



International Association of Public Transport
Union Internationale des Transports Publics
Internationaler Verband für öffentliches Verkehrswesen
Unión Internacional de Transporte Público

*UITP Light Rail Committee
Rolling Stock Maintenance*

Bucharest, May 25, 2011

Leo Haring

Better mobility for people worldwide

WG Rolling Stock Maintenance

Content of the presentation

- **Introduction**
- **Light Rail Projects**
- **Vehicle Maintenance**
- **Outsourcing**
- **Obsolescence**
- **Maintenance Strategies**

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Introduction

Results of activities of following working groups:

“Outsourcing of activities in technical departments”

Sub-Committee Rolling Stock, 2008

J. Lanckriet

“Managing obsolescence of electronic components”

Metro & Industry Committees of UITP, 2010

Hubert de Blay and Umberto Piso:

“Do’s and Don’ts in Light Rail Projects”

WG Improving the commissioning of LR Systems, 2010

Leo Haring and Hugo Hohmann

“Maintenance of trams and light rail vehicles”

WG Rolling Stock Maintenance, 2011

Leo Haring and Klaus-Dietrich Matschke

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Vehicle Maintenance

Objectives

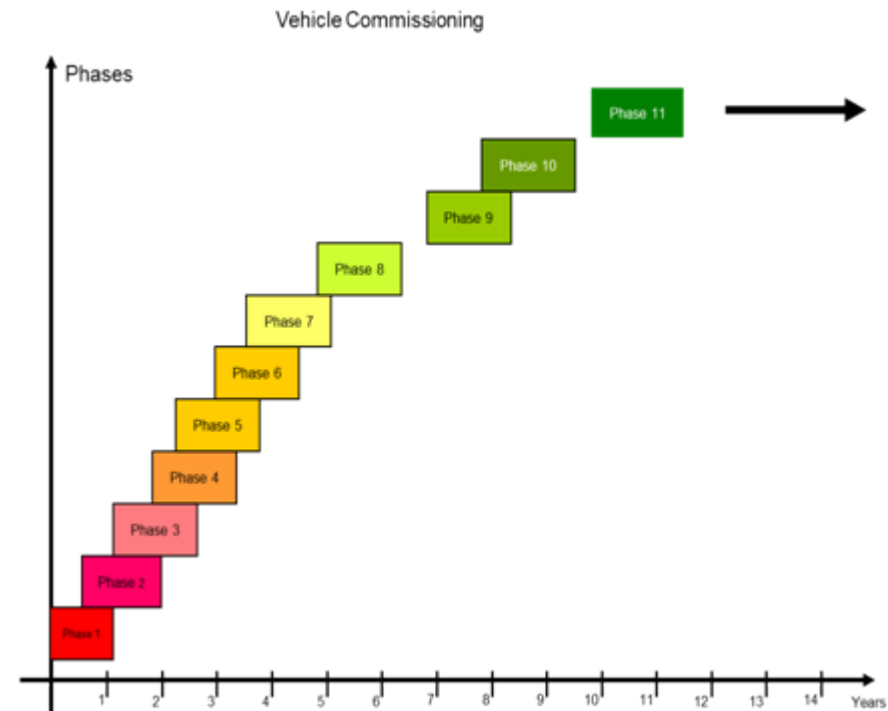
- **Decrease risks of safety and environment incidents**
- **Avoid down-grading in the long term**
- **Optimize the lifecycle**
- **Limit scheduled standstills**
- **Avoid unscheduled standstill (breakdowns)**
- **Avoid loss of capacity**
- **Avoid loss of quality**
- **Comply with applicable standards and legislation**

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Maintenance Demand

Demand determined by results of 11 phases of a light rail project:

- 1 Planning
- 2 General functional requirements
- 3 Technical requirements
- 4 Concept dialogue with industry
- 5 Tendering phase
- 6 Contract phase
- 7 Engineering phase
- 8 Production phase
- 9 Commissioning phase
- 10 First operation years (warranty)
- 11 First years after warranty



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Maintenance levels

1st line maintenance:

Activities on trains, periodical preventive & curative maintenance

2nd line maintenance:

Activities on trains requiring special equipment & knowledge

3rd line maintenance:

Revisions and repairs of components & parts removed from train.

