Océ

TU/e

# Spare Parts Planning: New Concept for the Field Stock Planning

océ

Aafke Visser-Van Boekel (Océ)
Geert-Jan van Houtum (TU/e)

Canon
CANON GROUP

# Content

- **Introduction**
- Mathematical principles
- Fieldstock model
  - Calculation expected usage
  - Points of attention
- Pilot projects
- Full implementation
- Project outline

# Océ

- Member of the Canon Group since 2010
- Over 20,000 professionals worldwide
- Top 5 for office printing and high volume printing
- Global leader in wide format printing systems
- Products sold in 90 countries
- Wide range of products




# Service strategy Océ

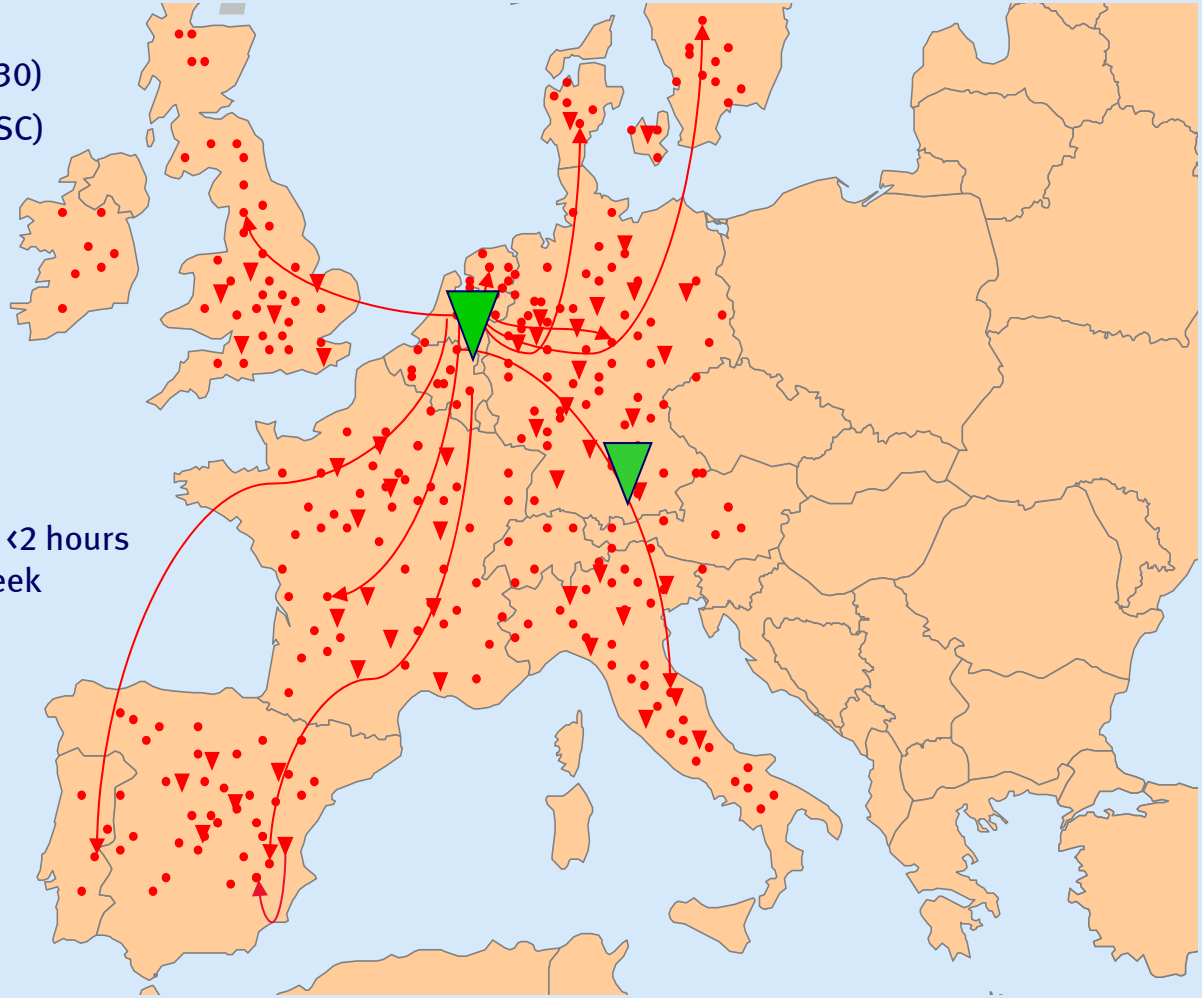
- Service oriented: 71% recurring revenues
- Service level is key selling point
- Service contracts for typically 5-9 years after placing machine
- Service parts demand between 0 and 10,000 pcs/year
- Service parts price range 0 – 10,000 EUR

