential to reduce derailments by over 50%. Importantly DB stated that 75% cost reduction could be achieved by optimising the implementation of just 3 systems:

1. HABD Hot axle box detector
2. ALC Axle load checkpoint
3. TGMS Track Geometry Measuring System

For further economic improvement these interventions should be analysed on the potential they have for preventing passenger derailments as well as freight. It was the conclusion of this research that:

- RAMS practice in railway infrastructure needs further research
- TGMS needs to be improved and research is needed to improve its reliability
- Industry involvement is needed in further research activities.

OBB reported from the HRMS project that there was already input from D-RAIL for the categorisation of sites and the limit values. The D-RAIL project deserves congratulations as it was an excellent short term achievement that SBB and OBB are using the limit values practically as they were based on science and engineering, giving the IMs confidence of their validity.

ERRAC Evaluation Working Group Chairman
Dan Otteborn

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D. Progress towards the contractual obligations in regards to impact

It was a requirement of D-RAIL that the project only considered medium and long term actions. This obviously means that D-RAIL may need further research and development prior to real implementation. D-RAIL has shown and demonstrated **potential** for major steps forward. The UIC project HRMS is working on short term solutions.

Emmanuel Ruffin (ERA Safety Unit) recognised the impact of D-RAIL and stated that there was a need for research project targeting breakthrough improvement and that from the ERA perspective there were 3 domains where D-RAIL provides key inputs:

1. Future Train and Infrastructure Condition Monitoring. This domain was thought to be best addressed by SHIFT2RAIL.
2. Further Harmonisation of Safety Data Exchange. ERA have already taken the initiative on this and provided a tender.
3. Potential innovation on electronic derailment detection (prevention), as opposed to mechanical devices. Possibly demonstration projects through S2R or Horizon 2020 Pilot Actions (Fast Track to Innovation Pilot).

E. Recommendations on how to secure and increase the market uptake

The EWG believes that D-RAIL could make a serious contribution to EU Policy by addressing:

- Reducing freight train derailments by more than 50% by using the proposed monitoring, maintenance and supervision solutions (existing and emerging)
- Demonstrating that collaboration between Infrastructure Managers, Rolling Stock Undertaking and Entities responsible for Maintenance could result in affordable and effective systems.

Yours sincerely

Dan Otteborn

Chairman ERRAC Evaluation Working Group

ERRAC Evaluation Working Group Chairman
Dan Otteborn

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➢ **MERLIN Letter**

European Rail Research Advisory Council

Mr. Patric Mercier-Handisydel
Mr. Ludger Rogge
EUROPEAN COMMISSION
Directorate General for Research and Innovation
Office COV2 – 07/011
Office COV2 – 07/59
B 1049 Brussels

Re: ERRAC Evaluation Working Group - FOSTER RAIL
Task 6.1 Monitoring of Ongoing Relevant Projects

MERLIN FP7 project

Dear Sirs

In accordance with FOSTER RAIL, Project number 605734, contractual obligations, Work Package 6, ERRAC Evaluation Working Group is entrusted to monitor relevant on-going projects (Task 6.1) and formulate an opinion on these projects in the following areas:

A. How the projects goal and main objectives fit the ERRAC road map and, overall, the white paper priorities.
B. The consortium composition and how stakeholders are represented within the project.
C. The implementation plan and expected impact.
D. Progress towards the contractual obligations in regards to impact.
E. Recommendations on how to increase the market up-take and consequently the impact.

Work Package 6 Evaluation Working Group have now completed the monitoring of the ongoing MERLIN project, and concluded the following:

A. How the project goal and main objectives fit the ERRAC road map and, overall, the white paper priorities.

The MERLIN overall objectives are "Sustainable and intelligent Management of Energy for smarter Railway systems in Europe: an Integrated optimisation approach". MERLIN will deliver the interface protocol and architecture for energy management systems in the railway domain together with some communication hardware, combining the technical development with new business model that would enable and foster their application.

ERRAC Evaluation Working Group Chairman
Dan Otteborn

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The Evaluation working group are of the opinion that:

The objectives of the MERLIN project are perfectly in line with the ERRAC road map and with the priorities of the white paper.

B. The consortium composition and how stakeholders are represented within the project.

The consortium consists of 18 partners representing all the relevant stakeholders and branch organisations.

The Evaluation working group are of the opinion that:

The projects contain all necessary stakeholders in order to archive its objectives and foster market uptake.

C. The implementation plan impact and expected result.

The project has established a comprehensive exploitation plan including a questionnaire to be answered by all partners. The evaluation group has never seen, in any project before, such comprehensiveness of a plan and associated questionnaire. This plan constitutes a very good tool for managing the implementation in the future.

The viability of the project will be demonstrated in Spain, and also via simulations in cooperation with 3 other European infrastructure managers, where the architectural framework and interface protocol together with communication hardware will be developed to a working "prototype". However, the development aims to allow for the architectural framework to be able to applied in different situations across Europe; there is of course necessary that steps to be taken in order to implement such an architecture, which requires an investment to be made by the operators, in particular the infrastructure manager.

The Evaluation working group are of the opinion that:

MERLIN project will be able to demonstrate that energy savings and better performance of the railway system are achievable trough deployment of the MERLIN result and recommendations.

Elaboration of a business case could strengthen the implementation plan.

D. Progress towards the contractual obligations in regards to impact.

The Evaluation working group are of the opinion that:

ERRAC Evaluation Working Group Chairman
Dan Otteborn

European Rail Research Advisory Council

The MERLIN project will succeed in its contractual obligations but real impacts are as describe above dependent on users willingness to make the necessary investment in elaborate the content of the architectural framework.

E Recommendations on how to secure and increase the market up-take.

