Challenge G: An even more competitive and cost efficient railway

Market Impact Evaluation – The way to judge the success of completed rail research

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The European Rail Research Advisory Council (ERRAC) was set up in 2001 to help revitalise the European rail sector:

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

The European Rail Research Advisory Council is a European Technology Platform and an advisory body to the European Commission representing Member States and all stakeholders in the sector. One of the main tasks of ERRAC is to advise the European Commission on the research needs of European rail stakeholders gathered in the platform. It has in the past developed a ‘Strategic Rail Research Agenda’ to inform on the planning of research programmes across the EU. Current activities of ERRAC focus on concrete and detailed roadmaps on common European R&D to implement the ERRAC Strategic Rail Research Agenda (SRRA). Officially the ERRAC-ROADMAPS project started on 1 June 2009.

Following the Calls for Proposals, ERRAC has facilitated the forming of some of the proposals and has followed those that we knew were being prepared. Forming consortia were advised to use the “EU project checklist”, which was developed by the ERRAC Evaluation Working Group, in their proposal preparation. This list is based upon an ongoing ERRAC process of evaluating the impact or “market uptake” of EU-funded rail research projects and considers all factors that can have a negative or positive effect on the success of a project.

The ERRAC Project Evaluation Working Group (EWG) determines the market impact of previous rail research to improve use of research funding and to ensure a strategic approach to the prioritisation of rail research.

Individual projects are evaluated after they have been completed to ensure successful dissemination of project results in order to:

- To ensure that the results of previous rail research can be taken into account for future projects
- To avoid weak market uptake of results by learning the lessons of previous research
- The EWG will provide intelligence based on the project evaluations for input into future European Framework Programmes

The overall scope of the WP6 Evaluation Working Group, within the ERRAC ROADMAP Project, is to bring forward and enhance the work done in providing essential information and tools on the lessons learnt from the evaluation of past projects, to allow relevant rail related stakeholders and roadmap producers to make better choices and decisions, to achieve a more effective and measurable success of future rail research projects, both in terms of a systemic-oriented use of resources and in terms of concrete outcomes and real market uptake, for the future evolution of the rail industry.

During the past years, a great number of rail research projects have been funded by the European Commission in previous Framework Programmes and billions of euros have been spent. Yet it has

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not always been easy to gain full awareness of all the relevant research that has been carried out. Valuable research results are often lost and the risk of overlapping and/or generating redundant rail project initiatives is significant. The aim of the EWG is therefore to provide a database of previous and existing national and European projects to support the ERRAC-ROADMAP Work Packages and FP7 research activities to ensure that valuable research undertaken in the past is not forgotten. The project evaluation methodology is based on an analysis of project results and deliverables, together with a set of interviews with project participants and other stakeholders. The aim is not so much to evaluate the contents of the projects per se, but rather to assess the actual implementation and market uptake of the project results once the work has ended.

A good process of thinking in advance, based on lessons learnt from other projects, can lead to a much better focus to help devise new rail research projects that can guarantee concrete market uptake, offering widely acknowledged improvements and solutions for the future rail industry and market in general.

Objectives of the Evaluation Working Group

1. to provide essential information to stakeholders and roadmap producers on lessons learnt from the evaluation of past projects to promote a more systemic and focused approach to the use of funding resources and enhance real market uptake of project results
2. to provide a database of previous and existing national and European projects to support the FP7 research activities and ensure that valuable research undertaken in the past not be forgotten.

European Rail Research Advisory Council

SRRA updated research priorities areas

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<th>Intelligent mobility</th>
<th>Energy and environment</th>
<th>Personal security</th>
<th>Test, homologation and security</th>
<th>Competitiveness &amp; enabling technologies</th>
<th>Strategy and economics</th>
<th>Infrastructure</th>
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<td><strong>FP7 research Activities</strong></td>
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<td>Encouraging modal shift and decongesting transport corridors</td>
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<td>Ensuring sustainable urban transport</td>
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<td>Improving Safety &amp; Security</td>
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<td>Strengthening Competitiveness</td>
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Matrix structure for the creation of the ERRAC-Roadmaps, some explanatory examples

Working method

ERRAC EWG has evaluated over 50 finished projects and has a database with details relating to past and current rail research projects.

