



Simulation Based Economic Efficiency Evaluation

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Motivation

- An increasing competition on the traffic market asks for more economic efficiency
- More economic efficiency can be reached through
 - a higher capacity on a fix infrastructure
 - decreasing costs by fulfilling the traffic demand
- **AIM: economic efficiency evaluations of track equipment alternatives**

Motivation

- Microscopic Railway Operation Simulation Tools are used for dimensioning the infrastructure and/or timetable optimization

Problem:

- Costs for infrastructure, resources, staff, unavailability, etc. are not recorded (life cycle costs)
- Benefit is not quantified
- No economic efficiency evaluations possible with simulation tools

Solution:

- Extension of existing simulation tools with a tool for economic efficiency evaluations



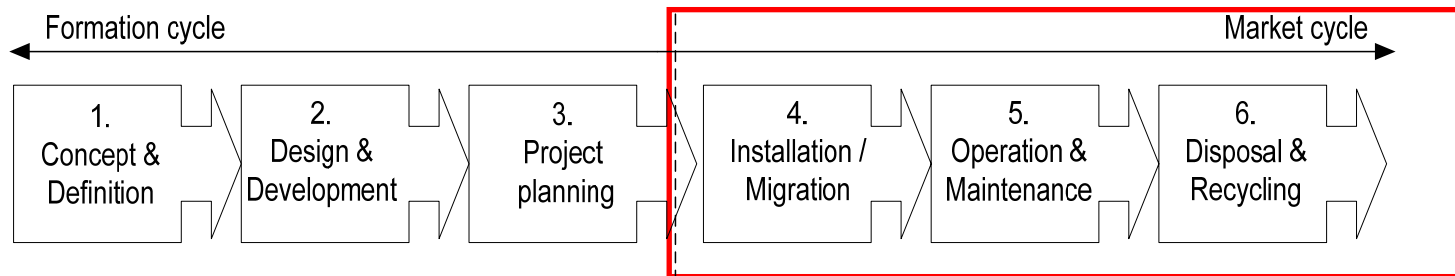
Background (Microscopic Railway Operation Simulation)

- Characterised through:
 - Exact modelling of infrastructure including gradients, turning circle, etc.
 - Modelling of individual infrastructure elements, e.g. warning signal, mandatory signal, balises, stop beards, etc.
 - Modelling of trains with load, length, power, etc.

- Field of application:
 - Calculation of travel time
 - Construction of time tables
 - Stability- analysis of time tables
 - Proof of infrastructure demand
 - Calculation of capability
 - etc.

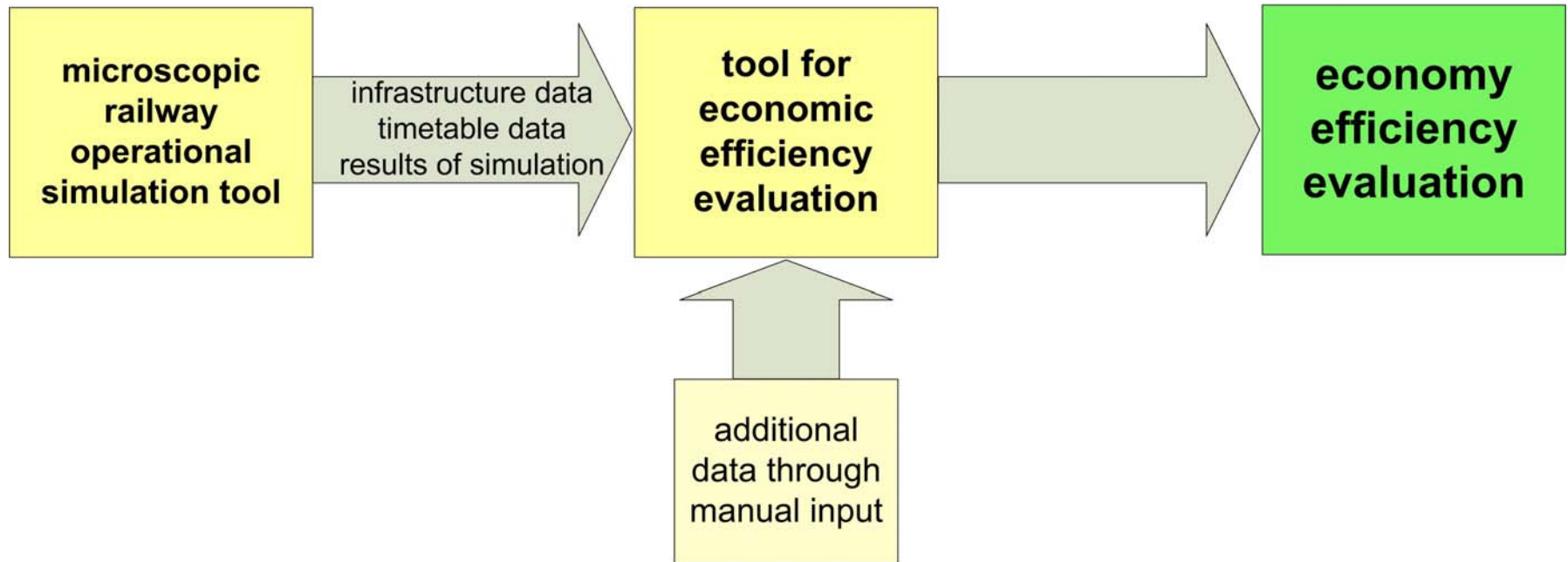
Background (Economic Efficiency Evaluation – LCC)

