



ProRail

OECD, International Transport Forum (ITF)
Roundtable: Efficiency in Railway Operations and Infrastructure Management
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Case study ProRail: understanding the drivers of Railway (in)efficiency

Jan Swier, ProRail

Who is Jan Swier?

- *Jan Swier, 63 years*
- *Married and five children*
- *Civil Engineer*
- *Expert in asset management*
- *Career:*
 - *bridge engineering*
 - *maintenance contractor*
 - *staff manager*
 - *advisor*



Theme of the presentation

- **Separation Transport-Track**
- **Costs & Earnings Transport**
- **Cost drivers Infra**
- **(In)efficiency drivers**

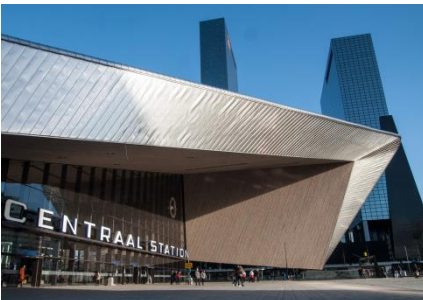
Railways in the Netherlands

Together with Switzerland we have the most densely used network in Europe



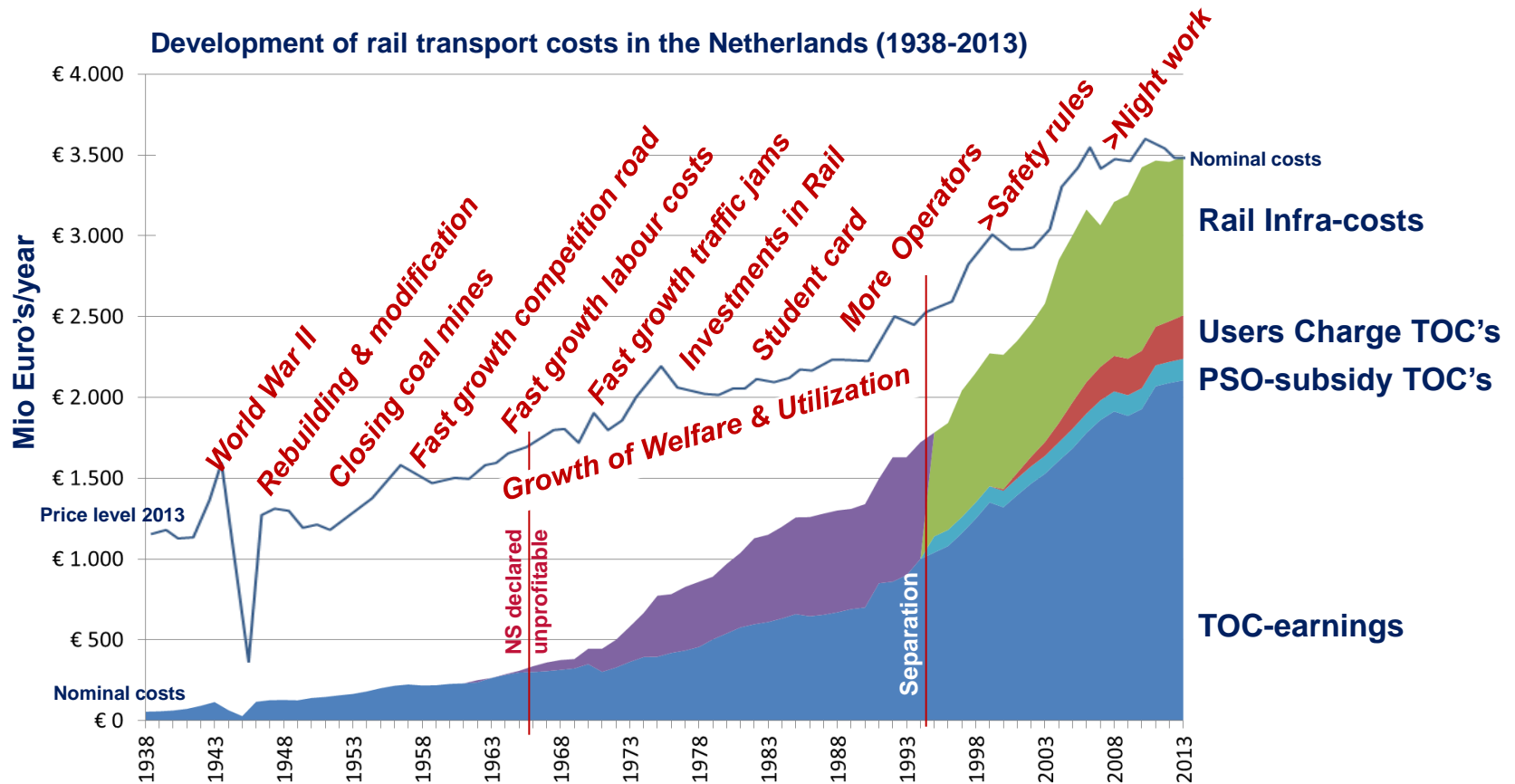
Line; 3063 km
Track: 7033 km
Stations: 404