# Field stock model within Océ

- Field stock model implementation is part of strategic improvement program Océ
- Being rolled out to all European sales organizations during 2012 and 2013

# Overview supply chain (1)

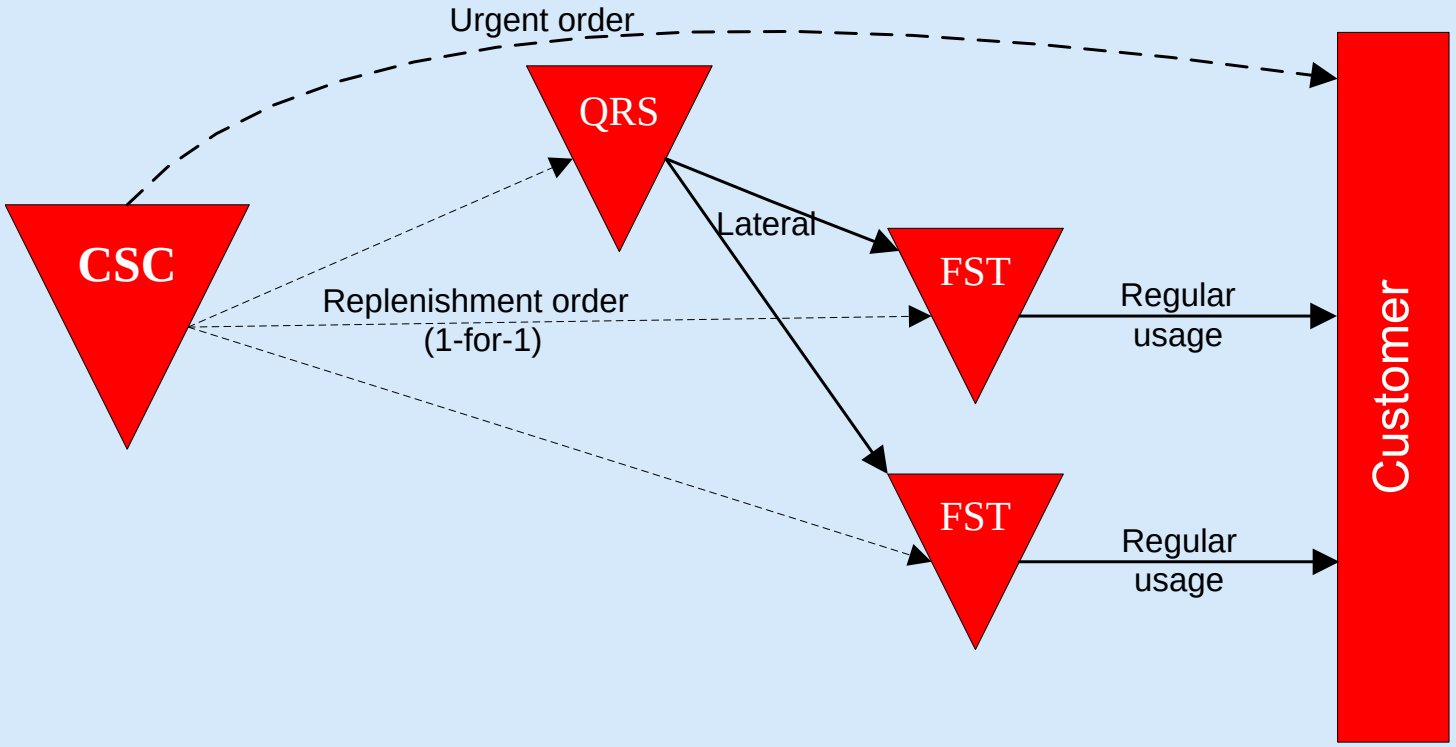
- Car stock (2000)
- Quick Response Stock (130)
- Central Supply Centre (CSC) Venlo & Poing



Supply to car stock out of QRS ‹2 hours
Regular replenishment 2-5/week
Urgent orders ‹ 24 hrs