- Global strategy evaluation implies the analysis of costs and benefits
- Evaluation of investment strategies for the signalling concerning their life cycle costs (LCC)



- Non-monetary criteria also included in the benefit evaluation
 - Safety
 - Delay reduction
 - Maximum speed
 - Etc.

The Tool Link



The Tool Link

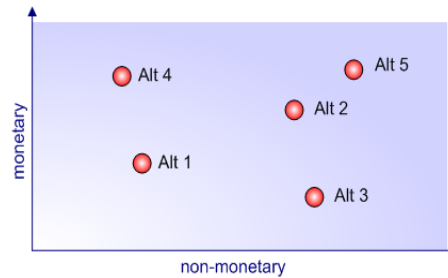
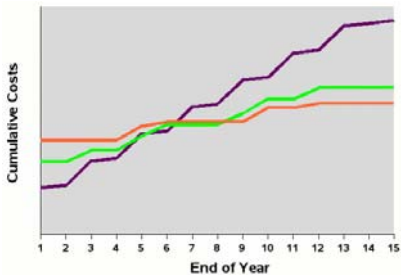
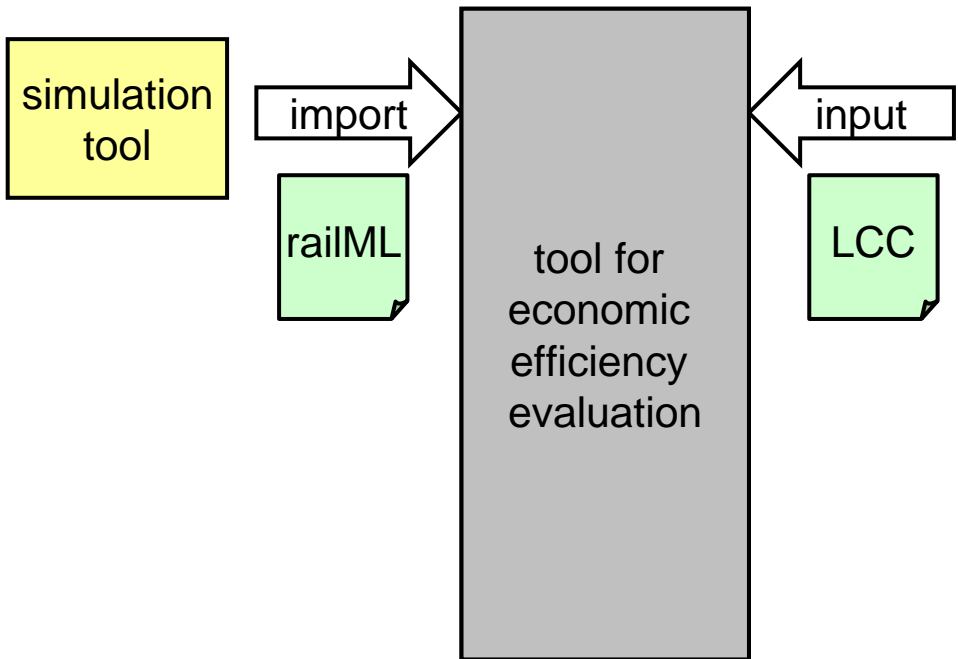
➤ Railway Operation Simulation Tool:

- Modelling the infrastructure, simulating the railway operation
- Data export with ***railML***

➤ Economic Efficiency Evaluation Tool:

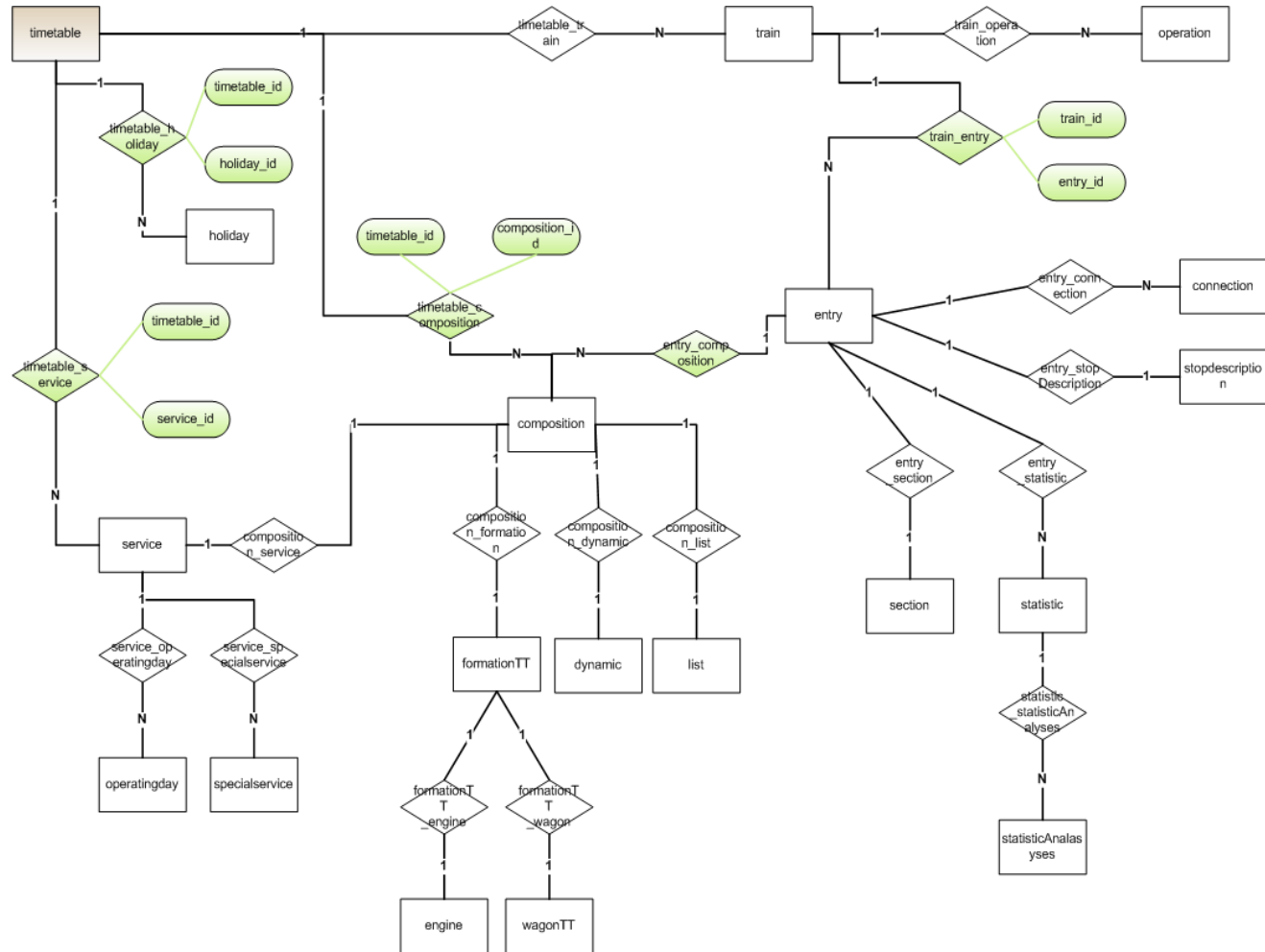
- Data import via ***railML*** - interface
- Static information input through entry mask
- Life Cycle Costs are calculated
- Benefit is quantified

The Tool Architecture



The Tool Architecture

- *railML* schemas are mapped into an entity relationship diagram
- Currently infrastructure and timetable schemas implemented
- Application layer and GUI are next



Conclusion



- *railML* specification is open, well structured, growing in acceptance
- *railML* is well suited to import data from railway operation simulation tools
- Integrated use of operation simulation, LCC calculation and benefit analysis enables an economic efficiency evaluation
- Economic efficiency evaluation as decision support for infrastructure operators and/or train operating companies



Thank you for your attention!