Punctuality: 94% (<5')
Passengers: 1,1 mio/day
Freight: (net ton): 0,1 mio/day

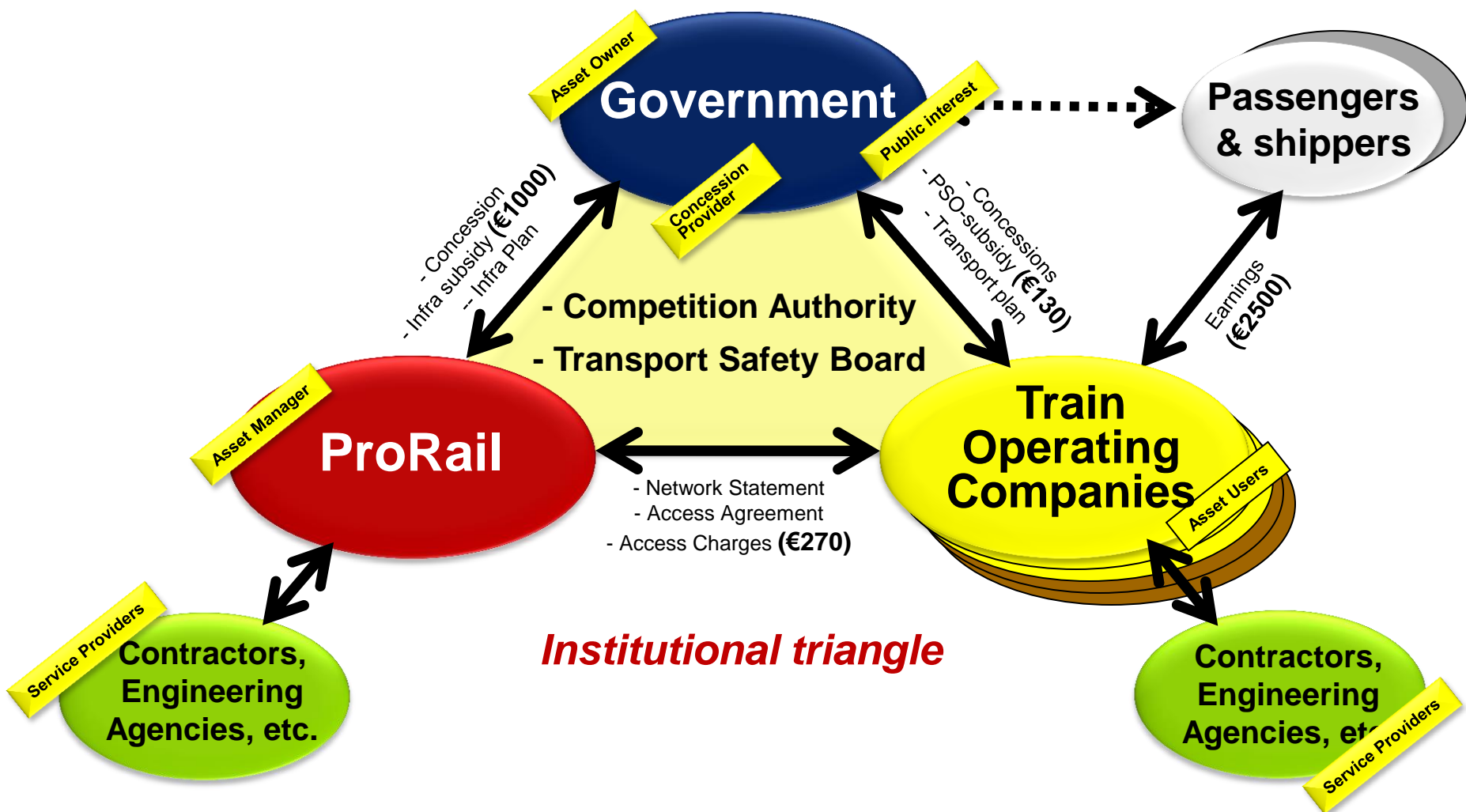


Value rail infra: € 32.000 mio
M&R costs infra: € 1.200 mio/yr
Earnings Transport: € 2.500 mio/yr

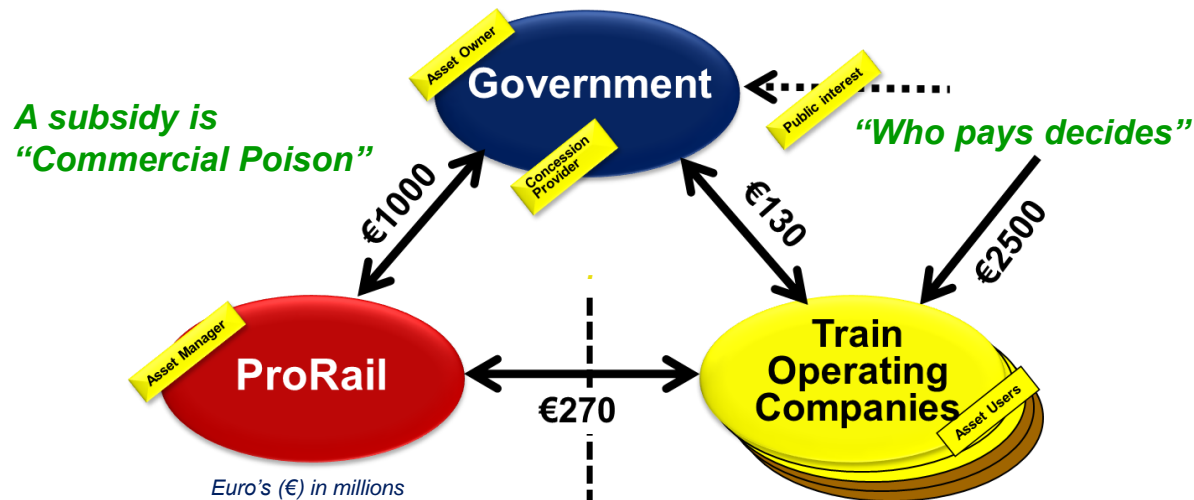
Rail Transport Costs & Revenues increased fast because of changing conditions and circumstances



The institutional triangle was born as a consequence of increasing government involvement



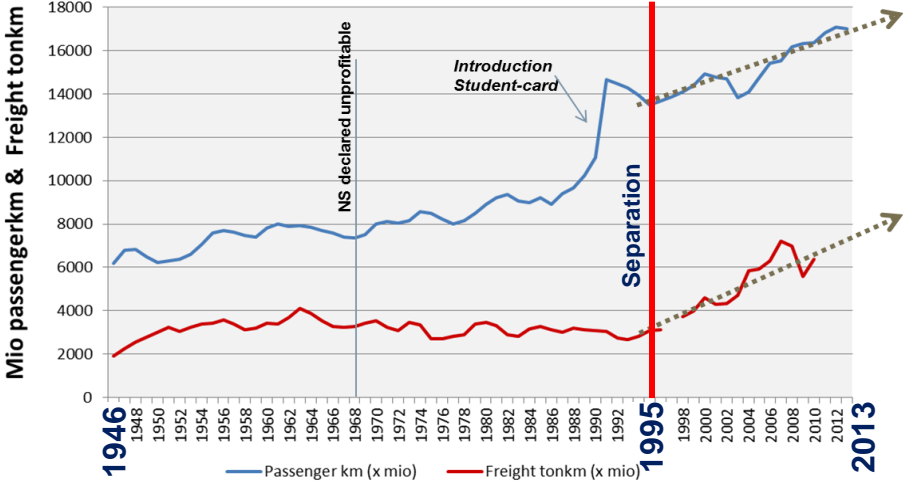
Full vertical separation created a clear division of roles, money flows and responsibilities