- Criteria for selection and evaluation of projects to be evaluated, were established from the beginning, also starting from direct experience of members of the working group:
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- Projects that are mature and have been completed at least 2 years before evaluation
  o eg. HVB/RAIL, ended 1998; HERO, 1999; INFRASTAR, 2003; SUPERTRACK, 2005
- Projects that have or have had proposals for follow ups
  o eg. REORIENT, ended 2007, and followed up by NEWOPERA, ended 2008
- Projects that are linked together by a theme
  o eg. the Tunnel Projects set up to study solutions for fires in tunnels: DARTS, SIRTAKI, VIRTUALFIRES, all ended 2004; FIT, 2005; UPTUN, SAFE-T, 2006

Work is carried out to:
- improve methodology to scrutinise and assess the contribution of projects to the ERRAC ROADMAPS and Strategic Rail Research Agenda (SRRA) goals.
- provide inputs to EC Project officers during the negotiation phase and during the course of the projects
- evaluate finished rail research projects, analyse success/failure factors and market uptake to communicate this information
- to provide ideas for new European and national projects in terms of market uptake or implementation.
- develop the database to provide rapid access to information on results of rail research projects, deliverables etc., as well as lessons learnt and possible contributions to the attainment of the goals of the Vision 2020 in coherence with SRRA.

The evaluations methodology
The methodology for the evaluation of the projects, is based on an analysis of project results and deliverables, together with a set of interviews to project participants and other stakeholders, aimed at determining not so much an evaluation as to the contents of the projects per se, as rather of the actual implementation and market uptake of the project results once the work has ended, according to the following criteria:

<table>
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<tr>
<th>Strong Market Uptake</th>
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<td>A project will be evaluated with a strong market uptake if there is clear evidence of use of products or services, processes, dissemination of knowledge, tools etc. in several countries/products and the major objectives of the project have been implemented. These projects will sometimes lead to additional research to realise their full market potential.</td>
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<th>Medium Market Uptake</th>
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<tr>
<td>A project will be evaluated with medium market uptake if there is some evidence of use of products, services or processes, or a limited dissemination of knowledge, tools etc. in a few countries or products. If only a small proportion of a project has some market uptake the project as a whole is considered to have a medium market uptake. A follow up project may be necessary in some cases.</td>
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<th>Weak Market Uptake</th>
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<tr>
<td>A project will be evaluated with a weak market uptake if no known use of products, services, processes, knowledge, tools etc. has been identified anywhere. No follow up project is needed unless the reason for the market uptake failure is clearly understood and removed.</td>
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The interviews carried out by the EWG members for the project evaluations are based on the following questionnaire:
**EWG WP06 Questionnaire:**

- Were the results implemented in the design of new products and services?
- Were these put into commercial operation?
- Is new legislation or standardisation based on the findings from this research project?
- Are the results implemented across Europe?
- Are the results implemented outside Europe?
- Did the project increase competitiveness of the European rail sector? Compared to other transport?
- Are the results taken into account when preparing public tenders?
- Do the results help facilitate cross-border operation? Intermodal operations?
- Can benefits be estimated financially?
- Are the results useful for future and new projects?