The Evaluation working group are of the opinion that:

- The project should try to facilitate the post MERLIN project customisation work as much as possible.
- The project should try to make sure that the communication hardware is commercially available after the project finalisation.
- The Project should pay more attention to a business case, actually how much is the potential increase in energy optimisation worth in monetary terms.
- The project should prepare for EN standards as a delivery as much as possible.

4th December 2014

Yours sincerely

Dan Otteborn
Chairman ERRAC Evaluation Working Group

➢ **SPECTRUM Letter**

European Rail Research Advisory Council

TO:

SPECTRUM project consortium (project coordinator),

Mr. Ludger Rogge
EUROPEAN COMMISSION
Directorate General for Research and Innovation
B 1049 Brussels

Re: ERRAC Evaluation Working Group - FOSTER RAIL
Task 6.1 Monitoring of Ongoing Relevant Projects

SPECTRUM FP7 project

Dear Sirs

In accordance with FOSTER RAIL, Project number 605734, contractual obligations, Work Package 6, ERRAC Evaluation Working Group is entrusted to monitor relevant on-going projects (Task 6.1) and formulate an opinion on these projects in the following areas:

A. How the projects goal and main objectives fit the ERRAC road map and, overall, the white paper priorities.
B. The consortium composition and how stakeholders are represented within the project.
C. The implementation plan and expected impact.
D. Progress towards the contractual obligations in regards to impact.
E. Recommendations on how to increase the market up-take and consequently the impact.

Work Package 6 Evaluation Working Group have now completed the monitoring of the ongoing SPECTRUM project, and concluded the following:

A. How the project goal and main objectives fit the ERRAC road map and, overall, the white paper priorities.

The SPECTRUM overall objectives are to *"Develop a rail freight train/service that provides a higher service speed for high value, low density and time sensitive goods with the performance characteristics similar to a passenger train."*

The Evaluation working group are of the opinion that:

ERRAC Evaluation Working Group Chairman
Dan Otteborn

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The objectives of the SPECTRUM project are perfectly in line with the ERRAC road map and with the priorities of the white paper.

B. The consortium composition and how stakeholders are represented within the project.

The consortium consists of 20 partners representing the relevant stakeholders and branch organisations.

The Evaluation working group are of the opinion that:

The project contains necessary stakeholders in order to archive its objectives and foster market uptake. However a stronger involvement of freight car manufacturers and freight car owners or leasing companies would strengthen the market uptake possibilities even further.

C. The implementation plan impact and expected result.

The project has established a market analysis showing the potential market for the intended goods, the correctness of this market analysis has been demonstrated in other projects. No business plan has been developed showing the economic viability of the implementation. Other projects in the past dealing with the same objectives have failed to reach the market partly because of a negative business case.

No physical demonstrator is planned within the project.

The Evaluation working group are of the opinion that:

The SPECTRUM project will be able to demonstrate a theoretical market for the intended goods, two different wagon designs. A socio economic evaluation has also been established, the problem with this is that it is probably far too unspecific. The project needs a business case focusing only on the situation for the investors and direct customers to this service.

Elaboration of a business case could strengthen the implementation plan.

D. Progress towards the contractual obligations in regards to impact.

The Evaluation working group are of the opinion that:

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Dan Otteborn

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The SPECTRUM project will succeed in its contractual obligations but real impacts as describe above dependent on users willingness to make the necessary investment to elaborate the content of the architectural framework.

E Recommendations on how to secure and increase the market up-take.

The Evaluation working group are of the opinion that:

- The project should try to facilitate the post-SPECTRUM project customisation work as much as possible. Including the establishment of a pilot service.
- The project should involve car manufacturers and private wagon owners in order to prove the concept.
- The Project should pay more attention to a business case, for example how much is the potential increase in higher speed and better track utilisation worth in monetary terms.
- The project should prepare for a TSI approval of the freight cars.

18 January 2016

Yours sincerely

Dan Otteborn

Chairman ERRAC Evaluation Working Group

➢ **SPARTACUS Letter**

European Rail Research Advisory Council

TO:

SPARTACUS consortium
(Mr. Clemente Fuggini, d'Appolonia - project coordinator)

Mr. Ludger Rogge
EUROPEAN COMMISSION
Directorate General for Research and Innovation
B 1049 Brussels

Re: ERRAC Evaluation Working Group - FOSTER RAIL

Task 6.1 Monitoring of Ongoing Relevant Projects

SPARTACUS FP7 project

Dear Sirs,

In accordance with FOSTER RAIL, Project number 605734, contractual obligations, Work Package 6, ERRAC Evaluation Working Group is entrusted to monitor relevant on-going projects (Task 6.1) and formulate an opinion on these projects in the following areas:

A. How the projects goal and main objectives fit the ERRAC road map and, overall, the white paper priorities.
B. The consortium composition and how stakeholders are represented within the project.
C. The implementation plan and expected impact.
D. Progress towards the contractual obligations with regards to impact.
E. Recommendations on how to increase the market up-take and consequently the impact.

Work Package 6 Evaluation Working Group have now completed the monitoring of the ongoing SPARTACUS project, and concluded the following:

A. How the project goal and main objectives fit the ERRAC road map and, overall, the white paper priorities.

The SPARTACUS overall objectives (General aim) are: *"To implement solutions for location awareness in the context of crisis management based on existing (GPS, EGNOS, EDAS) and incoming (GALILEO) satellite services and technologies providing precise tracking/positioning,*

ERRAC Evaluation Working Group Chairman
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ensuring no lack of communication and no gaps of information in coordination actions. The system should cover Locomotives, Containers and Wagons."

The application areas are:

- Tracking, tracing and localization of critical transport assets even in the case of major failure of the existing network.
- Flow tracking of relief support goods from sending party to the receiving/end place.
- Support and ensure the safety of first responders in crisis management.

The Evaluation working group are of the opinion that:

The objectives of the SPARTACUS project are theoretically in line with the ERRAC road map and with the priorities of the white paper. The problem is that most of the objectives are already covered by existing solutions even on a TSI level.