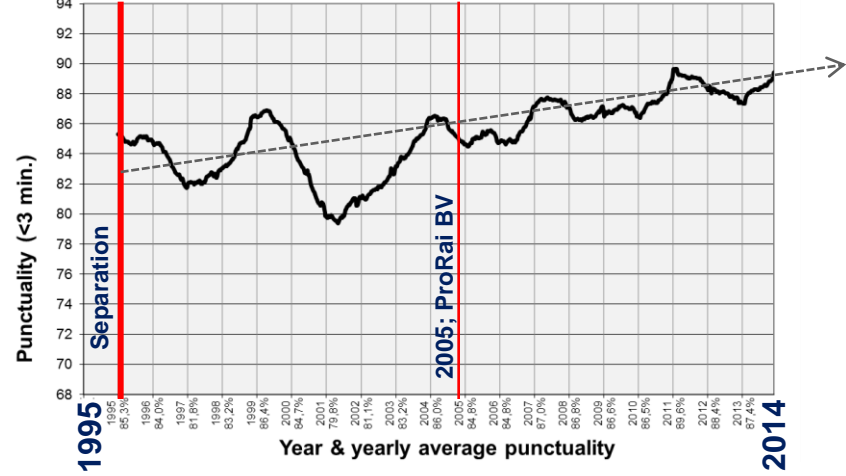
One infra Manager	Multiple TOC's (>15)
Means of production	Product
Subsidy	Revenues
Costs	Profit
Infra Performance & LCC	Transport profitability
(Very) Long Term focus	Short/Medium Term focus

Quality & Utilization improved after separation

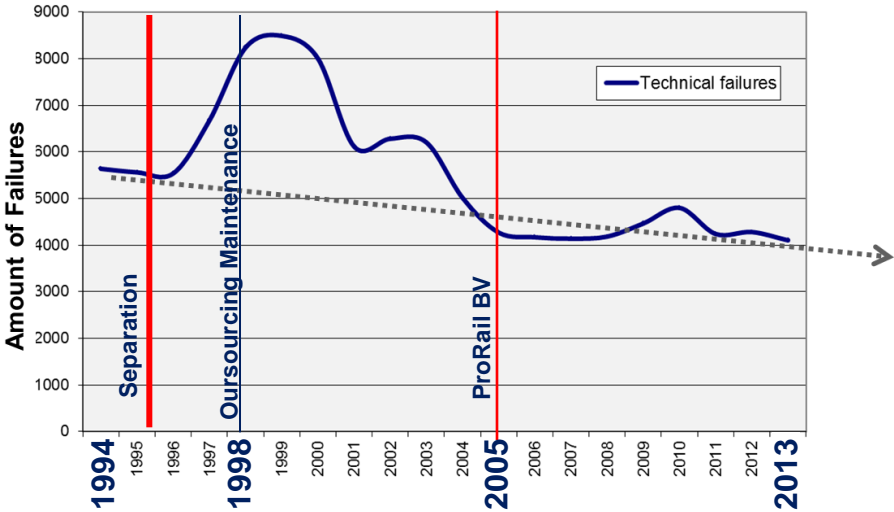
Increase utilization



Increase punctuality (<3')



Less technical infra failures



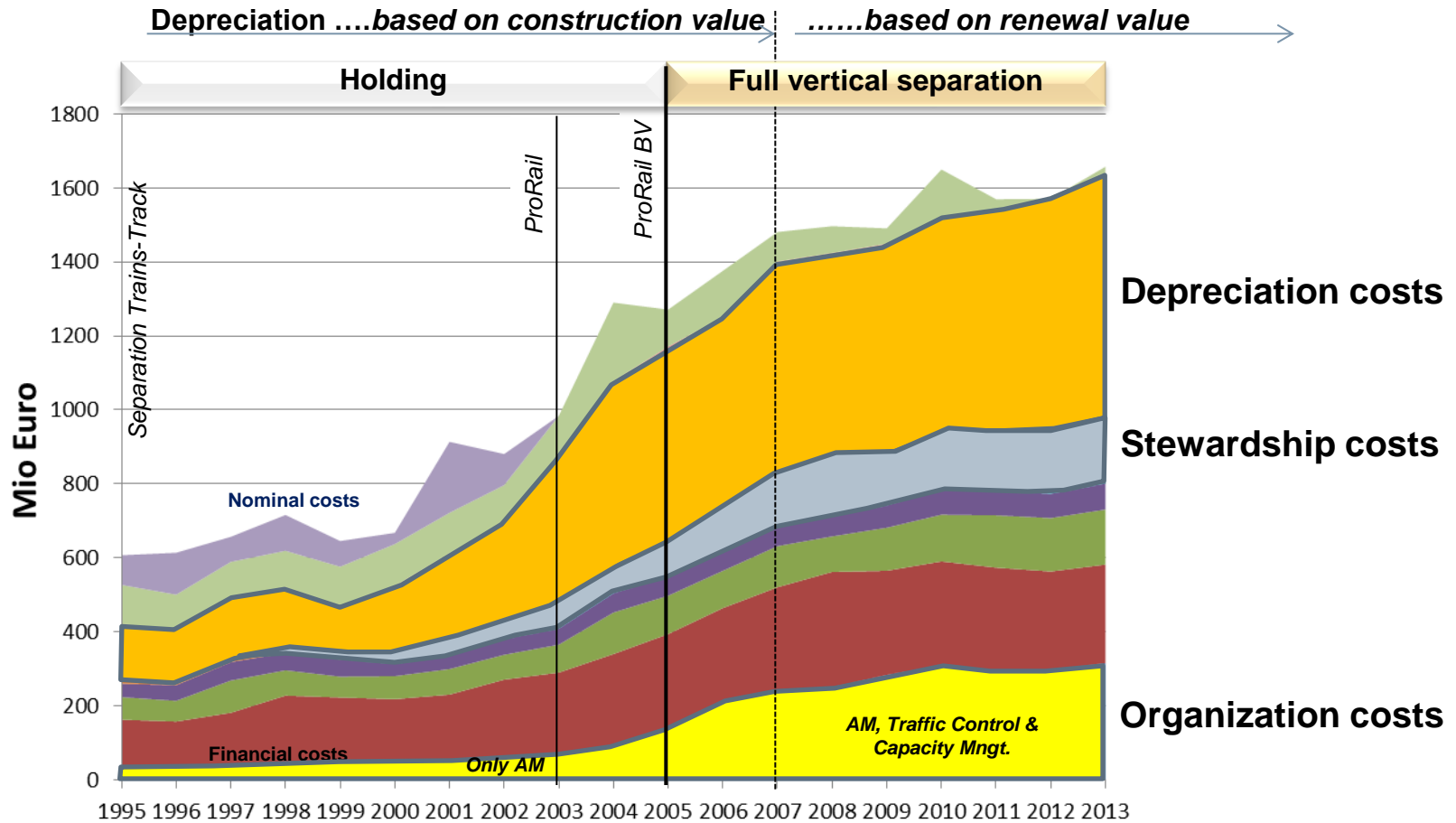
Full vertical separation created positive optimization circumstances:

