ERRAC Evaluation Group – Checklist for the Risk Benefit Analysis of EU Projects

The ERRAC Evaluation Working Group has established a check list where they can assess the state of health of existing EU Funded Research Projects. The intention is to use the same list for evaluating on-going projects as well as for pre-evaluating the feasibility of projects during the preparation phase before they are submitted to the Commission.

The first set of check points are related to the ease of implementation.

(The success of the project itself is taken for granted so the aim of the check points is to identify specific threats to the successful implementation of its results)

1. Why is the project being initiated?
   The actual vehicles are not defect/failure free and as a consequence the reliability of the commercial service is quite often jeopardized.
   This project is initiated to put the train operators in the position to achieve the ultimate objective to operate the trains with the highest values of RAMS through the minimization of the unplanned line stops and equipment breakdowns.
   This might lead to new concepts in train maintenance.
   In particular this requirement is very strong for driverless vehicle as Metro or Light System.

2. By whom is the project being initiated?

By UNIFE and the european members of UIC. Proposed during the first meeting on 2006

3. What are the objectives and forecast benefits?
   The project will browse the actual reliability data of the in service vehicles to identify the weakness areas where the efforts will be concentrated.
   Then it will develop common guidelines to approach the predictive analysis for a new generation of on board train equipment.
   The common objective is to prevent a possible on line stop of a train, or an equipment breakdown, and define a “new concept of Maintenance”.
   A continuous monitoring, recording and transmission to ground station of the essential on board equipments information will be implemented.
   The captured data will be processed by means of an Artificial Intelligence so as to prevent the faults.
   The **Prognostics & Health Management** represents the core element that monitors the health state of the equipment and assure automatically and quickly the interview of the logistics flows

The main benefit is to assure the performances evaluation of the on board/on line system and suggest the consequent actions to achieve the previous objectives.

4. How can that benefit be measured?

Ask the experts in cost benefit analysis

5. Who is taking the benefit?

Benefit a is for the whole community.

Benefit b is for the railway sector (operators and manufacturers)

6. Who is taking the cost?

Costs are taken in account by the manufacturers and operators together which will evaluate the possibility to achieve the final objective by an analysis on board vehicles and on the infrastructure . In this way will be possible to propose a new vehicle/infrastructure diagnostics requirement and define a new concept of the maintenance

7. How equitably are the costs and benefits being distributed? (i.e. a proper LCC analysis should be elaborated and agreed upon in the bid preparation or initial work phases)

No idea !

8. Is any party going to lose anything if specific results are implemented?

This is a win-win process, nobody will lose anything when the results will be implemented.

9. Are all the real stakeholders for implementation of the results represented in the project or do they support the project in some other way?

All stakeholders are represented: operators, vehicles manufacturers, diagnostics for component and maintenance management expertise.

10. What are the consequences if part, or all, the implementation fails?

It's important a participation at the project of the manufacturer , operators and expertise in the diagnostic sector to assure the final success.

Contrary the consequence will be the impossibility for the rail sector to improve the new concept of maintenance and to propose a standardization of the main requirement for the predictive diagnosis .

11. Who is affected by these consequences of failure?

For first the railway sector because a partial failure of the project due to the lack of the results from the railway vehicles and infrastructure, will not allow a possibility to reduce the maintenance cost and , in the same time, to reduce the stop train during the service .

Also the community whole because a not correct management of the maintenance and the frequent stop train improve the general energy consumption and reduce the service quality (logistic transfer of the spare part and train recovery)

12. Is there any up front investment necessary before the benefit can be taken? Surely yes, but refer to question 7 with a demonstrable and increased LCC. Only then should we start the full project.

Yes, cost of the analysis , predictive diagnosis, maintenance and demonstrator construction of the vehicles and infrastructure are necessary to achieve the benefit.

13. Is there anybody who has specific reasons to block implementation? (special interest groups or some potential industry partners excluded from the project?)

No, We don't think so

14. What are the reasons for their opposition? (Market protection, job protection, call on investment funding, etc…)

n.a..

15. Is there a need to change laws or Technical Specifications for Interoperability in order to be able to implement the results?

No.

16. How can the necessary changes best be implemented? (Through changes to Directives, national regulations or through the TSIs or mandatory or voluntary standards? What happens if there is no enabling legislation such as a Directive, as applied to most of the urban sector?)