Already in formulating the objectives it is clear that the initiators do not completely understand the conditions and functions of the railway system at large.

B. The consortium composition and how stakeholders are represented within the project.

The consortium consists of 12 partners representing all cases except one: no railway related organisations and branch organisations.

The Evaluation working group are of the opinion that:

The project needs a much closer involvement of real stakeholders in order to understand the railway conditions; future tracing of containers is not only a railway issue, it involves trucking companies, as well as shipping organisations. The project must start a real dialogue with real implementers in order to achieve its objectives and foster market uptake.

C. The implementation plan impact and expected result.

A business model exists relying on a scenario where public authorities such as National safety authorities, ERA, etc. should launch tenders. The problem is that the entities who are supposed to use the system in most cases are private container, wagon or locomotive owners. The alternative business model where an intermodal operator equips its own wagons with the researched components is also questionable because few intermodal operators actually own the operated wagon, and even if so, other methods exist to keep records of mileage and positioning. The business case for the rail sector is not feasible.

The Evaluation working group are of the opinion that:

ERRAC Evaluation Working Group Chairman
Dan Otteborn

FOSTER RAIL WP06: Monitoring to improve rail research innovation
www.errac.org

European Rail Research Advisory Council

It seems to be very difficult to SPARTACUS project to demonstrate that investing in the proposed/researched system will enhance the railway or intermodal market in a way that justifies the investment.

D. Progress towards the contractual obligations in regards to impact.

The Evaluation working group are of the opinion that:

The SPARTACUS project will need to re-focus its work from what is technically possible with satellite communications and associated technologies to what is actually needed in the operation of railway and intermodal. This includes a comprehensive understanding of the state-of-the-art of existing railway equipment to the understanding of the business drivers and limitations in the rail and intermodal market.

E. Recommendations on how to secure and increase the market up-take.

The Evaluation working group are of the opinion that:

The project must start from the real need in railways, needs which cannot be solved with existing technologies and similar technologies developed by other research projects.

The project must establish an implementation plan with realistic assumptions.

The project must establish a business case identifying who will potentially make an investment in the proposed technologies and who will actually benefit from the investment.

20th January 2016

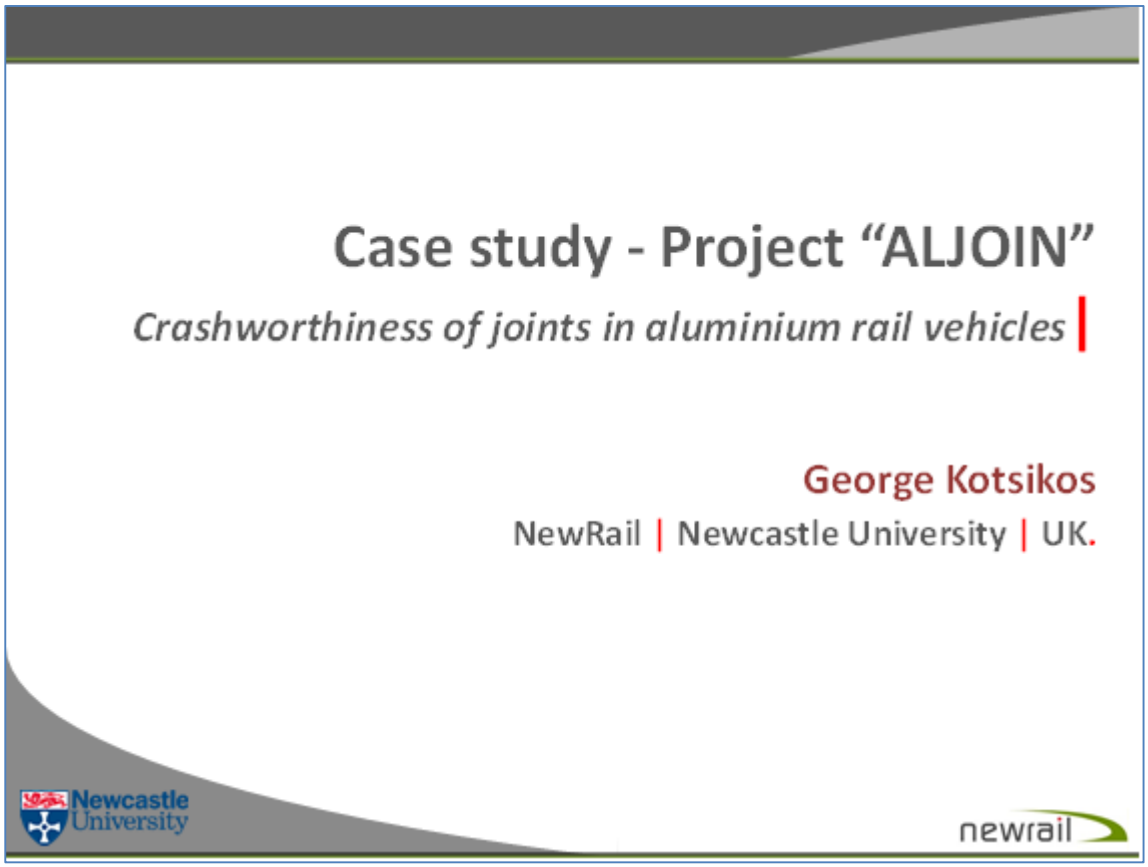
Yours sincerely

Dan Otteborn

Chairman ERRAC Evaluation Working Group

Appendix 2 Example Case Studies (strong and weak implementation)

- **ALJOIN Project**



Content

- Background
- Development of the ALJOIN Project
- Project description
- Lessons learnt

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Background

- Aluminium alloys: Lightweight, corrosion resistant, weldable.
- Earliest applications of aluminium in rail coach design in 1935.
- First aluminium monocoque bodyshells were designed in the 70s (APT, TGV)
- Large closed cell extrusions.
  - Design versatility
  - Superior surface finish
  - Superior collapse strength and impact resistance in the longitudinal direction





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Background

The Ladbroke Grove Accident

5th October 1999, 21 fatalities and 400 injured

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Background

'…the aluminium extrusions had fractured along the weld lines and there was a lack of plastic deformation (…) the structure appeared to have failed along the welds rather than deforming in a controlled manner'
Cullen Report

The catastrophic failure of welds in this manner is a phenomenon known as 'weld-unzipping'.