- three views)* and contributions on one common goal: improving customer satisfaction,
- an open debate about the best solution
- “Who pays decides”

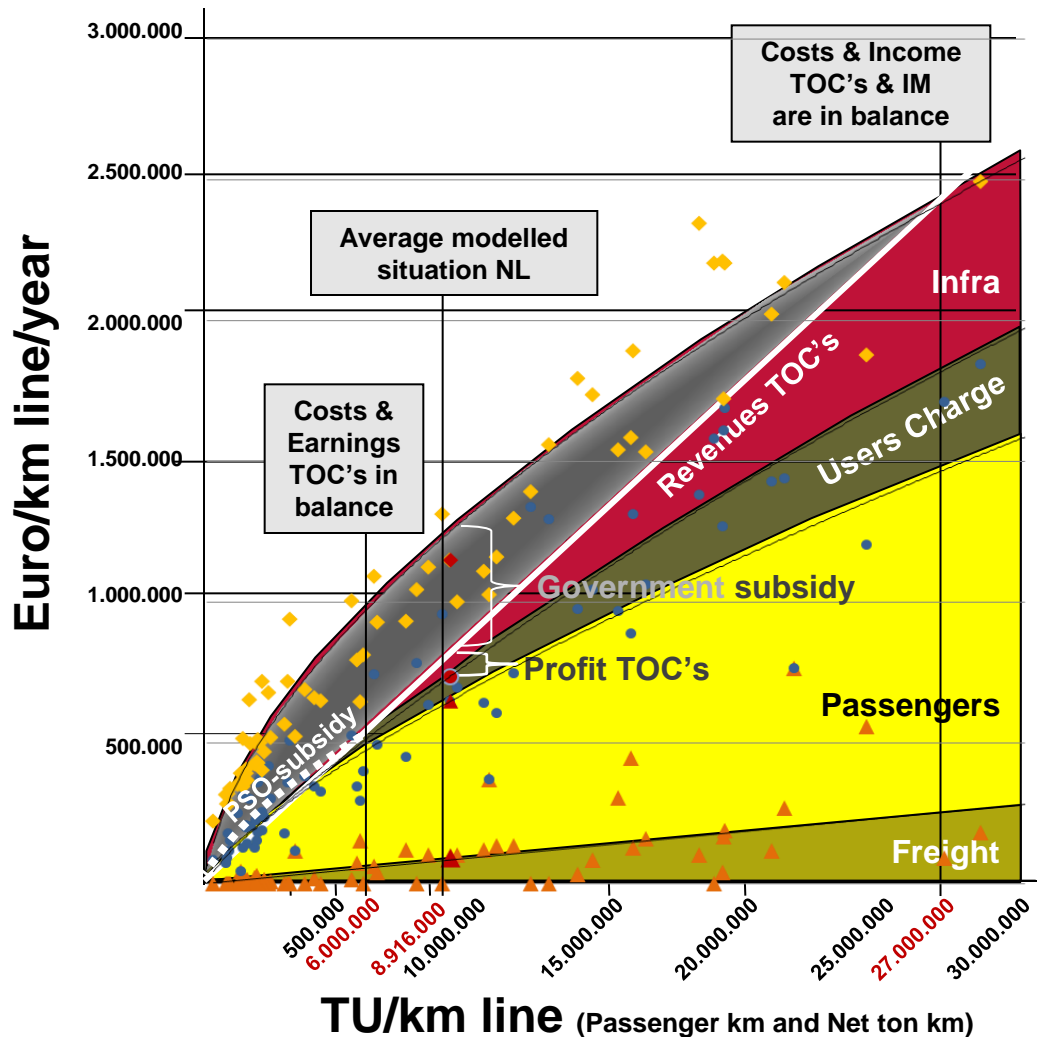
)*

- TOC's: transport costs, revenues and profit
- Asset Manager: infra life cycle costs & performance
- Government: national transport policy & public interest

Separation had a “purifying” effect on rail asset financing and reporting; full transparency to the taxpayer



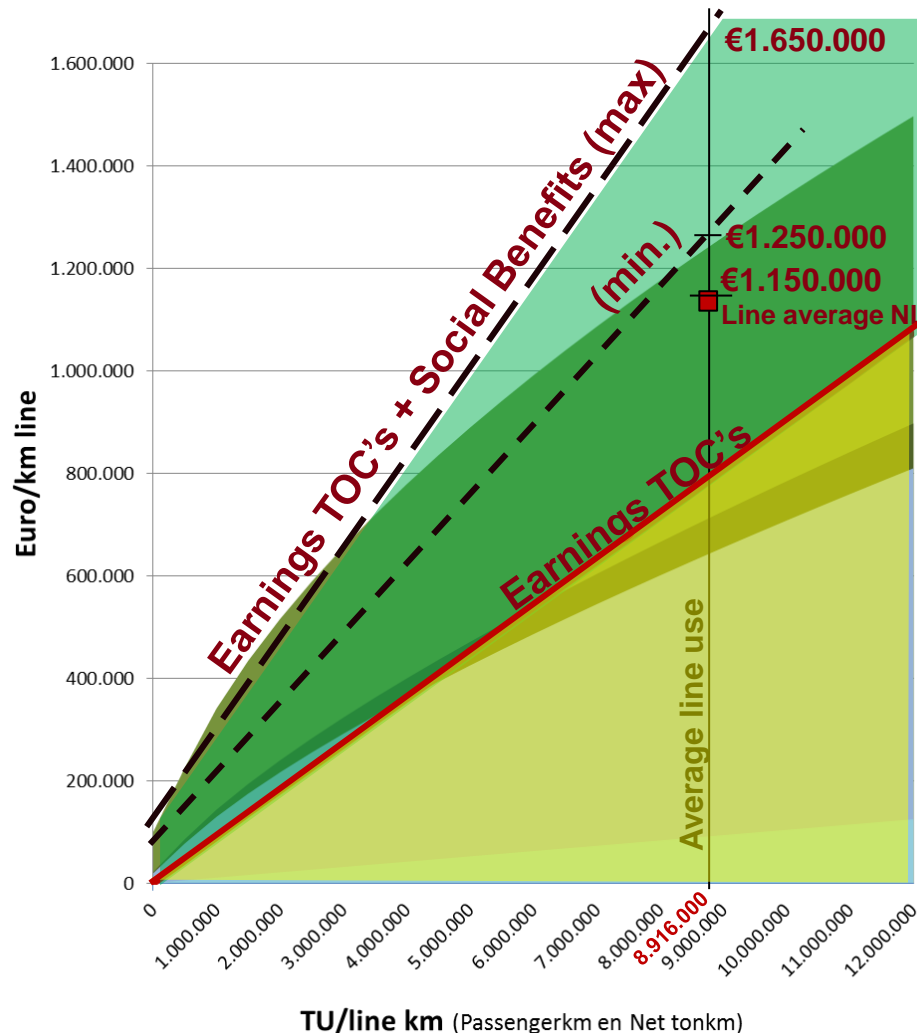
Railway Business in Europe is complex because of multiple users and costs are higher as revenues and