**Statistics on Evaluations**

<table>
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<tr>
<th>WP</th>
<th>Title</th>
<th>Budget (€)</th>
<th>Total Number</th>
</tr>
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<tr>
<td>WP01</td>
<td>The greening of surface transport</td>
<td>€177,677,989</td>
<td>30</td>
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<td>WP02</td>
<td>Encouraging modal shift and decongesting transport corridors</td>
<td>€247,368,511</td>
<td>43</td>
</tr>
<tr>
<td>WP03</td>
<td>Ensuring sustainable (sub)urban transport (including modal shift, suburban and regional rail, light rail and metro, and sustainable urban mobility)</td>
<td>€37,659,000</td>
<td>10</td>
</tr>
<tr>
<td>WP04</td>
<td>Improving safety and security</td>
<td>€95,747,374</td>
<td>27</td>
</tr>
<tr>
<td>WP05</td>
<td>Strengthening competitiveness</td>
<td>€143,143,928</td>
<td>39</td>
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**Breakdown of projects included in the EWG database on categories of main work package (total number – 149)**

- WP01 - The greening of surface transport;
- WP02 - Encouraging modal shift and decongesting transport corridors;
- WP03 - Ensuring sustainable (sub)urban transport (including modal shift, suburban and regional rail, light rail and metro, and sustainable urban mobility);
- WP04 - Improving safety and security;
- WP05 - Strengthening competitiveness.

*Note: the figures in Euros are the total budgets of the projects considered in each category.*
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![Pie chart showing market uptake breakdown]

**Breakdown of the market uptake of the projects evaluated by the EWG**

Projects evaluated with Strong market uptake:
- ALJOIN
- ALJOIN plus
- CAESAR
- EUROMAIN
- LIBERTIN
- ROSIN
- SAFETRAM
- Sustainable Bridges
- TRAINCOM

**NOTE:** Initially, three other projects (PROSPER, RAVEL, REPID) were evaluated with strong market uptake but, after gathering more information, they were re-evaluated as having a medium market uptake.

**Examples of criteria observed for Strong Market Uptake evaluated projects**
- The project answered to a clear need for a harmonised solution, meaning a clear and positive business case
- The project has no competition tensions as its R&D was pre-competitive 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.
- The project was able to convert results into international standards
- The project presented major users involved in the requirements definition and assessment of results, a broad consensus was established
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- 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

LIBERTIN Evaluation

1. Were the results implemented in the design of the new products and services?
   Yes, through the use of relevant standards

2. Were these new products/services put into commercial operation?
   Yes, but no statistics available!

3. Is new legislation and standardization based on findings from this research project?
   LibeRTiN was an input not only for standardisation but also for the DURD and URP initiatives (LibeRTiN is mentioned in the mandate for urban rail standardisation). No more legislation is expected for Light Rail.

4. Are the results of the project implemented across Europe or only in a small number of Member States?
   The standards resulting from LibeRTiN are EuroNorms used at least in EU27 and often worldwide

   - CEN TC256 was made aware of the LibeRTin project in 2005. Its chairman Dee Razdan asked for recommendations on the top 10 needs for light rail.

   - Whenever possible, the merging EN’s have covered the requirements of LR. When asked, he said that there are many examples where those requirements have been taken into account:
     - Braking – EN 13452-1,-2, 14531-1, 14478, 14535-1
     - Air Conditioning - EN 14750-1,-2 : 2006
     - Crashworthiness – EN 15227 2008 + FprA1
     - Suspension components – EN 13597, 13913, 14817, 13802, 13298 etc.
     - Flange lubrication – EN 15227 2008 + FprA1
     - Axle boxes – EN 12080, 12081, 12082, prEN 14865
     - Structural – EN 12663 [in revision]
     - Rail – EN 13145, 13146, 13230, 13481, 13674-4, 14730,14811, 14969 and prEN’s 14587 and 15594.
     - Others – EN 14752(doors), 13272 (lighting) etc.

SAFETRAM Evaluation

1. Were the results implemented in the design of the new products and services?
   Yes, initially in the Porto Metro

2. Were these new products/services put into commercial operation?
   Yes, they are in operation

3. Is new legislation and standardization based on findings from this research project?
   Yes, the new standard EN 15227 has been issued and EN 12663 revised

The SAFETRAM findings have already been applied via EN15227 to the design of the various Tram Trains. EN15227 expands upon the DIN 5560 National Crashworthiness Performance Standard. In addition, EN12663 Cases 4&5 compliment the above Euronorm with structural requirements for LRV bodyshells.
4. Are the results of the project implemented across Europe or only in a small number of Member States?
   They are widely accepted and have been gradually implemented across Europe.