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Background

- Weld unzipping - dynamic ductile tearing of the weld metal or heat affected zone is known to materials engineers.
- The process is controlled by:
  - Geometry of applied stresses/crack trajectory
  - Plastic deformation at the crack tip
  - Material composition
  - Impurities
  - Microstructure
- Fusion welding can be critical in localising failure as it affects microstructure, mechanical properties and can introduce defects.
- Aluminium alloys are sensitive to heat input introduced by the fusion welding processes.
  - Proof strength of 6005A HAZ ~ 50% parent plate

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DEFINITION OF OBJECTIVES AND PARTNER SELECTION

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Project development

- A detailed research programme of work was necessary to provide a solution to **eliminate weld unzipping** in aluminium rail vehicles.
- How? (definition of intermediate objectives)
  - Provide physical evidence of the energy absorption capability of aluminium alloy welds by testing;
  - Assess the adequacy or inadequacy of current design and construction practices of aluminium alloy welds in the context of crashworthiness
  - Investigate alternative welding techniques and/or joint designs for improved impact performance of aluminium alloy joints;
  - Development of the material constitutive modelling for the parent material and the welds;
  - Numerical modelling of simple joints subjected to quasi-static and dynamic loads;
  - Develop numerical modelling techniques for simulation of crashworthiness of full rail vehicles

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Project development

- Partner selection
  - Can it be done by a single organisation? NO
  - Wide ranging expertise required? YES
  - Is industry/end user involvement important? YES
    - Rail coach manufacturer(s)
    - Materials supplier(s)
  - Welding/joining specialists required? YES
  - Modelling experts required? YES
  - Academic expertise required? YES
  - Specialist test facilities required YES

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Project development

- **FP5 - FP5-2002-GROWTH – Competitive and Sustainable Growth**

- **Key Action 3**, Land Transport and Marine Technologies
- Strategic Objectives
  - Improved fuel efficiency and reduced emissions - cutting CO_2 emissions and developing and validating zero-emission vehicles.
  - Improved performance - increasing safety, reliability, maintainability, availability, operability, energy efficiency and adaptability.
  - Improved system competitiveness - reducing both time to market and development costs.
- **Priority 2:** Technology integration and validation
  - Research will focus on integrating and validating six technology platforms:
    - New land transport vehicle concepts; enhanced systems efficiency, Advanced concepts for ships and vessels; competitive shipbuilding, Enhanced design and manufacturing for road vehicles, Sustainable and modular trains, Safe, efficient and environmentally friendly vessels and platforms, Efficient interoperability and transhipment.

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Project development

Project acronym:	**ALJOIN**
FP:	5
Project Reference:	G3RD-CT-2002-00829
Call identifier:	FP5-2002-GROWTH
Total Cost:	€ 2,177,806
EU Contribution:	€ 1,200,036
Timescale:	08/2002 – 08/2005

Project Partners :

	Country
• D'Appolonia SPA	I
• NewRail – Newcastle University	UK
• Bombardier Transportation	F
• Danstir	DK
• The Welding Institute (TWI)	UK
• Alcan	CH

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ALJOIN PROJECT - OVERVIEW

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ALJOIN project overview

- The project concept constituted of 5 distinct parts:
  - Mechanical characterisation of joints (MIG, Laser MIG, FSW, bonded, bolted)
  - Fracture mechanics analysis
  - Impact tests on full size components
  - Solution development and validation
  - Modelling and collision simulation

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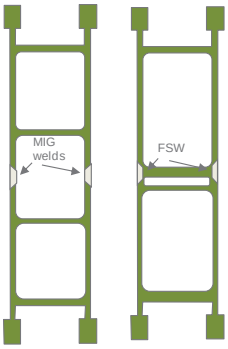
Mechanical property characterisation

- Material supplier partner manufactured full scale closed cell extrusions for assessment.
- Same extrusions also used for impact tests.
- MIG and Laser MIG welded extrusions were produced with two types of filler wire; Al-Si (existing consumable), Al-Mg (proposed alternative consumable).
- Bonded Bolted and FSW extrusions used slightly modified type of extrusions.



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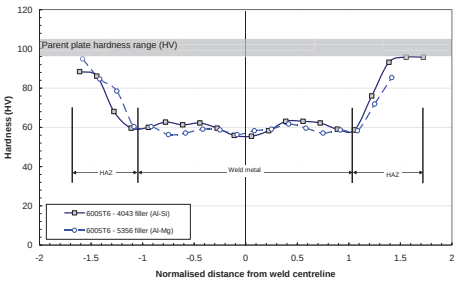
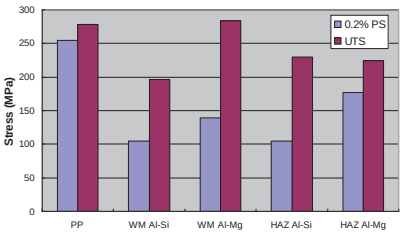
Mechanical property characterisation

- Academic partner undertook material characterisation work





- Use of Al-Mg filler produces welds with improved mechanical properties over Al-Si filler
- Hardness variation across the weld is similar

Material	Charpy impact energy (J)
Parent plate	0.73
Weld – (Al-Si filler)	0.32
Weld – (Al-Mg filler)	0.56