Railway Business Model:

- Realization of 95 lines
- TOC-costs are modelled, based on known quantities and yearly costs
- Total infra-costs = Infra + Users Charge. Both are based on realization.

Social benefits are a part of the rail transport business



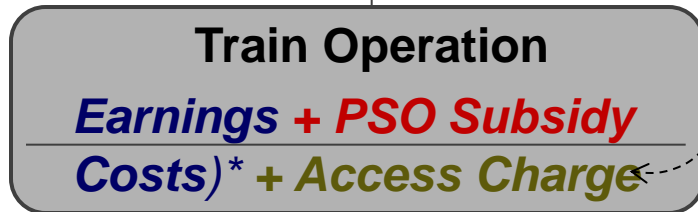
Social benefits:

- travel time savings by reducing traffic jams;
- less accidents;
- (possible) less air pollution;
- (possible) less landscape damage;
- (possible) lower production costs;
- (possible) economic stimulus.

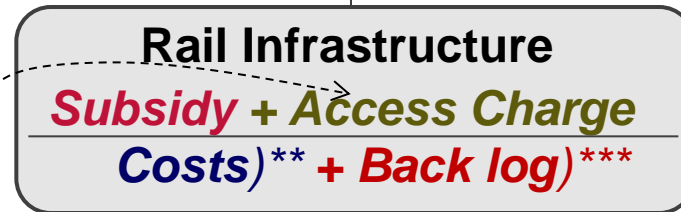
Rail Transport in the Netherlands is abundantly profitable because of high utilization/earnings and considerable social benefits

Business (in)efficiency can be measured as the ratio Earnings(= Performance) /Costs

Efficient = effective
= business like
= competent
= economical



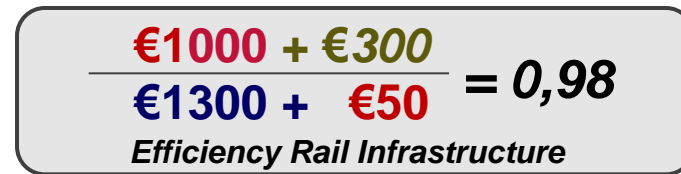
)* Only Train Operation not real estate and stations
PSO = Public Service Obligation



)** Traffic Control, M&R & Capacity Mngt
)*** Back log = % main track with speed restriction * M&R-costs Infra

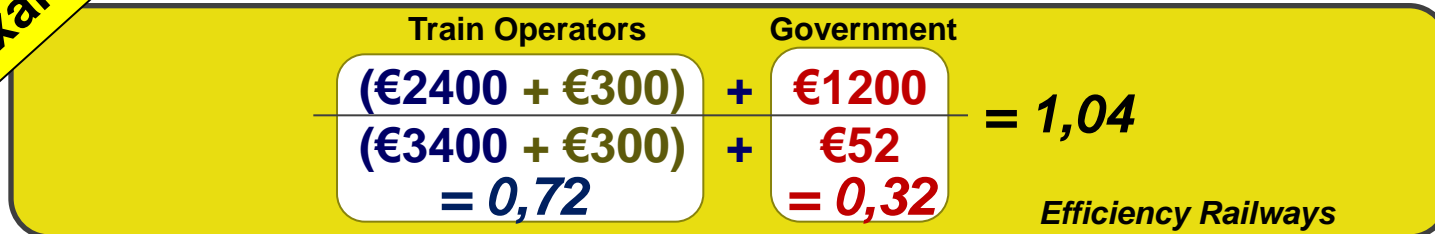


Euro's (€) in millions



Euro's (€) in millions

Example



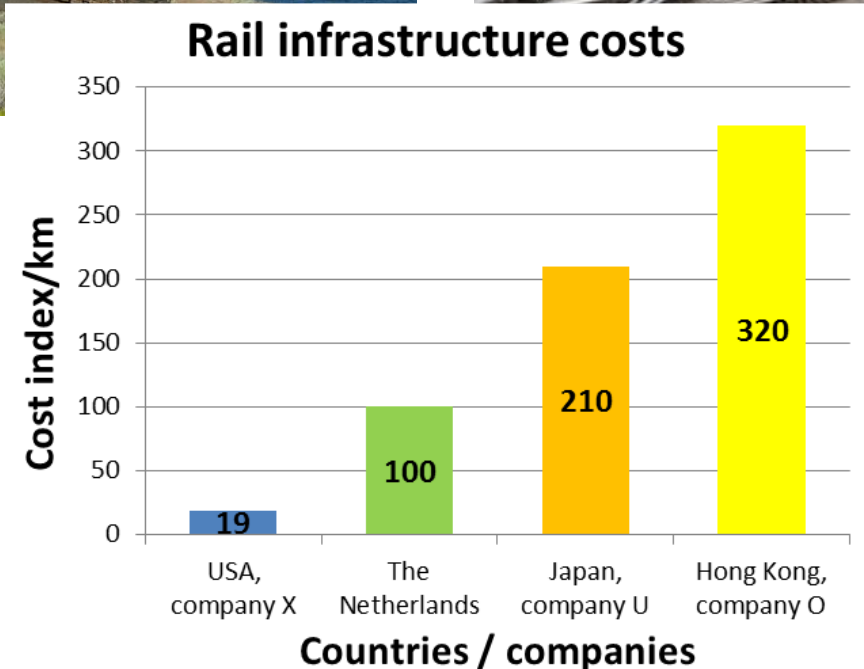
Efficiency Railways

Public Service Value

Drivers behind (in)efficiency are understood by analyzing differences & analogous between companies