N/A

17. What are the probabilities to succeed with the necessary changes to the law or TSIs? See 16

N/A

18. Are there any unknown parameters affecting implementation? (Fees, hidden costs or permissions required, etc…)

Not yet identified.

19. Is there a need to redesign products to gain any benefits from the project? See 12.

No. The agreement between manufacturers and operators it's the first need to meet the requirements. The possible change is not in the architecture but in the equipment on board and on the infrastructure because a new maintenance concept probably requires an improvement in the diagnosibility – Consequently will be necessary a tuning in the SW and HW to extend a direct

diagnosis in the equipment today not monitored (es. Bogie suspensions, track ,catenary)) and an evaluation of existing equipment (traction system, auxiliary, doors, HVAC etc.) to improve a prediction of a future fail.

20. Is there a need to make changes to already installed base of vehicles or infrastructure?

One of the targets is to minimize the changes necessary to the vehicle. Important it's to define requirement to improve the diagnosis on the board and on the infrastructure

21. If there is no need to change the existing installed base, can the existing base be disadvantaged in any way?
22. N/A
23. Who pays for the above changes and how will investment be funded? LCC must demonstrate.

The vehicle manufacturers. An evaluation of the LCC it's a relation between the modification costs and the reduction cost for several maintenance (not signaled equipment cut off, train recovery on the line, delay in the service for train stop) . The modification cost are in general not recurrent ,while the several maintenance yes. In this condition an breakeven point it's possible in three years

24. Is the project underwritten by all stakeholders, at an operational level, with an appropriate level of authority?

Yes, it is approved and will be signed by all.

25. Are there any negative impacts of implementation foreseen which could threaten implementation in the longer term?

No, in general.

26. Are there any existing projects whose results could be in conflict with this one?

No. The project will be based on the results of InteGRail (2005-2008), whose purpose is to create a framework allowing the integration of the different railway subsystems, based on a common architecture. Within InteGRail a set of punctual Demonstration Scenarios has been defined, in order to show at a micro extent the possible applications of the developed system.The purpose of the proposed project is to realize an applicative implementation of the considered framework particularly focused on maintenance, including predictive maintenance and detection of incipient faults, in order to reach the goal of a "zero faults train". Such implementation will take in account all the different sub-components present on-board of a train, exploiting also the results coming from other projects (i.e. FBS and PBS defined in the scope of MODTRAIN project).

27. Are there any other projects supporting or depending on this one?

No, according to my knowledge.

28. Are the results of the project immediately capable of implementation or is some additional research work likely to be required?

The aim is to have results immediately capable of implementation.

29. Can an 'Early Adopter' be identified and brought into the project from day one?

Yes, I think so. It's important a basic know how.

30. Are there any 'parallel' activities at the level of CEN/CENELEC/ETSI/IEC/ IEEE in this area?

No. ?????????

The second set of check points deals with the project & threats to its future success.

(Economic and project auditing issues are excluded. Almost all of these items are required in the Bid documents and the agreed description of work negotiated with the Commission.)

31. Project participants (Composition of Consortium)

Alstom, Siemens ?, DB ?, TI, CAF, D'Appolonia, Mermec, Selex SI, POLIMI,

32. Project mandate (Description of Work)

The core of the project it's the predictive diagnosis of the main equipment on board and on the infrastructure. A good possible project success is an approach that involves all equipment responsible of failure during the train service. It's our opinion to study directly the main causes responsible of this negative event and not an evaluation of the effect (as today it does in many application).
In the current application, many data related to the train event are downloaded in the ground storage system. Today it's very "arduous" to evaluate it and relate the effect at the causes of the failure because the equipment diagnosibility in many cases is not deepened. This situation causes often a skepticism in the operators toward sophisticated diagnostic systems in particular when a personal experience of the repairer has to resolve the problems . In this situation also the expertise system are not sufficient .
The new approach could change this situation because in this project we would like to propose a specific study to improve the relation between the fail causes and effect.
A first step is that to do a failure risk analysis to evaluate each possible cause of the stop train and the equipment responsible of that .
The second step is to extend the diagnosibility in the equipment so that each single failure could be directly identified. After this analysis will be clear the failure map and relationship.
A final step represent the prevention/predictive extension. For each system will be possible to anticipate the breakup of the component monitoring the performance degrade . This phase will represent the true innovation in the project and an very strong opportunity for operators and manufacturers.

