UIC Asset Management
Global Conference 2015

The battle of Asset Management is won in the design phase

The impact of new design and renewal

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Putting your assets on the right track

Summary

- Recalls to fix ideas
- Examples of design choices impacts
- Key principles for a better future
- Conclusion

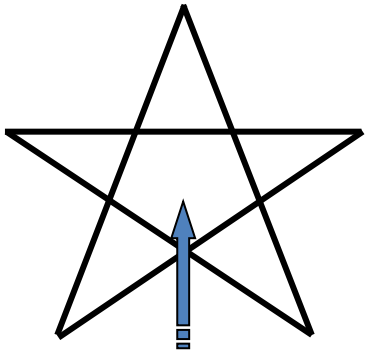
Recalls to fix ideas

The railway system is **a** "System" in "stable imbalance"

- The new design / modification / evolution of one of the five dimension has an impact on the four others

Men (organisation, skills, education, culture…) IM's & RU's

Environment (economical and safety targets, traffic, track possession politic…) IM's vs. RU's



Operation principle, Rules (operation rules, laws, technical directives, track possession management…) IM's & RU's

Infrastructures (track, signalling, overhead lines, monitoring…)

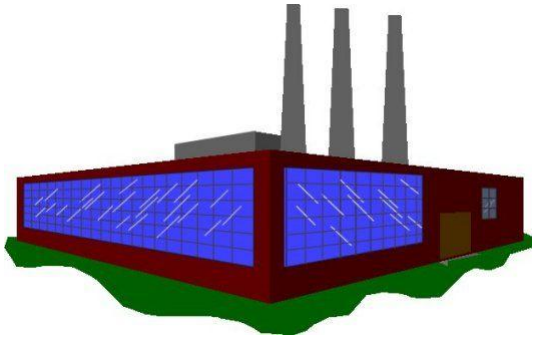
IM's

Rolling stock (speed, load, aerodynamics, acceleration, monitoring…) RU's

Recalls to fix ideas

Railway is an “always living system” :

- We can only renew or maintain the “always living railway system” that we have given thought to in advance
- If we haven’t given it any thought in advance we would have to pay much more to do the same… if possible in a safe way