5. Are the results of the project implemented outside Europe before being accepted in Europe?
   Not known for certain, but it is believed that this standard has been the basis of work in Korea, the RSA and India.

Reasons for the Strong Uptake in SAFETRAM
- Tram Trains and Stadtbahns are relatively small volume products, so the application of the SAFETRAM findings in this sector has been very rapid in reality.
- Economic pressures to develop Product Platforms to avoid small build quantities have been influential in the rapid adoption of crashworthy EURONORMS in the design of Light Rail products.
- All the major European Manufacturers, or their key subcontractors, were project partners so internal communications were short and UITP customer association was a full project member.
- The project developed and fully evaluated trial cabs which needed little additional work to productionise them.

Evaluation of market uptake and lessons learnt from past project results
Why is market uptake of fundamental importance for ERRAC?
- Research without market uptake in our field of applied engineering is a waste of public money as well as of that of Companies participating in the research.
- Research without market uptake in our field of applied engineering is also, in a longer perspective, a waste of intellectual capacity and of talented people and resources.
- People want to be part of successful activities, not the opposite, and participating in EU funding research should be seen as a booster of career opportunities for individual researchers.

Overall lessons learnt observed from projects evaluated so far
- The ERRAC ROADMAPS EWG WP06 evaluations done up to now, have established a level of knowledge by which we can predict, to an accurate extent, a success in market uptake already at the research idea conceptual phase.
- By applying this knowledge already in this phase we can:
  - design future projects so that chances of successful market uptake are dramatically increased or
  - determine that an idea will have a very narrow chance of achieving any market uptake and therefore should not be proposed.

General lessons learnt observed from Strong market uptake evaluated projects
- Projects aimed at solving issues of general acknowledged interest (eg. technical, safety, of harmonisation, business cases).
- Projects had strong interaction between partners and relevant stakeholders.
- Projects clearly defined scope and objectives at the beginning.
- Project results applied and implemented for products, or for regulatory application and made available for future revision.
- Project capability of building on results of previous projects (systemic view).
- Project pilot cases or business cases developed to provide viable solutions and not just as an exercise.
ERRAC Evaluation Working is providing essential information and tools on the lessons learnt from the evaluation of past projects, to allow relevant rail related stakeholders and roadmap producers to make better choices and decisions, to achieve a more effective and measurable success of future rail research projects, in terms of concrete outcomes and real market uptake. 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 needs to change.

The assessment of post-project evaluations helps guarantee that there be:

- focused attention on project funding
- enhanced awareness and reflection on how the already scarce resources available can be channelled
- achievement of the goals set for future scenarios.

**Recommendations**

- Make it clear that projects should search for viable solutions in terms of applicability and cost implications, and develop real business cases
- Think of future market uptake and what happens after project ends: the project as an enabler and not an end to itself
- Clearly define scope, inputs and deliverables of project at inception. Specify meta-goals of projects and develop implementation strategy/plan (a mandatory critical factor), identifying targeted users for dissemination of results.
- Clarify ownership of project results and deliverables at inception (2)
- Select committed partners really interested in finding and applying viable solutions (eg. for new products, involve companies that actually make them to avoid barriers to implementation).
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- Anticipate and identify possible problems/ barriers to implementation 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 (eg. not to devise technical solutions that incur extra costs to another party, without involving them).
- Form 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.
- Plan for knowledge retention and dissemination at inception
- Establish clear communication channels and frequency of exchange
- Conduct a regular review on post-project progress (possibly electing a project responsible/promoter).

Acknowledgement

The authors would like to gratefully acknowledge the support and funding provided to the ERRAC-ROADMAP project by the European Commission under the 7th Framework Programme (FP7-SST-2008-RTD-1), Grant Agreement Number: 234255.