Decision levels

- Strategic
- Tactical
- Operational

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Outsourcing *)

- A public transport company has to focus attention on the client, which is the passenger.
- Because of costs the company also needs to optimize the LCC of the vehicles.
- Maintenance is important
- Can maintenance be considered as “core business”?
- Should maintenance be outsourced?
- What is outsourcing, advantages and disadvantages

***) Outsourcing of activities in technical departments
Sub-Committee Rolling Stock, J. Lanckriet dir. RM MIVB**

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Definition of Outsourcing

- **Hand over in a controlled way certain well specified activities to another organization, for example by the transfer of activities or by hiring external personnel, usually experts, for specific projects or activities.**
- **Activities with temporary personnel under supervision of its own staff/management are not considered as outsourcing.**

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Ways of outsourcing:

- **Sub-contracting = task oriented**
Buying capacity and/or competence
- **Outsourcing = target oriented**
Contractor gets tasks and responsibility

Contract forms:

1. **Capacity contract (capacity driven):**
2. **Effort contract (effort driven) :**
3. **Results contract (results driven)**
4. **Performance contract (Partnership)**
5. **Ownership**

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Advantages and Disadvantages of Outsourcing: Threat

- Loss of total control
- Loss of knowledge and experience
- Dependence of supplier
- Less flexibility
- Demoralize own staff

Opportunity

- Focus on core activities
- Introduction of knowledge and experience
- Control the cost
- Higher performance and cost efficiency (scale economy)
- Continuity and support

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**If outsourcing is not possible anymore:
(Sub-contractor bankrupt or not interested to continue the activity)**

Reversibility of outsourcing is often difficult:

- **Know how has been lost**
- **Infrastructure is no longer available**
- **Staff is no longer present or difficult to find on the market**

Recommendation

- **The functional know how needs to be preserved.**
- **Good estimate of the cost of outsourced product and quality control is necessary.**

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Insourcing of activities

Opportunities for such insourcing could be:

- More efficient use of the existing infrastructure
- More efficient use of specialized staff
- Financial earnings
- Social impact on the staff members is mostly positive.

Threats or dangers linked to insourcing:

- Contractual obligations with “customers” (prices, terms, volumes,...) can damage own interests in case of certain unexpected circumstances.

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Obsolescence *)

Largest problems encountered with railway electronic components due to the Life Dilemma:

- **Trains & Fixed Installations Market Life** **10 years**
- **Operation & Maintenance life** **30 40 years**
- **Components Market Life** **3 – 5 years**

***) Hubert de Blay and Umberto Piso:**

“Managing obsolescence of electronic components”

Warning for obsolescence by Metro & Industry Committees of UITP.¹³

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Segmentation of electronic components

- **Electronic consumer appliances**
- **“Off the Shelf” components**
- **Railway catalogue products**
- **Specific Railway products**

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Obsolescence Management Strategy (1)

- **Easy replaceable components (interfaces, standard...)**
- **Long Life Cycle components**
- **Preferred Parts Lists**
- **Market monitoring (anticipate)**
- **Contracts with suppliers (agreements)**

Obsolescence Management Strategy (2)

- **Do nothing until needs arise**
- **Components substitution (interfaces)**
- **Re-design of components & equipment**
- **Regular upgrades of components/equipment**
- **“Lifetime buying”**

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Obsolescence Management Process

- **Supply the list of electronic components**
(references, characteristics, suppliers etc....)
- **Supply the list of obsolete components**
- **Warning of upcoming obsolescence**
- **Studies on handling upcoming obsolescence**
(incl. re-design, upgrading, storage and assessment of impact)
- **Safe deposit by the industry of design documentation, manufacturing, software sources for railway products**

Conclusions

Obsolescence of electronic components is important phenomenon: impact on projects, operation and costs

- **Be prepared: obsolescence shall be considered in advance.**
- **Establish obsolescence management policy**
 - **Define objectives related to acceptable risks**
 - **Define requirements levels to industry and implement obsolescence management process.**
 - **Implement “Obsolescence Watch” with industry.**

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Maintenance Strategies

Light Rail Committee stated:

Most European operators have pressure to improve their rolling stock maintenance with special focus on **Obsolescence** and **Outsourcing**.

LRC established WG RS Maintenance with duty and target:

- To investigate the maintenance strategies of operators
- To identify trends and problems
- To establish recommendations for maintenance strategies

Study based on operators experiences collected with questionnaires.