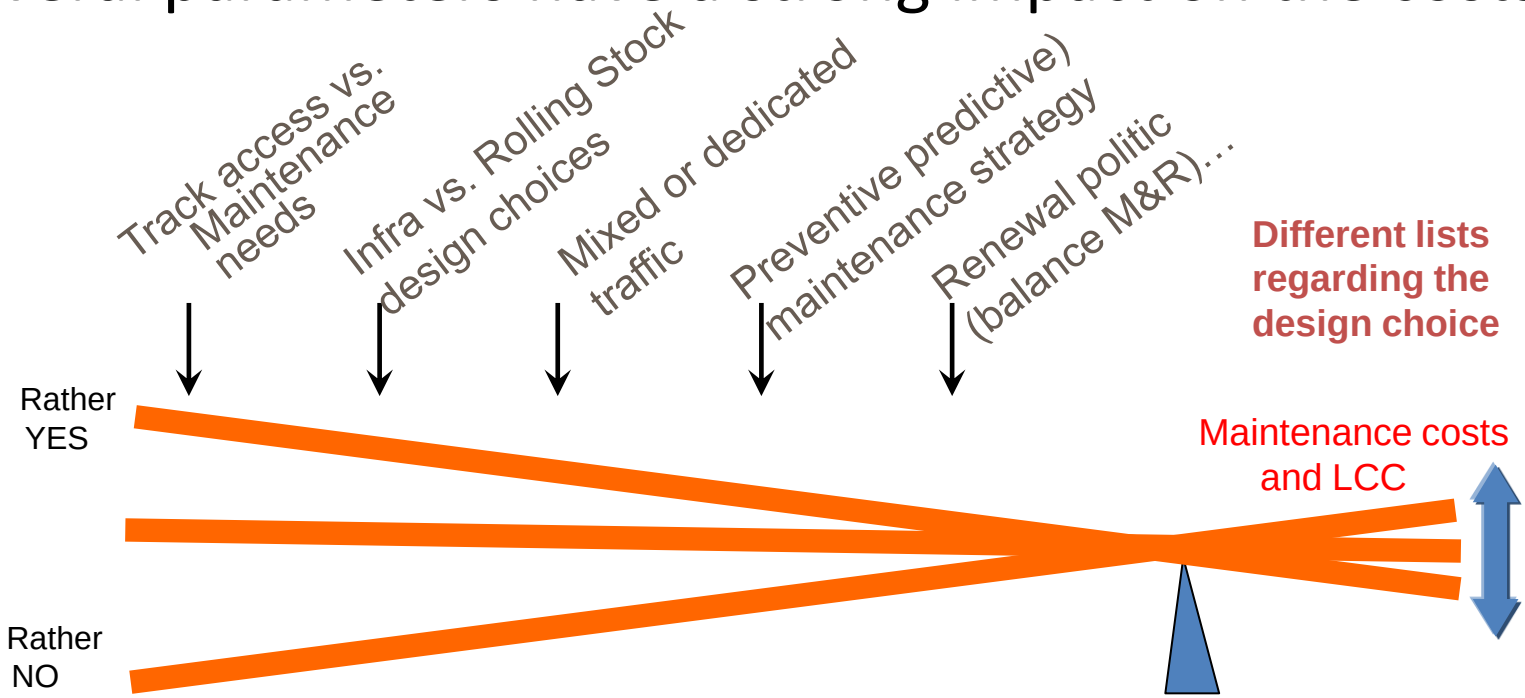


➔ Railway is not a factory

Recalls to fix ideas

The maintenance and operation costs of the railway system are functioning on various parameters

- Several parameters have a strong impact on the costs



Recalls to fix ideas

Asset management is the «art» to reach for the best performance of the system in a context of shortage of resources:

- Which resources? Easy replaceable units, skilled human resources, financial resources, track possession possibilities, tools, environment…

➔ We have to plan it in the long terms and be able to adapt the schedule to unexpected problems...
This needs modelling – estimation of future maintenance needs!

Recalls to fix ideas

How to estimate the future maintenance needs for the different assets in they conditions of use:

Five main steps :

4 – Tools for **renewal guide/program** definition regarding the key parameters (track possession, unavailability costs…) → Planning

3 – Tools for the estimation of track **maintenance needs** and associated track possession time (with different renewal strategies) → T0, LCC

2 – Assessing **deterioration and failure laws** →W(β,η) of each the track components