The project will cover issues such as:

a. On board continuous monitoring of all essential equipment connected with safety and vital train functionalities;
b. Evolution of a database for the development of algorithms for the Decision Support System, to reduce the sizing of Spare parts stored and to maximize the availability of the same parts when required;
c. Optimization of maintenance through monitoring equipment status and the remaining time to fault, used in preventive maintenance guidelines to approach the predictive analysis for new generation of on board train equipment;
d. Possibility to test on line the experimental monitoring system mounted on the existing vehicle will be evaluated.

The general approach of this project it's not competitive. The results of InteGRail project will be taken in account, in particular the holistic on board analysis that involves the main component responsible of the possible stops. Following equipment categories on board will be taken in account:

- Electrical/electronic (as power pack, pantograph, driver cab etc.)
- Mechanical/mechatronics (bogie components, body to body connections, tilting system etc.)
- Auxiliary on board (HVAC, braking, doors etc.)
- Others (as pneumatic/hydraulic etc.

For infrastructure will be taken in account the track geometry and catenary condition monitoring .

In the "Zero failure in Railway service" project, we start from this results and study a possibility to reduce (near to zero) the failure in the operation and prevent all possible stop train during the service.
For this reason we think that a specific interest for the Operators it's possible because this approach allows a reduction of extraordinary maintenance cost and a high train service availability. In other word a cost-benefit it's possible in this way and it's an appeal important for the Operators. An other

consideration it's in according to the general theme of the II Call : an energy and CO2 emission reduction it's possible with a reduction of the failure and stops in service.
In particular it will be also considered the numerical simulation of the diagnostic systems anti-derailment, running stability and over-turning, and verified the requisite for an optimised architecture (number, type and position of the sensors) and the diagnostic signals elaboration techniques.
Analysis (based on experimental laboratory and numerical simulations) of the diagnostic signals from anti-yaw dampers and other critical components will be done (for conventional and steering bogie). The study of the possible necessary additional signals for the diagnostic scope able to identify the worn wheel and the suspensions component failure-degradation will be taken in account. In addition it will be possible to investigate the integration of the diagnostic system with the acquisition of rail and catenary condition information.
Data transmission to the Operative ground site will be defined and in particular the expertise SW able to define and to prevent possible problems in the monitored equipments. Information on board, necessary to signal macro-troubles to the driver man, or PIS indication in the driverless vehicles, will also be considered.

33. Project organization (Management Structure)

UNIFE Organization for cost follow up and general project management, technical management by AB (Research office and expertise designer)

34. Representatives with an appropriate level of authority and expertise (Identified Experts)

POLIMI for bogie analysis and diagnosis, Selex SI for expert ground system, ????

35. Intellectual leadership of the project, system architecture, etc. (Technical Management)

?

36. Mechanisms available to ensure that the project is not deviating from its original mandate and objectives within the defined review frameworks (Management Structure)

UNIFE technical management

37. Measures taken to follow up deliverables are made on time and to the right quality (Project Quality Plan)

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38. Mechanisms to quickly and smoothly resolve conflicts within the project (Management Structure)

?

39. Known sources of potential conflicts (Risk Assessment prior to contract signature)

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40. Any participant who may have an interest in failure of the project, should be identified at the Risk Assessment stage and mitigation measures considered

No.

41. Communication with the main stakeholders (Communication and Dissemination Plan)

?

The third set of questions could be industry or company specific

(These are not normally made available for public use)

42. Who will pay for the proposed changes and how will investment be funded? If there is a market and demonstrable LCC, the companies will pay for changes, if not they won't and the project shouldn't start.

The potential market it’s in according to the operators interest.

43. Is the project underwritten by all internal stakeholders, at an operational level, with an appropriate level of authority?

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44. Are there any negative internal impacts of implementation foreseen which could threaten implementation in the longer term?

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45. Are there any existing internal projects which could be in conflict with this one?

No.

46. Are there any other internal projects supporting or depending on this one?

No.

The fourth set of questions relates to completed projects researching into the same topic and deals with the degree of implementation achieved:

N/A

47. Have the results already been implemented somewhere?
48. Have the results not been implemented in areas where similar conditions exist?
49. What are the reasons for this non-implementation? (Lack of funding, NIH, research overtaken by innovation, etc…)

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