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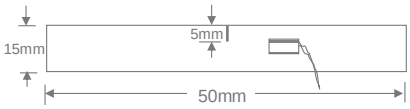
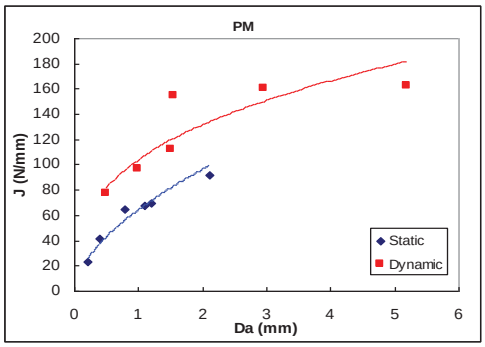
Fracture mechanics

Static and dynamic J-R curves were obtained through SENB tests for the parent material and weld region





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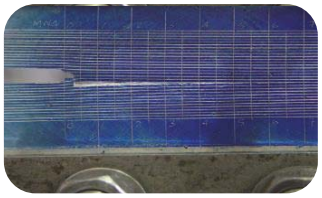
Fracture mechanics

- Fracture mechanics tests using a modified SENB specimen design and a CCT specimen were
- The analysis used the *Energy Dissipation Rate* (EDR) approach.
- The tests provided information such as *tearing resistance index* (T) and critical CTOA and were intended to aid with numerical modelling of tearing process in the welded aluminium extrusions.



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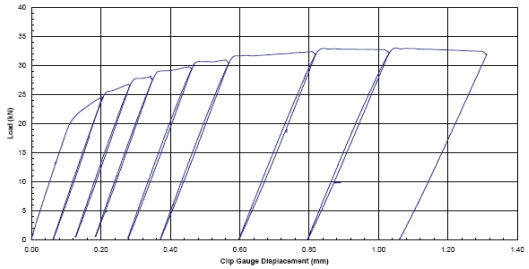
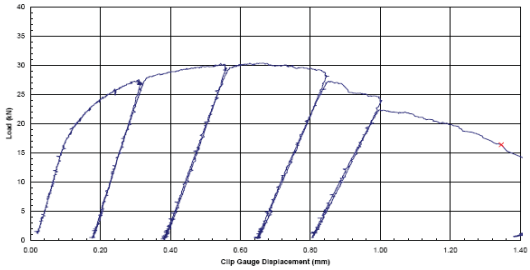
Fracture mechanics





Al-Mg filler

D=1170 kJ/m^2

T= 0.03

Al-Si filler

D=350 kJ/m^2

T= 0.011

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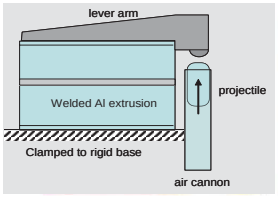
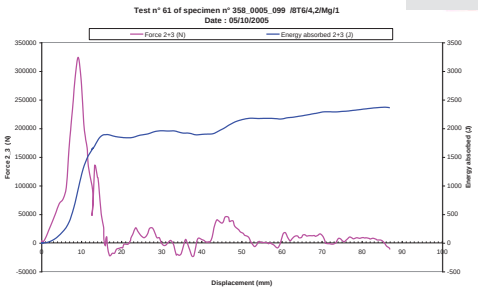
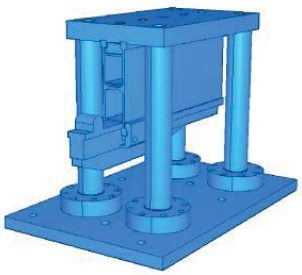
Full scale impact tests

- Dynamic tear tests on full scale welded extrusions were carried out by the industry partner's facility.







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Full scale impact tests

Laser MIG

FSW

MIG

All welds failed by weld unzipping!

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Solution approach

- What matters when a collision takes place is whether the structure spreads the impact energy or concentrates it in a specific region (the weld in this case).
- Fusion welding in aluminium alloys results in an "*undermatched weld*".
- The impact energy in a structure with a strength undermatch, may channel all the energy to the weld region. This will have to be taken up by the energy dissipation rate which implies extensive crack growth.

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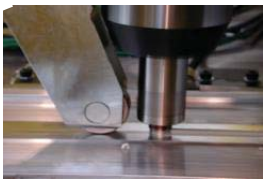
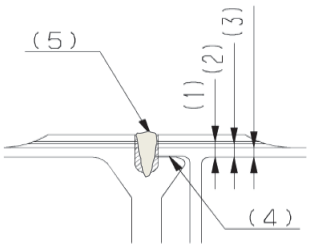
Solution approach

- Reducing the heat in
  - Laser MIG
  - FS
  - Bonded joints

Have not delivered expected benefits



- Change joint design
  - Altering weld geometry by thickening the plating at the weld region



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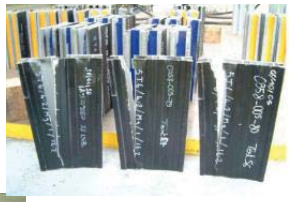
Solution approach

FSW



MIG

Laser MIG

Failures away from weld with the exception of Laser MIG welds

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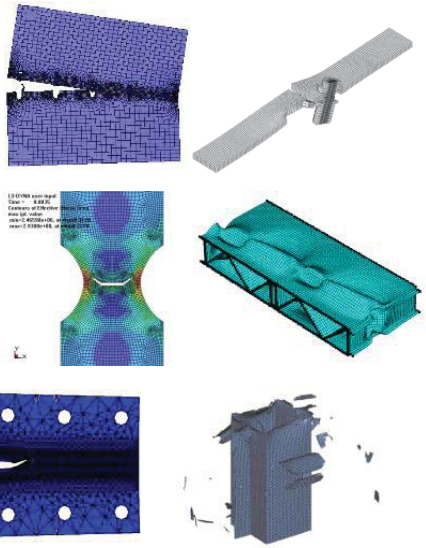
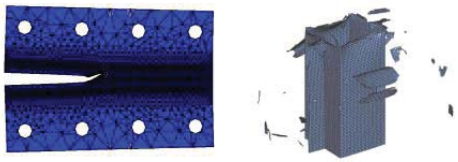
Modelling weld failure