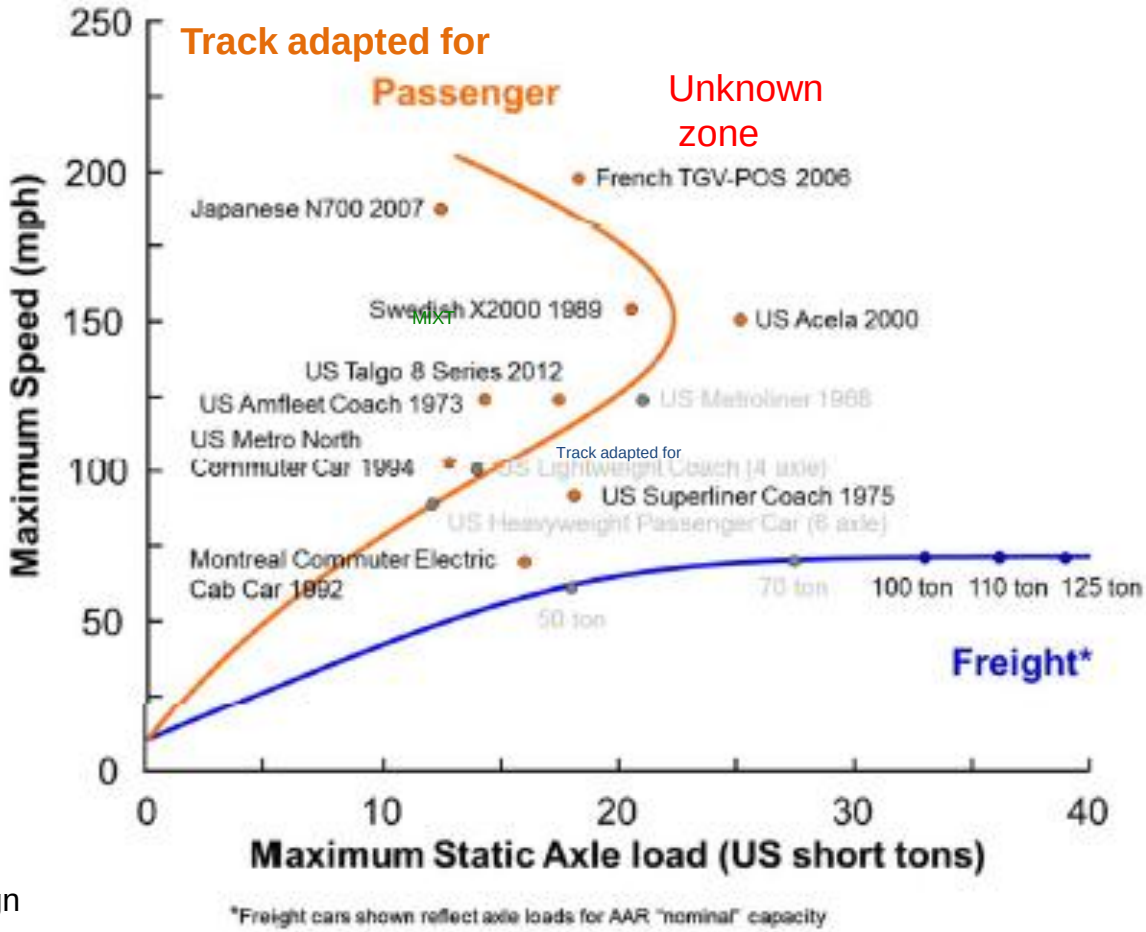
1 – **Databases** (asset types and asset populations, maintenance operations, environment, condition of use…)

0 – **Design stage** → Technology, modularity, maintainability, standardisation, integration & safety demonstration friendly... Regarding the conditions of use

Recalls to fix ideas

General example :