2-4 trains/day
1 track
>5000 ton/train
>2000 m/train



>200 trains/day
2 tracks+
70-1000 ton/train
40-600 m/train

TOC-costs per line differ substantial because of differences in train length, -type and -intensity

100-200 seats/train



400-1100 seats/train



Regional

Intensity	1 or 2 trains/hr/direction
Trains	Short, simple
Demand	Low / Medium
Distance	Short / Medium
Personnel	Train driver
Speed	100 km/hr

Intercity

Intensity	4 trains/hr/direction
Trains	Long, comfortable
Demand	Medium / High
Distance	Medium / Long
Personnel	Train driver + conductor(s)
Speed	140 km/hr

Freight

Intensity	Depending need
Trains	Long, simple
Demand	High load per train
Distance	Long
Personnel	Train driver
Speed	100 km/hr

Intensity	
Trains	
Demand	
Distance	
Personnel	
Speed	

Infra costs per line differ substantial because of differences in utilization and complexity

+/- € 200.000 /km line



Regional line

- Single track
- Simple layout
- Simple signaling
- No catenary
- 100 km/hr
- 17-20 ton axle load

+/- € 500.000 /km line



Intercity main line

- Double (or more) track
- More complex layout
- Double/single track signaling
- Catenary
- 140-200 km/hr
- 22,5 ton axle load

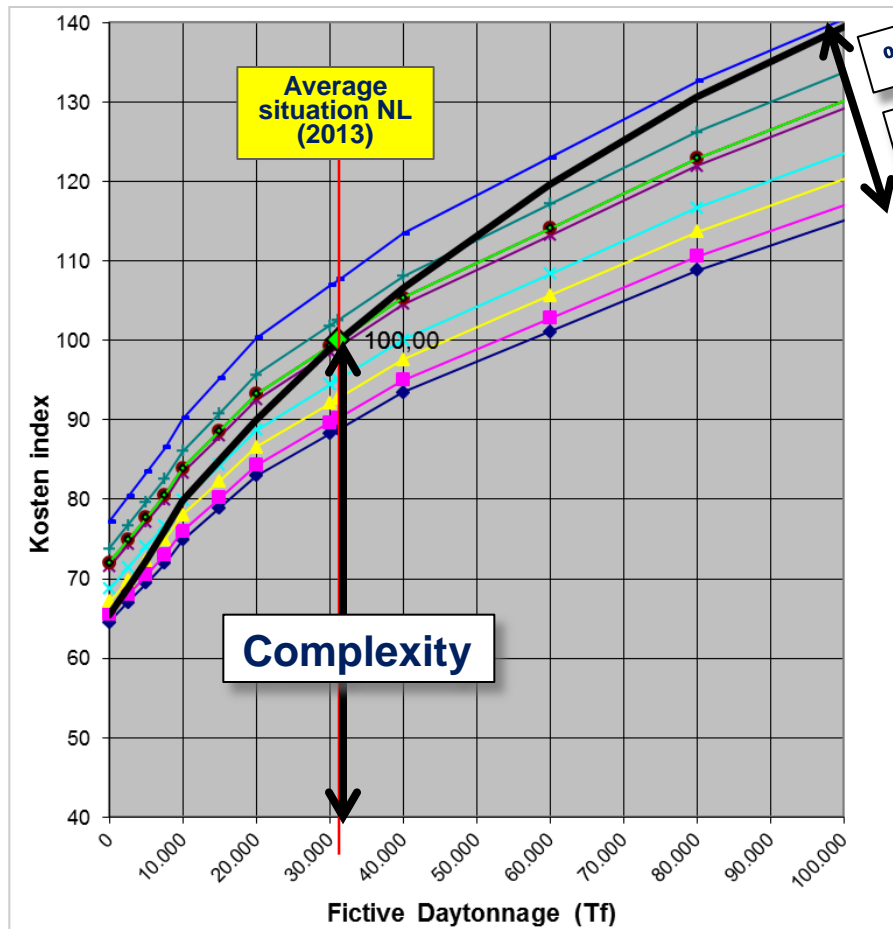
> € 1.000.000 /km line



Yards

- Complex layout: many switches
- Complex signaling
- Complex catenary
- Complex traffic control
- Complex surrounding
- Low(er) speed

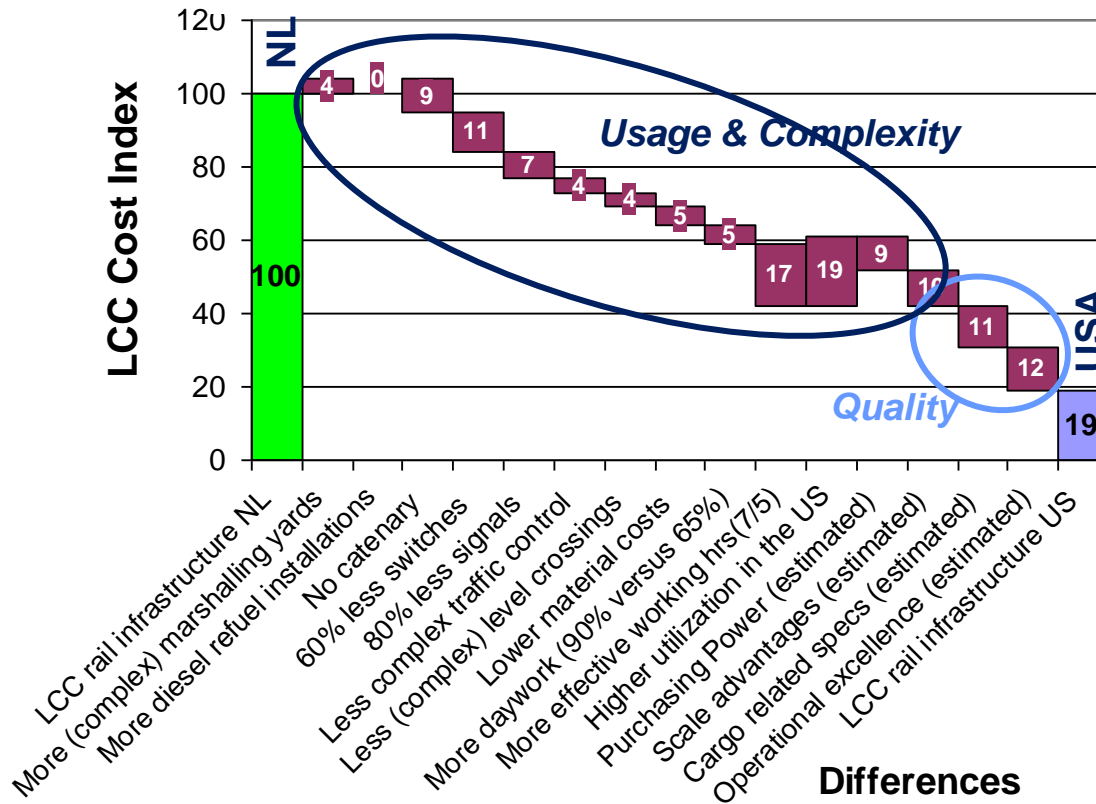
Modelling maintenance cost drivers revealed the impact of the conditions



