

# IMPACT OF SHIFT2RAIL - A KPI MODEL FOR THE ENTIRE RAILWAY SYSTEM

Poster Number 11392

Michael Meyer zu Hörste, DLR, Germany

Florian Brinkmann, DLR, Germany

Mats Berg, KTH, Sweden

## INTRODCUTION

Many new ideas are understood as “innovations”. But: There is an important step from invention to innovation. An invention becomes an innovation as soon as it is used – typically, but not necessarily, in an economic or industrial way. The resulting question is: How can we estimate the economic impact of an invention as soon as it becomes an innovation. If this impact is too low it is quite probable that it never will become an innovation. The higher the impact is the higher becomes the probability that this will happen.

In industrial and economic environments it is state of the art to measure the performance of services, systems or organisations by so called Key Performance Indicators (KPI) [Parmenter2015]. Those parameters could be absolute values or relative values, i.e. a percentage against a well-defined baseline as 100%. Initially this approach was foreseen to estimate the operational performance, but it can be applied on everything what has an impact on the operation.

## METHOD AND APPROACH

The overall effects of the Shift2Rail initiative on the whole railway system will be quantified for three main (high-level) target KPIs: a) the overall costs of the railway system, b) the capacity and c) the reliability of the railway system in terms of punctuality. These parameters are the top level KPIs which will be influenced by the technical demonstrators of Shift2Rail, where all technical and process-related innovations are developed.

The approach is basically divided into two steps: in the first phase, a qualitative analysis of the effects of each TD on the main KPIs will be performed. In the second phase, the qualitative model will be complemented with mathematical descriptions or weighting factors for the effects. The model will then be filled with data from the TDs in order to quantify the effects of Shift2Rail.

Since the initiative aims at increasing the share of the railway of the modal split, the parameter “attractiveness” for the passengers and freight transport buyers is monitored and displayed as well, however without being quantified.

The qualitative analysis is done by building cause-and-effect chains between the technical details that are being developed and their influence on more aggregated components or processes of the railway system. System expertise of the companies involved in Shift2Rail will ensure that the technical or process-related measures are taken into account in the correct manner. By bringing together the different cause-and-effect-chains to a logical model, the parameters will be further integrated to higher aggregation levels, ending at the top level KPIs. Logical and functional interconnections between the effects of complementary developments have to be identified and represented in the model as well. Thus, a KPI model for the entire railway system will be developed.

## EXAMPLE (Ongoing Work)

One simple example for such cause-and-effect chain could be: the technical demonstrator “running gear”, see Fig. 3, deals amongst others with the design of the bogie. One improvement of this will be the reduction of weight for the running gear of the car. This effect will have an influence on the energy consumption of the single car and therefore on the whole train. This will reduce the costs for operating the whole train fleet. Another interpretation of the reduced weight of the running gear could be to increase the payload of the car, the train and the fleet in order to increase the revenues that could be gained by the train operator. Of course this is only one obvious result of developing a new bogie. There will be many more effects of this technical demonstrator like wear-resistant construction, improved driving dynamics etc. which also will be considered. And this is only one of more than 40 technical demonstrators of the Shift2Rail initiative.

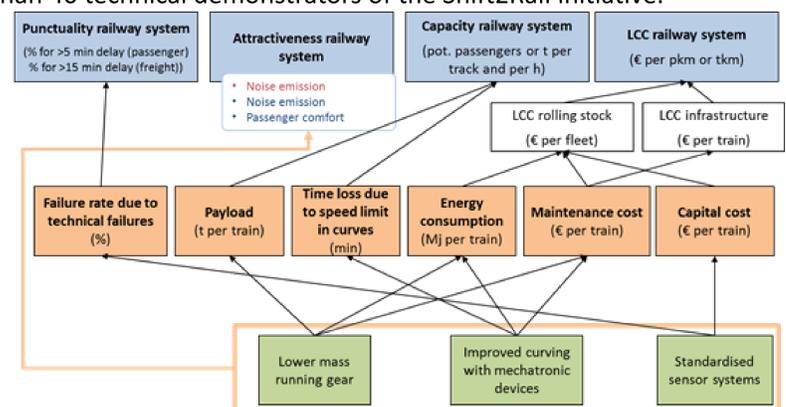


Fig. 1: Sample KPI –Model structure (ongoing work)

## CONCLUSION & PERSPECTIVE

The concept of the Key Performance Indicators has been applied to estimate the impact of the innovations to be developed in the Shift2Rail projects. A complex model of the results and interactions of the TDs is currently under development. Four generic application scenarios have been defined in so-called System Platform Demonstrators for high speed, regional and urban/sub-urban for passenger transport as well as for freight as fourth SPD. Currently the model is under development and the relevant parameters for reference trains, infrastructures and signaling layout will be identified. During the further development of Shift2Rail the models will be further developed and refined. When all this activities will be finalized a powerful tool for the estimation of innovations impacts will be developed and validated. This can be used in the future for any technology impacting the railway system.

The authors express their acknowledgement to the Shift2Rail Joint Undertaking for financing the projects related to the work presented here. The contribution gives the perspective of the authors.

Hosted and organised by:

Austrian Ministry  
for Transport,  
Innovation and Technology

**AIT**  
AUSTRIAN INSTITUTE  
OF TECHNOLOGY  
TOMORROW TODAY

**austriatech**

Co-organised by:

European  
Commission

Together with:

**ACARE**

**alice** | Alliance for  
Logistics Innovation  
through Collaboration  
in Europe

**CEDR**  
Conférence Européenne  
des Directeurs des Routes  
Conférence of European  
Directors of Roads

**ECTP**  
INNOVATIVE BUILT  
ENVIRONMENT

**ERRAC**  
The European Rail  
Research Advisory  
Council

**ERTRAC**  
European Road Transport  
Research Advisory Council

**ETRA**

**WATERBORNE**