Managing the stress state of the railroad



Source University Urbana Champaign

Examples of design choices impacts

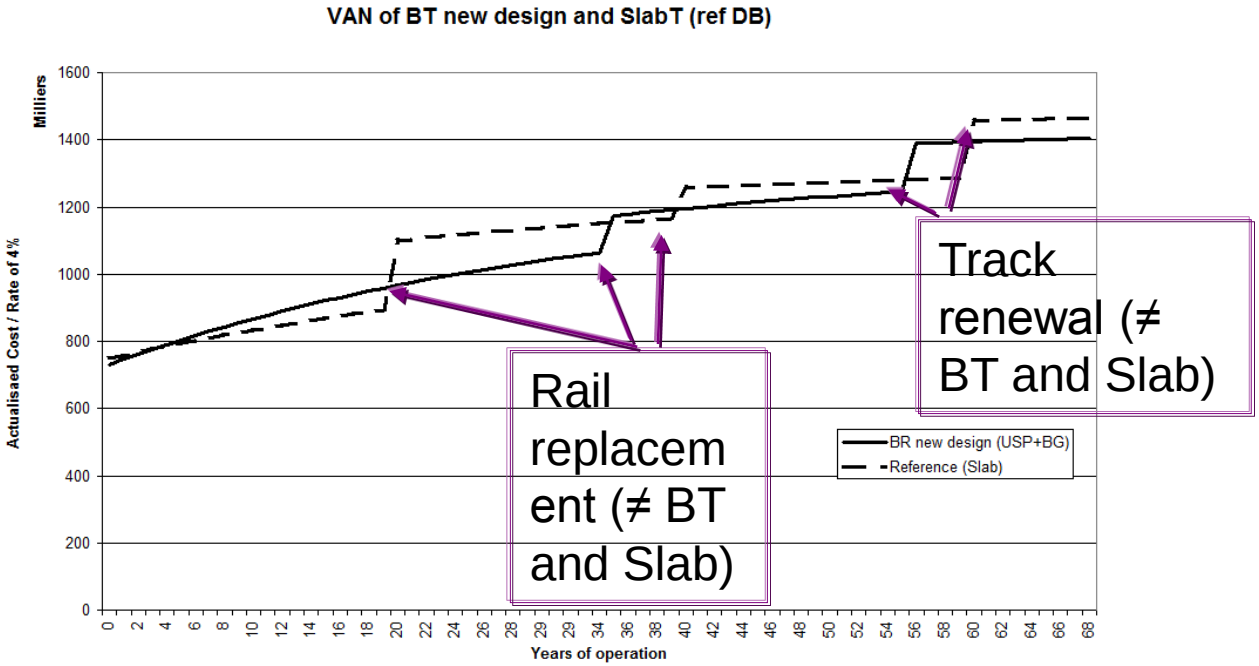
Track technology:

- Ballasted track versus Slab track?
  - each solution has it's own advantages and/or challenges regarding the economical choice linked to expected performance: nobody is perfect
  - the choice has to take into account different parameters as sub soil quality, network topology (alternative route, no trains for 1 day), track possession strategy, business strategy, rolling stock type...
  - this leads to different Life Cycle Cost curves

Examples of design choices impacts

Track technology:

- Ballasted track versus Slab track ?



➔ choose but the best choice for a given situation

Examples of design choices impacts

Signalling technology:

- Relays versus computerized signalling systems?
  - each solution has it's own advantages and/or challenges regarding the economical choice linked to expected performance
  - the choice has to take into account different parameters as network topology (track layout, distance), availability, integration friendliness, evolution friendliness, security and safety targets, capacity targets, life time and maintenance costs...
  - this leads to different maintenance costs curves

Examples of design choices impacts

Signalling technology:

- <u>Formal versus natural language for computerized signalling systems requirements</u>?
  - what is the best for the life cycle cost of the computerized signalling systems? For their safety and security demonstration? For their future evolutions?...

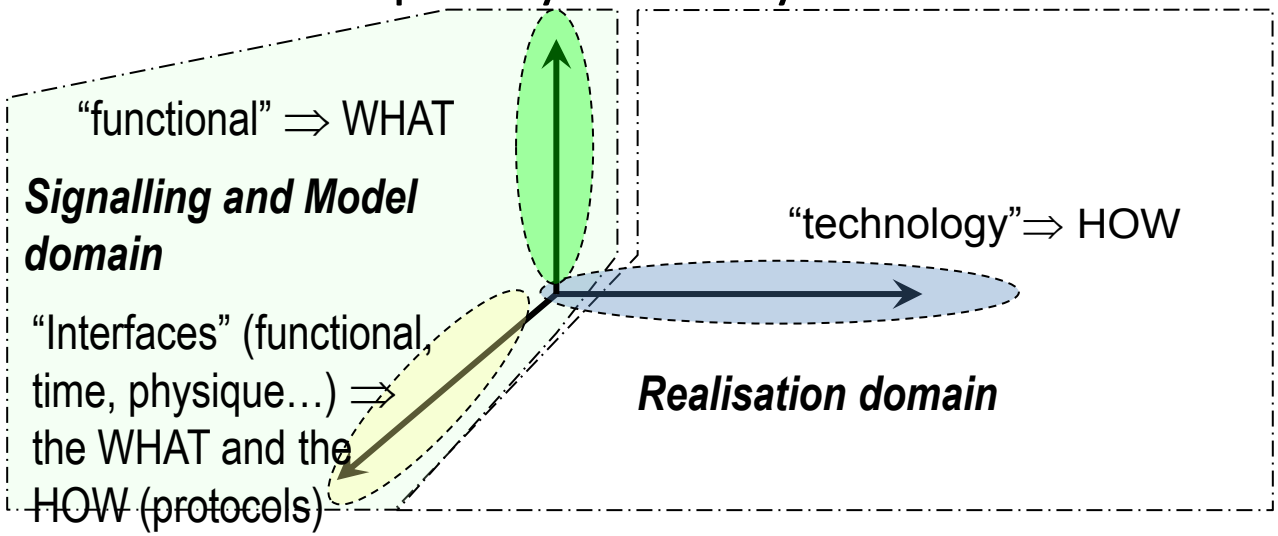
Complex system →
(never provable)