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Contributions received from:

BVG Berlin

BKV Budapest

BURULAŞ Bursa

KVB Cologne

De Lijn Flanders

HTM The Hague

TfL London

Metro do Porto

SSB Stuttgart

Veolia Transport

Rheinbahn Düsseldorf

Prague Tramway

CARIS Lisbon

MTR Hong Kong

DPMB Brno

RPA Dublin

GS Spårvagn Göteborg

Keolis

Carris Madrid

SL Stockholm

FGV Valencia

WL Vienna

MLT Tenerife

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Questionnaire 1

Questions for Maintenance Strategy concern:

- **Basis of vehicle maintenance programs: fixed intervals for inspections or intervals adapted to actual wear and tear**
- **Establishment of maintenance programs: operator, manufacturer**
- **Obsolescence problems for old and new operators**
- **Relationship between spare part availability and vehicle availability**
- **Acquisition of spare parts: contract for new vehicles including spare parts, alternatives for producers and licenses for production**
- **Relation between problems with availability of spare parts with experience of operators.**

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Theses

- 1. Old experienced operators do more maintenance by themselves and outsource less than new operators and/or owners of recently purchased vehicles.**
- 2. Outsourcing depends on size and age of the Company: Traditional old companies have inhouse maintenance and new operators and smaller companies outsource.**
- 3. Tendency is to outsource maintenance of new vehicles to the vehicle manufacturer from all maintenance outsourced to outsourcing of components only.**

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Recommendations

- **Be aware of 30 year life, manufacturing industry will not support you forever**
- **Make yourself independent from manufacturing industry**
- **Develop own skills based on your own experience with your fleet**
- **Create a group of experts within your company**
- **If your fleet of light rail vehicles is small, try to find partner operators who have skills and facilities to conduct large overhaul activities**
- **Be aware of advantages and disadvantages of outsourcing**

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Questionnaire 2

Maintenance, Obsolescence and Spare Parts:

- **Basis of vehicle maintenance programs: fixed intervals for Inspections or Inspection intervals adapted to actual wear and tear**
- **Establishment of maintenance programs: operator, manufacturer**
- **Obsolescence problems for old and new operators**
- **Relationship between spare part availability and vehicle availability**
- **Acquisition of spare parts: contract for new vehicles including spare parts, alternatives for producers and licenses for production**
- **Relation between problems with availability of spare parts with experience of operators.**

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Theses

- For cost-effective maintenance, the highest levels of safety, reliability and availability, the maintenance program should be in development all along the life of the vehicle.
- The operator or vehicle owner should play a major role in this development: he is responsible for the operation and has the experience. The support by the vehicle manufacturer cannot be guaranteed over the long life of the vehicle.
- Obsolescence is not only a technical problem but can also be a **managerial** problem: is the organization capable to find solutions
- Operators need alternative sources for their spare parts

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Recommendations

- **Develop and improve maintenance programs continuously, with or without support from manufacturers**
- **Start operation with a maintenance program established by the manufacturer, but quickly adjust maintenance to actual experiences.**
- **Obsolescence problems might be solvable by adequate technical management**
- **Include delivery of spare parts for new cars in the vehicle contract.**
- **Negotiate the possibility to buy spare parts directly from the manufacturer's sub-suppliers before signing the vehicle contract.**
- **Try to have more alternatives for purchase of spare parts: other suppliers, licencies**

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Questionnaire 3

Questions concerning Cooperation:

- Cooperation among operators
- Participation of manufacturing industry.
- Establishment of user-groups
- Initiatives
- Organisation of user-groups
- Mutual support
- Issues discussed in usergroups

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Theses

- **Most operators established some sort of cooperation with other operators using vehicles of the same vehicle platform or operators who purchased vehicles of different type from the same supplier.**
- **Operators who do not cooperate with other operators use vehicles of special design that are only being used in one city or system.**
- **Very few operators do not seek any cooperation.**
- **A well organized user group is the most appropriate form of cooperation offering benefits for both operators and manufacturer, in particular when he takes the initiative.**
- **Very effective for operators who buy new rolling stock**

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Recommendations

- **Seek cooperation for maintenance of your vehicles**
- **Establish a user group**
- **Both operators and manufacturing industry should be member**
- **Take the opportunity not only to discuss technical problems but use the meetings for discussion of other operational issues as well.**

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Changing roles and responsibilities

Traditional situation:

The operator was vehicle owner and responsible for maintenance, modifications and sometimes even construction of rolling stock.