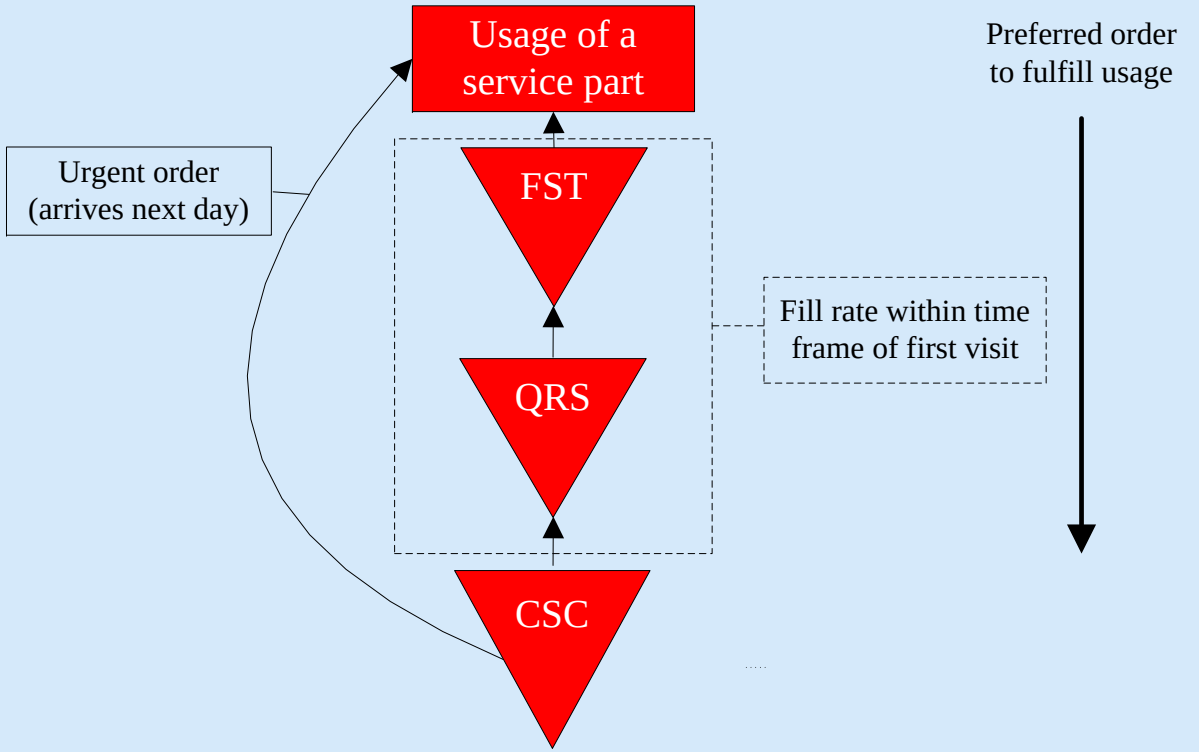
# Overview supply chain (2)

- Three types of warehouses;
  - Car stocks of field service technicians
  - QRS's for quick shipment to car stocks
  - CSC for urgent orders



# Overview supply chain (3)

- Main KPI for service level field stock
  - Second visit rate due to parts



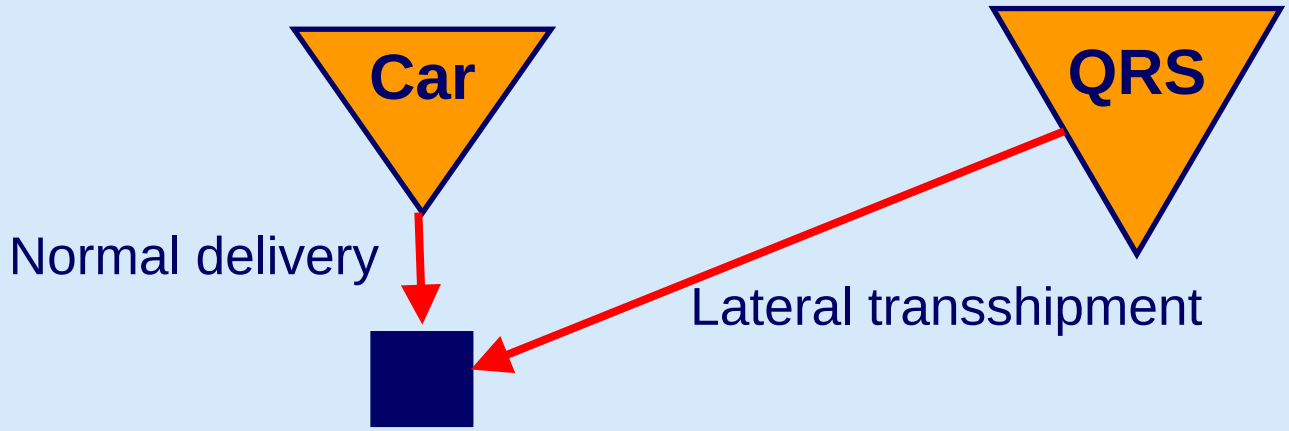
# Old model for car stock calculation

- Model used by some sales organizations
  - Focus on car stock; QRS not considered
  - Single item approach
  - ‘Minimum required usage level’ very important
- Manual review by other sales organizations