← Complicated system (can be provable)

Examples of design choices impacts

Signalling technology:

- <u>Formal versus natural language for computerized signalling systems requirements</u>?
  - how to master the complexity of the system



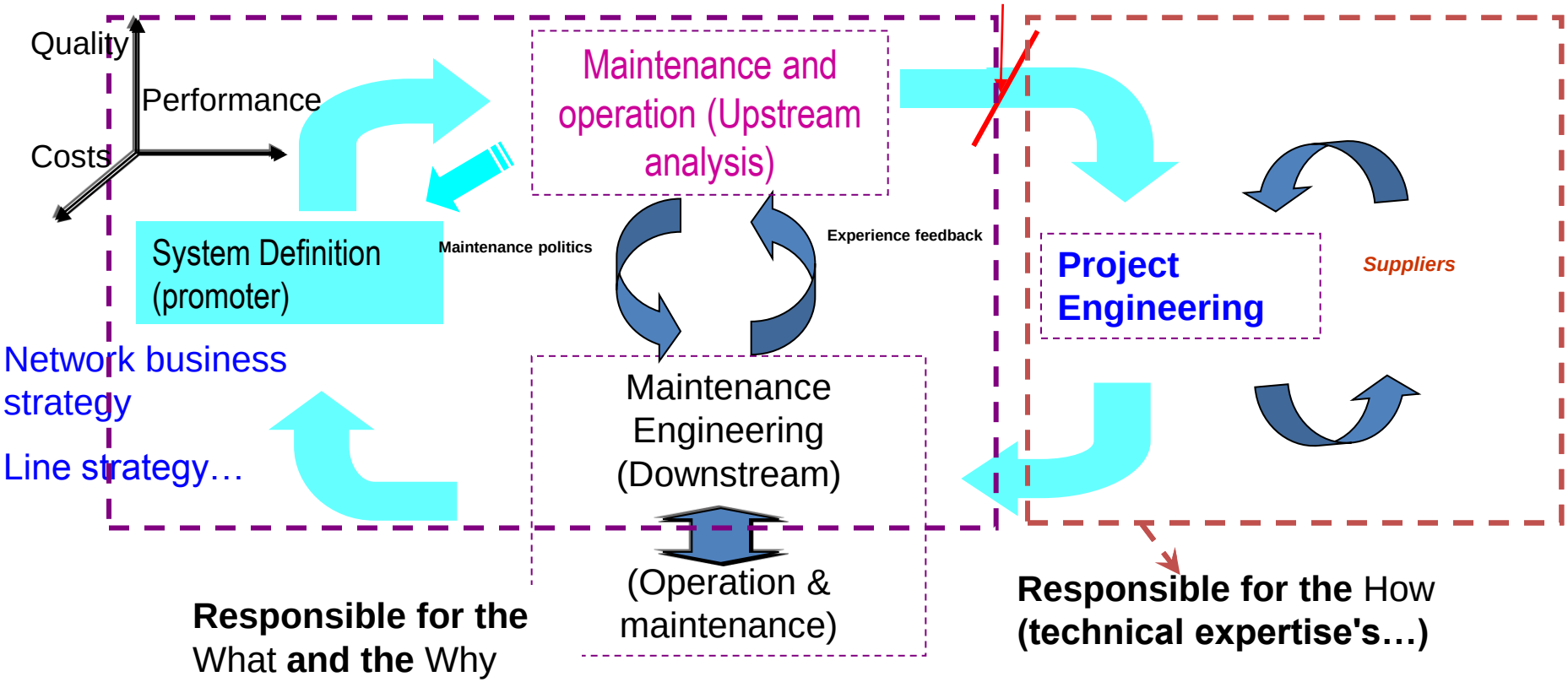
Examples of design choices impacts

Signalling technology:

- <u>Cyber issues due to IP open network and digitalisation</u>?
  - Asset management contributes actively to the "security and safety management system"
  - choice of network & signalling system architecture
  - choice of functional and organisational measures...

Key principles for a better future

The need for a system vision



Key principles for a better future

Modularity and interfaces challenges:

- The asset manager has to control the modularity of the railway system. It’s the only way to be responsible for performance, safety-security, maintenance...
- This gives the possibility to estimate the right failure-degradation laws, to identify the wearing of pieces and facilitate their replacement, the integration of the whole railway system on long term

➔ Power is the control of the incertitude's...

Key principles for a better future

Formalisation (« formal » description) of the sub-system requirements:

- To become “simulable” and/or “formally provable” before the launch of new sub-systems, to facilitate their integration and safety-security demonstration... Regarding the real condition of use

➔ A miracle is never coming alone, its needs to be facilitated

➔ If we don’t think of the future, we will pay for it!

Key principles for a better future

The Asset manager needs simulations to:

- Describe and justify each possible scenario regarding the different packages of constraints
- Project itself in the different possible future scenarios
- Prioritize the possible actions to be launched... regarding the possible impacts of different technical strategies

→enlighten the strategist of the middle and long term consequences of his choices

Conclusion