Maintenance cost model:

- Prediction of M-costs for projects, tenders,....
- Applicable for networks, lines, contract area's
- High reliability ($R^2=0,9$)
- Also applicable to understand cost differences between countries/continents

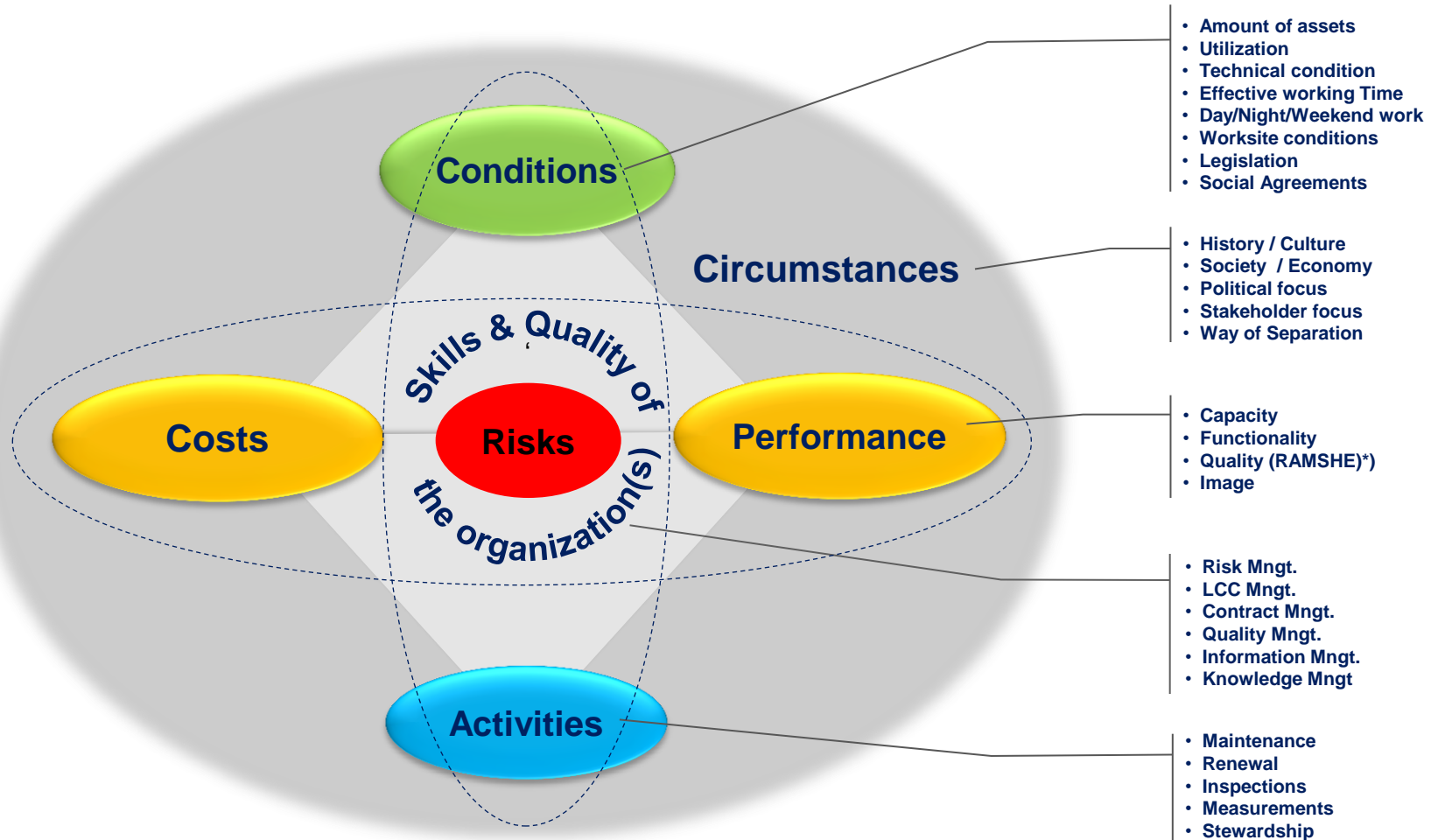
The big infra-cost gap between US-Netherlands are because of *difference in usage & complexity*



Difference in conditions:

- No catenary
- < switches (-60%)
- < signals (-80%)
- > day work (90%)
- > effective working time
- > tonkm, < trainkm

Maximizing asset efficiency depends of the skills and quality of the organization to manage all risks



“The mechanism behind Asset Management”

Performance improved after separation because of focus on clients, continuous improvement and co-operation



Kind of improvements in the branch:

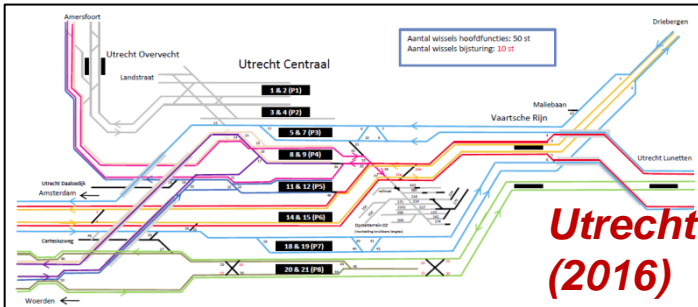
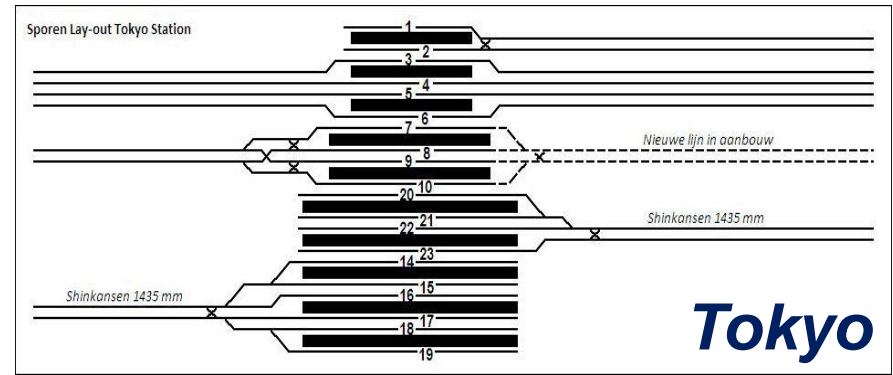
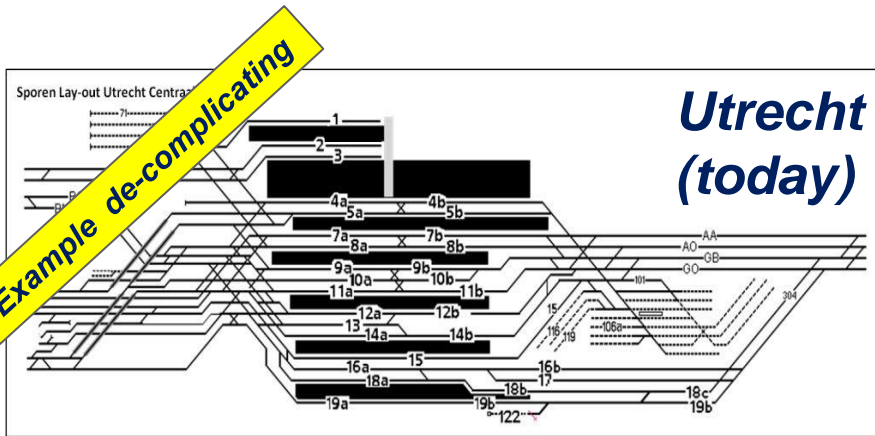
1. *minute/seconds in timetable per train series*
2. *track use per station*
3. *optimized maintenance schedules*
4. *decrease of red signal approaches*
5. *de-complex infrastructure, less switches/signals, less failures, increased speed*
6. *maintenance change: less train failures*
7. *Improved stop-&-go linking per station*
8. *Improve start-punctuality per station*
9. *Improved depart procedure trains*
10.

Example: Performance Analysis Bureau:

(at ProRail Traffic Control):

- **independent knowledge center for the whole branch**
- **provides all kind of train process info**
- **feedback loop plan-realization train process**
- **practical train process knowledge**
- **development and improvement info systems**

The cost-performance ratio improves when the whole system is de-complicated



90	60	180	trains/h
16	14	19	platforms
60	200	28	switches
2	3	2	min headway

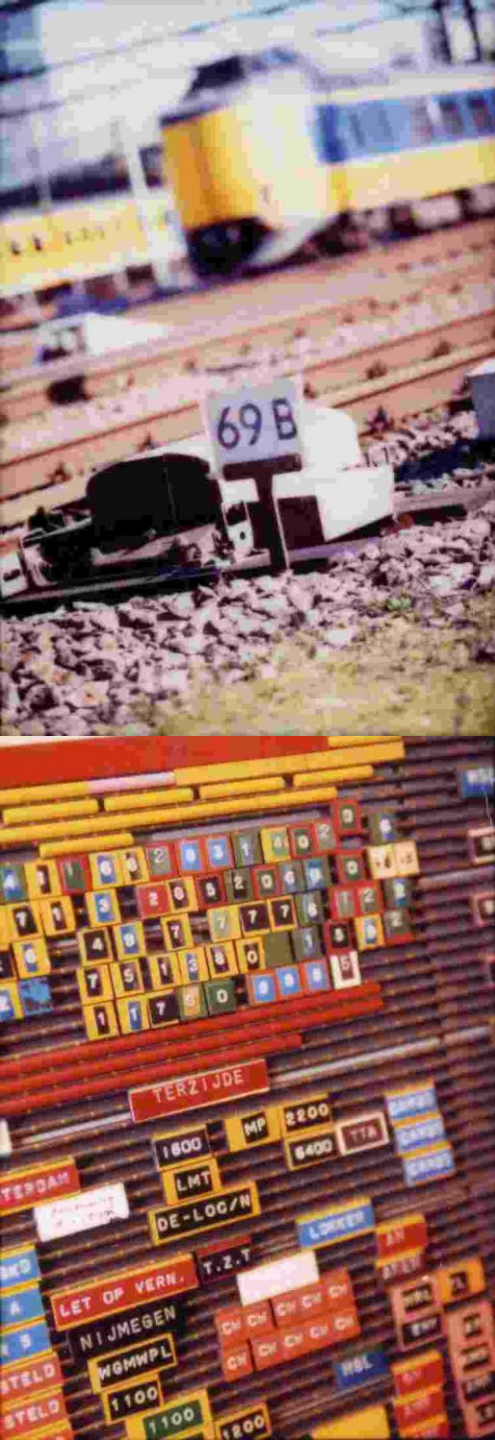
Performance)* increases and costs go down when the system is de-complicated

)* Capacity, Functionality and RAMSHE-quality

Conclusions

1. **Railways in Europe can't exist without government financing.**
2. **Full vertical separation created beneficial circumstances as a result of well separated roles, money flows and responsibilities**
3. **Full separation created positive optimization circumstances:**
 - *TOC's: transport costs, revenues and profit*
 - *Asset Manager: infra life cycle costs & performance)**
 - *Government: national transport policy & public interest*
4. **Role fulfillment of the government and co-operation are decisive**
5. **Earning/cost-ratios are high level indicators for efficiency**
6. **Usage and complexity are the main rail infrastructure cost drivers**
7. **Risk management is key to optimize infra costs & performance)***
8. **Skills, conditions, circumstances and price determine (in)efficiency.**

)* Infra performance = Capacity, Functionality and RAMSHE-quality



**Our ambition:
the best infra manager in Europe
and leading in the World**