# Content

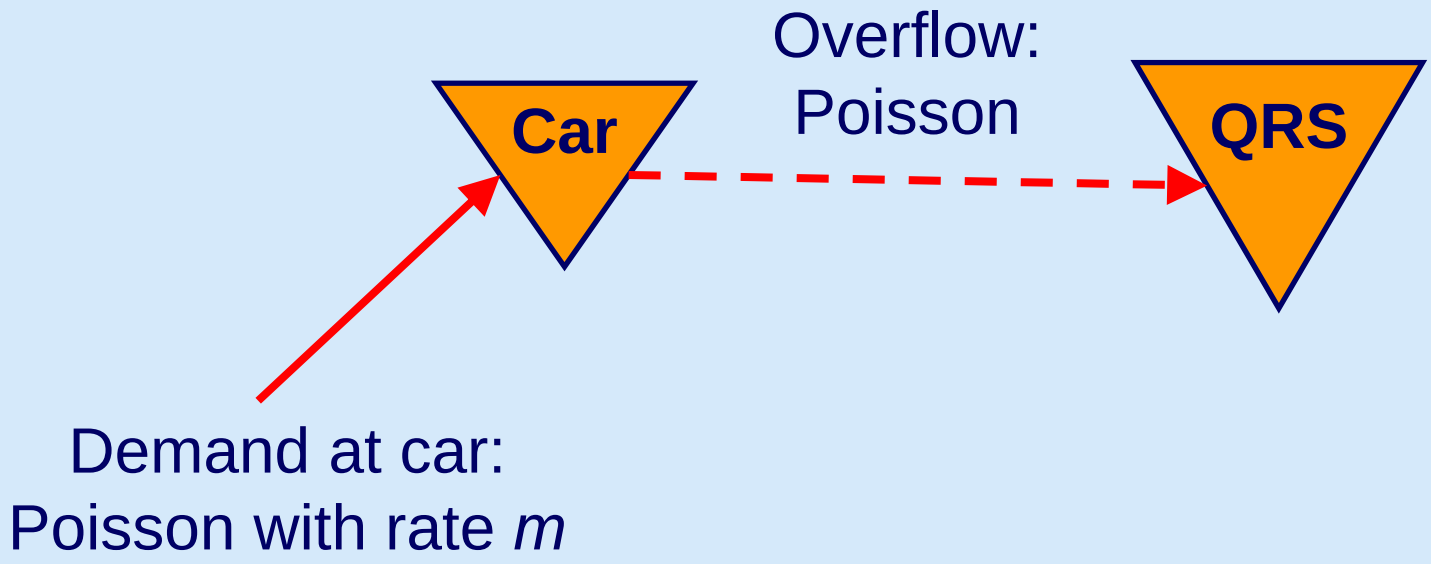
- Introduction
- **Mathematical principles**
- Fieldstock model
  - Calculation expected usage
  - Points of attention
- Pilot projects
- Full implementation results
- Project outline

# Evaluation method (1)




- Normal delivery from car stock
- If out of stock: lateral transshipment from QRS
- Demand at QRS: overflow demand
- Challenge: *How to model this overflow demand?*

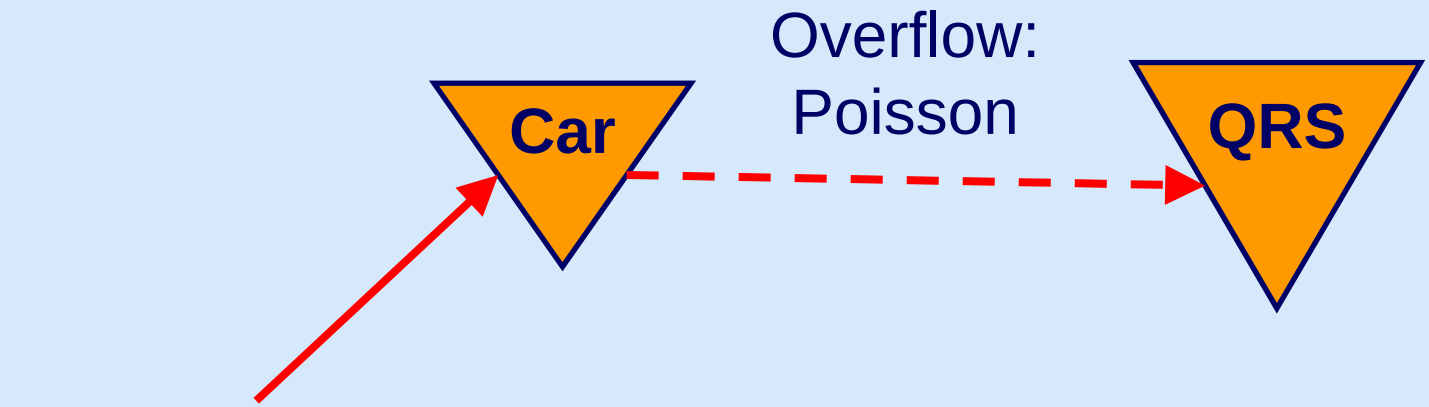
# Evaluation method (2)