- The asset manager needs a clear asset strategy support because the battle for asset management is won or lost at the system definition & design stage
- It is essential to consider the industrial balance of the trio made up of "Maintenance costs – Network Performances – Quality"
- A technical solution doesn't, on its own, produce the best answer!

Conclusion

- The asset manager needs a clear asset strategy support by a complete reflexion of all the points seen before: ability to integrate the new components, maintain and operate the system, in safety and security and efficiency

→ It could be useful to have a « guide line » for railways: asking itself the right questions, in the right order, regarding each specific context... an IRS is going to be written by UIC's members, responsible of the efficiency and safety of their network

Thinks for your kind attention

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Before we work, some sentences I like

«*We are dwarfs perched upon the shoulders' giants, so we see more than them and further, not because our sight is sharpest or our size is higher up, but because they carry us up and they move us up with all their gigantic height*»
Bernard de Chartres, XIIth century.

« Nous sommes des nains juchés sur des épaules de géant. Nous voyons ainsi davantage et plus loin qu'eux, non parce que notre vue est plus aigue ou notre taille plus haute, mais parce qu'ils nous portent en l'air et nous élèvent de toute leur hauteur gigantesque »
„Zwerge auf den Schultern von Riesen…“

«It's only possible to well understand a science insofar as we know perfectly his history»
Auguste Comte

« il n'est possible de bien comprendre une science que dans la mesure où l'on en connait l'histoire »

«*The species which survive aren't the strongest species, nor the more intelligent, but the ones which adapt themselves to the evolutions*»
Charles Darwin (1809-1882)
"Les espèces qui survivent ne sont pas les espèces les plus fortes, ni les plus intelligentes, mais celles qui s'adaptent le mieux aux changements."