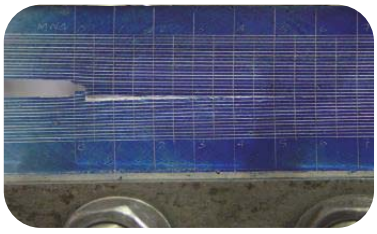
- Detailed mechanical property characterisation was used for modelling activities.
- Detailed FEA models were prepared and validated against component tests.
- Code used LS-DYNA
- Failure criteria used:
  - Maximum strain failure model
  - Gurson -Tvergaard model

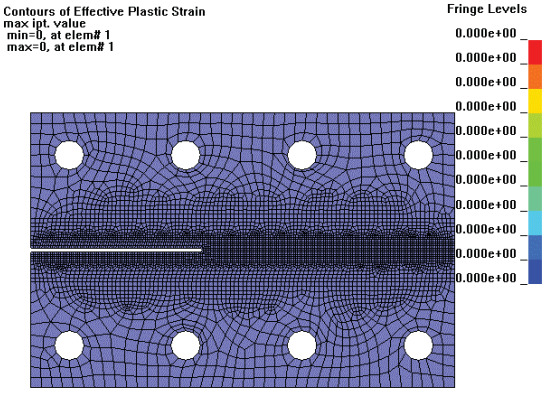




Modelling weld failure

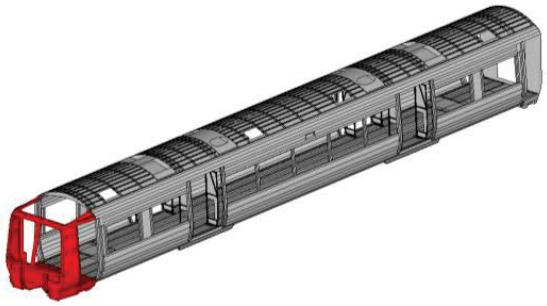
- Modelling of tearing test – Max strain failure model





Collision modelling

- A Finite Element model of a class 165DMU similar to that involved in the Ladbroke Grove accident in the UK was created (undertaken by research institution partner specialising in FEA modelling)
- Simulation of collision at 20m/s (72km/h) on a solid flat surface.
- The simulation is repeated with the new joint design and consumable



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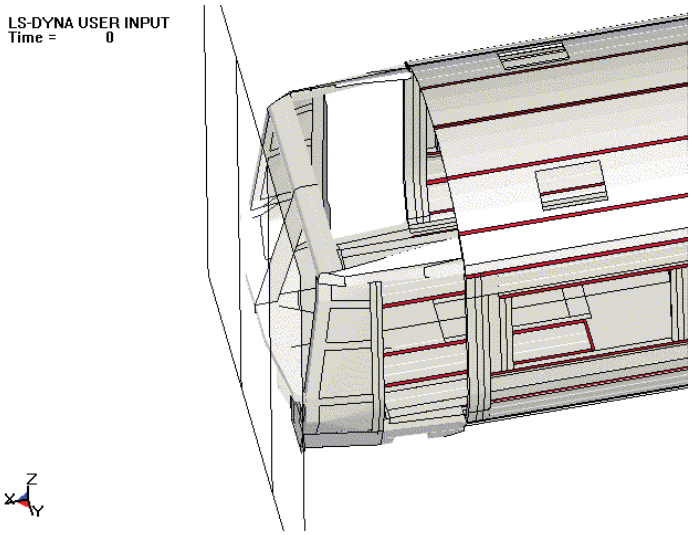
Train collision simulation – Standard weld design



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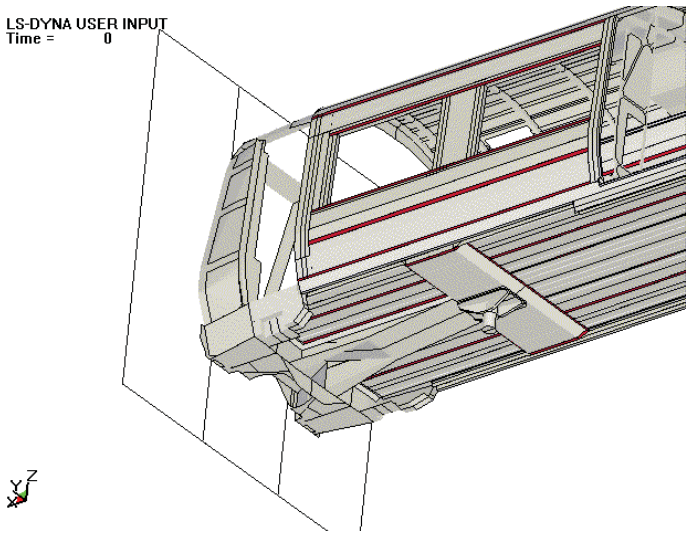
Train collision simulation – Standard weld design



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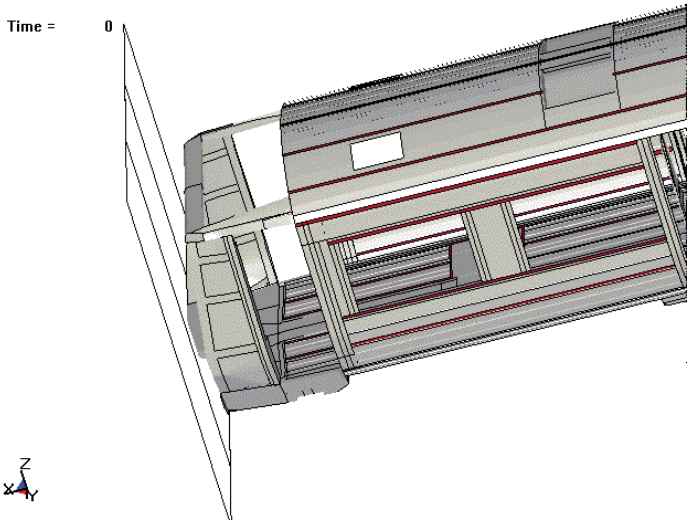
Train collision simulation – modified joint (section thickening)