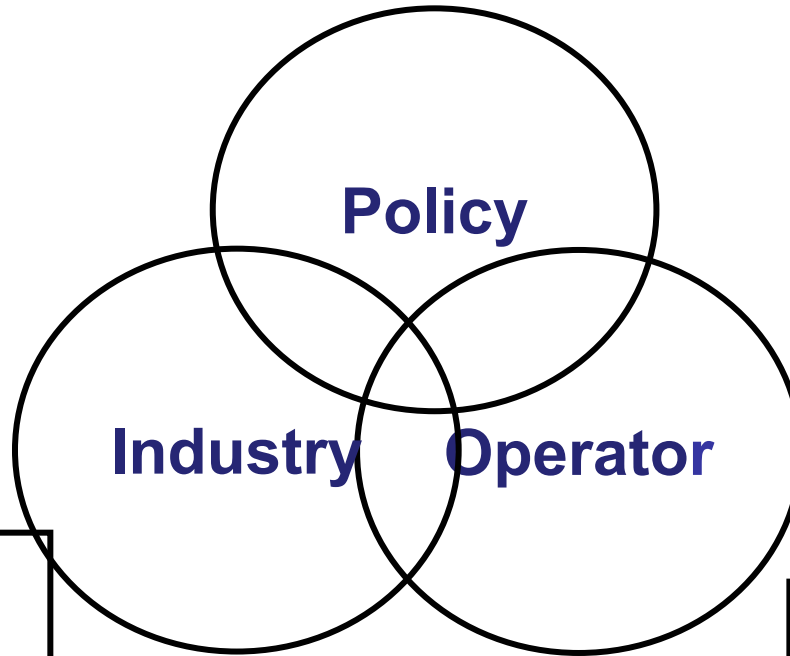
Current trends:

Roles and responsibilities are changing in some European countries due to changing PT market: Different parties can be responsible for:

- Vehicle ownership
- Operation
- Light Maintenance
- Heavy Maintenance
- Procurement of Spare Parts (Consumables and Repairables)³⁰

Political Main tasks:

- Political framework
- Mobility
- Laws and regulations
- Inspectorate
- Financing
- Contracts



Industrial Main tasks:

- Rolling stock supplier
- Infrastructure supplier
- Spare parts supplier
- Maintainer

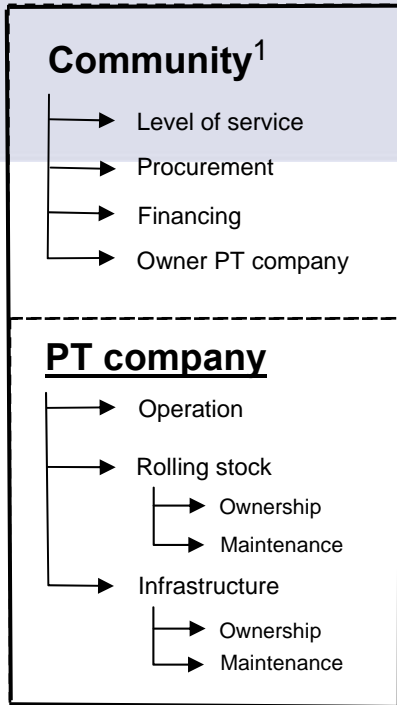
Operational Main tasks:

- Operation
- Rolling stock Maintainer
- Infrastructure

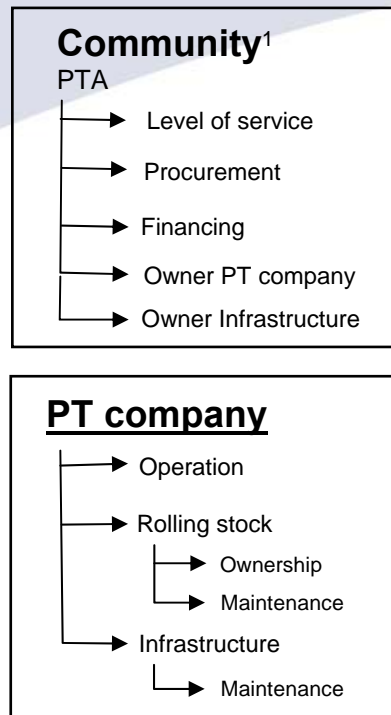
Maintainer

Main tasks in public transport

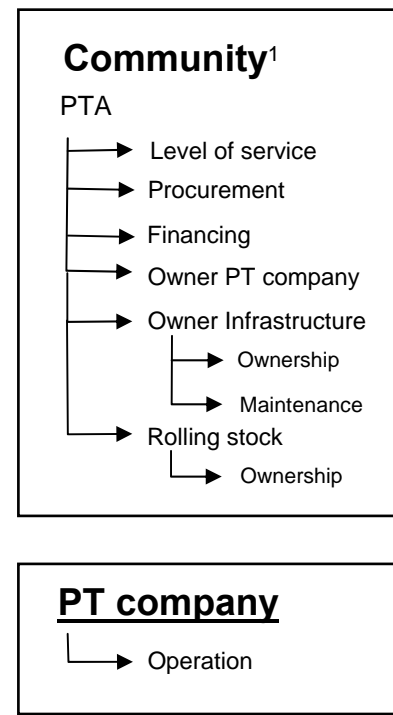
Model 1



Model 1a



Model 1b



Industry

Rolling stock and Infrastructure

- Supplier
- Repair and maintenance services
- Spare parts

Industry

Rolling stock and Infrastructure

- Supplier
- Repair and maintenance services
- Spare parts

Industry

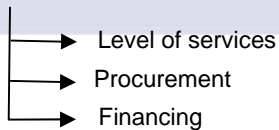
Rolling stock and Infrastructure

- Supplier
- Repair and maintenance services
- Spare parts
- Rolling stock
 - Maintenance

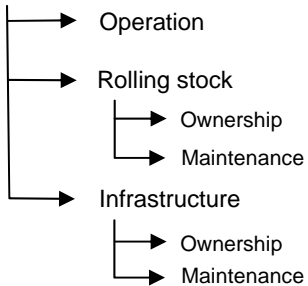
Model 2

Community

PTA



PT cie. private



Industry

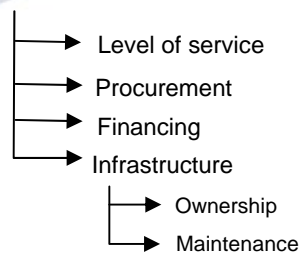
Rolling stock and Infrastructure



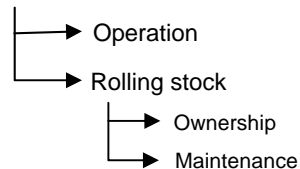
Model 2a

Community

PTA



PT cie. private



Industry

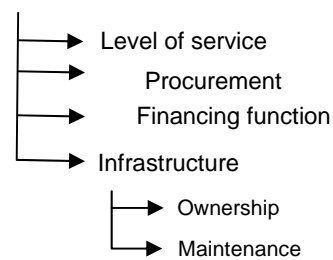
Rolling stock and Infrastructure



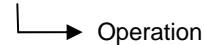
Model 2b

Community

PTA

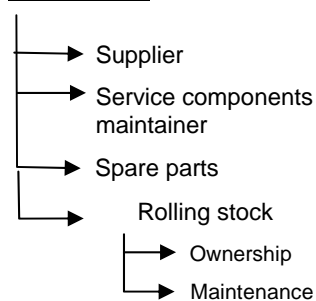


PT cie. private



Industry

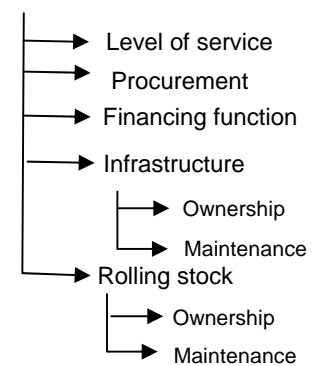
Rolling stock and Infrastructure



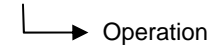
Model 2c

Community

PTA

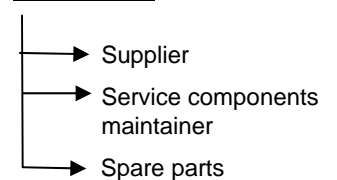


PT cie. private



Industry

Rolling stock and Infrastructure



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Effects of different structures/models

- Changing market with different structures and roles of Public and Private parties increase the number of interfaces .
- Responsibilities concerning ownership of vehicles and infrastructure, operations and maintenance are divided between authorities, industry and operators in many different ways.
- More interfaces = more friction, losses, more legal procedures,

Questions not answered so far:

- Do these developments influence costs, availability etc. ?
- Does a relation exist between problems in maintenance and different organization models?

Questionnaire 4 established to find the answers.

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Effects of different structures/models

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Thank you for your attention