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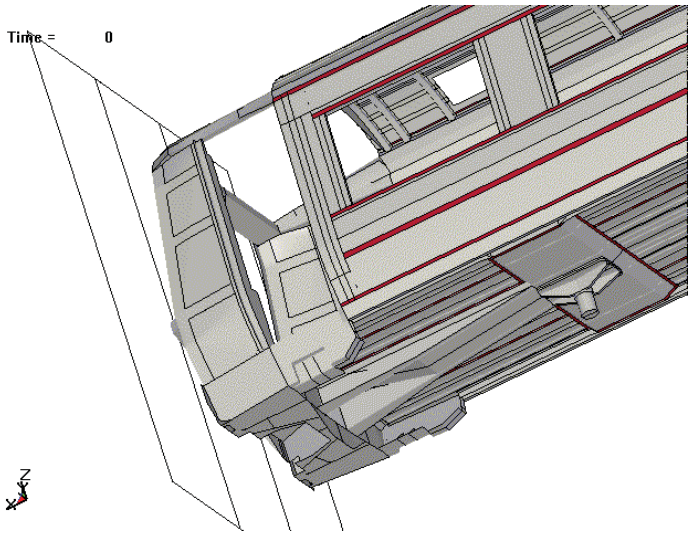

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Project output

- ALJOIN provided a solution to the problem of “weld unzipping” for welded aluminium closed cell extrusions.
- Contributed to the development of two industry standards;
  - EN 15085 "Railway applications - Welding of railway vehicles and components"
  - EN 15227, “Crashworthiness requirements for railway vehicle bodies”
- Contributed to the enhancement of safety for rail passengers and staff.
- The solution does not introduce a significant economic penalty to industry.
- Results have a Europe wide (if not global) impact.
- Contributed to the enhancement of knowledge to academia, research institutions and industry partners.

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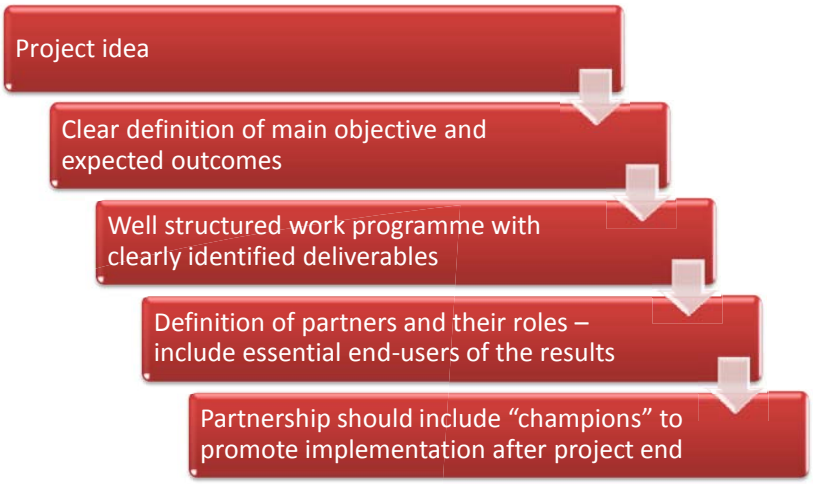
Lessons learnt



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THANK YOU

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➢ **INTEGRAIL Project**

ERRAC European Rail Research Advisory Council

ERRAC Project Evaluation Group

INTEGRAIL
Case Study

Project acronym:	INTEGRAIL
FP:	6
Programme acronym:	FP6-SUSTDEV
Project Reference:	12526
Call identifier:	IP - Integrated Project
Total Cost:	€ 19,927,652
EU Contribution:	€ 11,230,455
Timescale:	January 2005 - March 2009
Project Coordinator:	Ms Léa PATIES (Union of European Railway Industries)
Web references:	http://www.integrail.info/

- Prepared by: Dan Otteborn
- Market uptake: Weak

2

ERRAC *European Rail Research Advisory Council*

INTEGRAIL
Intelligent Integration of Railway Systems
Case study

Premise:

- The growing demand for mobility in Europe requires an efficient and well-integrated railway system; one which can cope with all the technical, logistical and environmental constraints, to enable sustainable growth of the enlarged European Union.
- ERRAC, the European Rail Research Advisory Council, proposed the target of doubling rail passenger traffic and tripling rail freight traffic by the year 2020. Responding to ERRAC's challenge, the InteGRail project intended to improve railway performance by better cooperation and information exchange between the different subsystems, allowing for a global optimisation at system level.
- Currently, increasingly larger amounts of information are accessible from all of the railway subsystems. A number of information systems are also available where information is stored for immediate or later usage. Unfortunately, most information is produced in proprietary formats and its circulation is limited to specific subsystems and applicative platforms. This can create or increase barriers to a wider flow and usage of information, as is required by new and advanced methodologies.

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INTEGRAIL
Intelligent Integration of Railway Systems
Case study

Rationale:

- The railway system is becoming more and more complex, Information & Communication Technologies have an increasingly vital role in ensuring it can operate effectively, efficiently and safely. Therefore a good level of standardisation and interoperability between railway information systems is and will be required in order to control the complexity and allow further performance improvements.

- The approach from the past applying specific solutions to solve individual problems proved to be too expensive and brought limited results. The rail society has recognised that new solutions need to be found on a clear and sound general platform, which allows easy integration and the management of different solutions and systems, while allowing their evolution according to the ever-fast, changing railway business models.

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INTEGRAIL
Case study

Objectives:

The InteGRail project aimed at developing an INTELLIGENT COHERENT INFORMATION SYSTEM by integrating the main railway systems. The objective was to achieve a higher level of coordination and cooperation between key railway processes, in order to achieve higher levels of performance (in terms of capacity, average speed and punctuality), safety and optimised usage of resources.

- *Increase capacity and efficiency by intelligent integration of railway systems.*
- *Favour convergence and integration between rolling stock, infrastructure, signalling systems, train control and traffic management.*
- *Allow for full remote supervision of trains from a control centre.*
- *Achieve automatic monitoring of train status and equipment condition*
- *Implement the concept of self-aware intelligent trains.*
- *Maintain the current high safety level in railways.*
- *Implement predictive maintenance and lean maintenance concepts.*
- *Implement intelligent system management and dynamic path allocation.*
- *Improve passenger information and information system interactivity.*
- *Improve interoperability based on new open standards.*
- *Pave the way for implementation of TSIs.*

5

ERRAC *European Rail Research Advisory Council*

INTEGRAIL: Background

Partners

6

ERRAC *European Rail Research Advisory Council*

INTEGRAIL: Background

Project description:

- The InteGRail project aimed to create a holistic, coherent information system, integrating the major railway sub-systems in order to achieve higher levels of performance of the railway system in terms of capacity, average speed and punctuality, safety and the optimised use of resources.
- By creating innovative concepts in the areas of train control and monitoring, maintenance, management and communications, InteGRail set out to re-define the basic elements required by each system.
- The project assessed the needs of rolling stock, infrastructure, traffic management (including the European Rail Traffic Management System, ERTMS), train operations and proposed intelligent procedures to process all available additional information to its best advantage.

ERRAC *European Rail Research Advisory Council*

INTEGRAIL: Background

Project description:

- InteGRail is not a system but rather defines a set of standards and methods for information sharing and interpretation so that IMs and RUs can integrate their existing systems and suppliers into the railway industry who can develop and market systems that will be integrated.
- InteGRail supports decision-making when a fault occurs, allowing traffic managers and operators to decide on the best course of action. Making the best decision leads to reduced delays. If recovery from a fault is made faster, trains can be timetabled closer together so, again, the usable capacity of the railway can be increased.

ERRAC *European Rail Research Advisory Council*

INTEGRAIL: Case Study

- The method used in the in-depth case study analysis was to compare the objectives from the project with key drivers for market uptake as found in the evaluation work of more than 10 years. Where poor matching were found the market uptake was low or none existent.

- If a similar matching process had been carried out prior to launching the project, the market failure could have been avoided.

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INTEGRAIL: Case Study

Key drivers for market uptake

1. Business case: There needs to be a strong incentive for implementation, which is normally expressed in a business case. This should preferably be a complete case i.e., the one who takes the cost should also take the benefit.
2. Strategy: There needs to be a strategic or commercial interest among project partners and implementers at large that application will be beneficial to the rail sector.
3. Continuation: There needs to be post-project capacity to continue towards the real implementation necessary for delivery of whatever is needed from one or a few sources. Intellectual property rights must be agreed on and accepted.

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INTEGRAIL: Case Study

Key drivers for market uptake (cont.)

4. Understanding: The complete implementation infrastructure must be understood and facilitated during the project lifetime. Implementation in relation to TSI, EU standards, follow on cost, approvals from external authorities etc.

5. Cost of implementation: The full cost of implementation needs to be estimated at least on a base scenario.

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INTEGRAIL: Case Study

INTEGRAIL objectives vs key drivers (comparison and matching)

1. Business case

No real business case was developed, some potential savings were estimated but no cost estimate of implementation was made. The business case if done would have shown a very divided one. The cost and benefit of implementation would have been shared by many different actors and legal entities in different member states. No reflection on how to facilitate a fare distribution of cost and benefit was carried out. An independent information broker system similar to what exists in the airline field would be established where information would be sold and purchased at agreed prices.

2. Strategy

Implementation of InteGrail research delivery would have required a high degree of cooperation between independent stakeholder in the rail sector. Decision on such cooperation and its competitive and economic consequences would have to be taken on a very high level never made aware of in InteGrail. It was known at the conception of the project that all major operators and infrastructure managers were negative about the project.

ERRAC *European Rail Research Advisory Council*

INTEGRAIL: Case Study

INTEGRAIL objectives vs key drivers (comparison and matching) *(cont.)*

2. Strategy (cont.)

During the project lifetime a limited number of example applications were developed, to demonstrate that the concepts developed in the project can really work. These example applications were demonstrated at the end of the project, to prove that the platform, the architecture and the common language strategy worked and to prove that a real improvement of railway performance can be achieved by using this way to manage and share information.

3. Continuation

There were no plans on how a possible implementation would be realised after the end of the project with no clear agreement among the 39 partners on any future implementation. Ownership of results was spread among many different unities including universities possibly not allowed to enter into commercial agreements. An attempt to create a voluntarily implementation group failed due to lack of interest.

The project was too ambitious to implement and therefore nothing was achieved.

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INTEGRAIL objectives vs key drivers (comparison and matching) *(cont.)*

4. Understanding

There was no understanding in the project of the complicated strategy, financial and competitive issues. The technical complexity of connecting a large number of different information sources was underestimated despite development of middleware.

5. Cost of implementation

The cost of real implementation was not estimated

INTEGRAIL: Case Study

Conclusion:

- The above concluded analysis shows that out of 5 essential criteria for market uptake, none was evident in the InteGrail project.
- The market failure could therefore have been foreseen had a proper analysis taken place before launching the project.