Approximation:

Overflow stream is a Poisson stream

# Evaluation method (3)

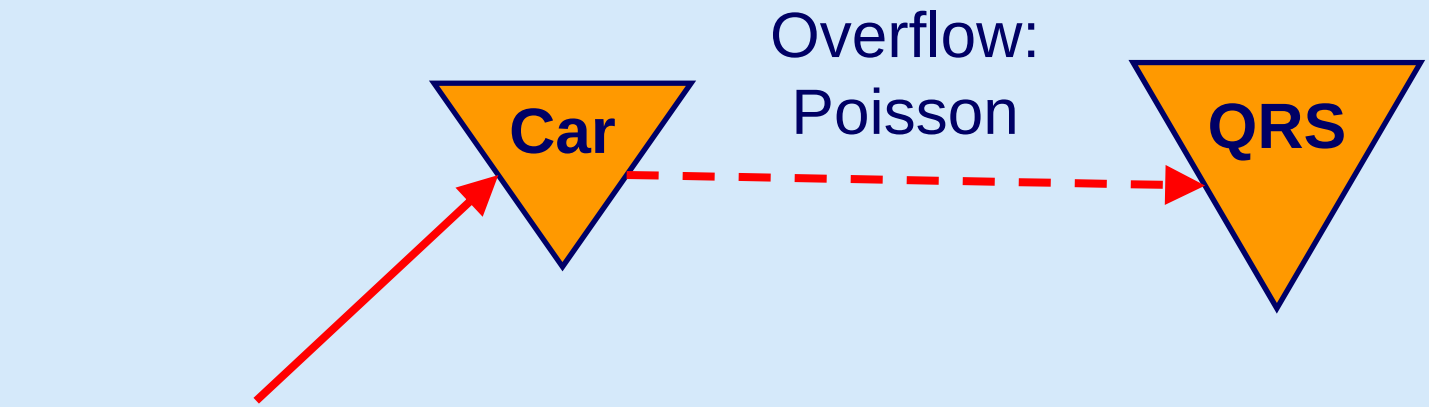



**Stock at Car:**

Is as an M|G|c|c queue with:

- arrival rate *m*
- service time = replenishment leadtime
- c = basestock level

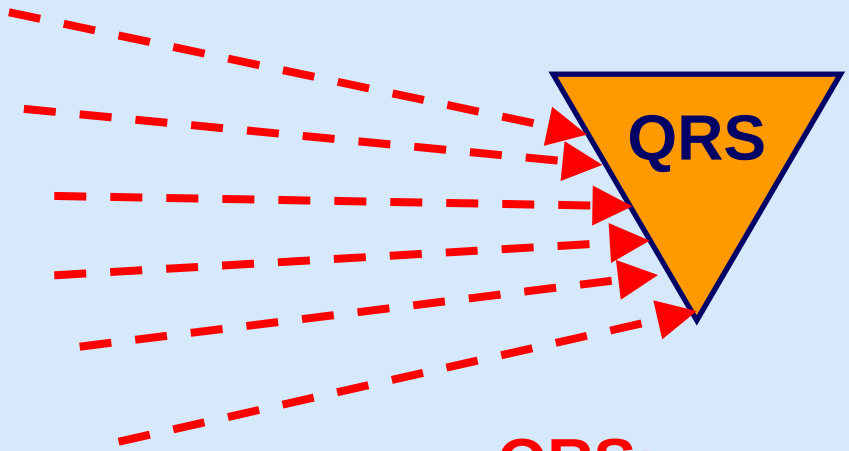
# Evaluation method (4)




**Overflow:**

Rate: *m* x (fill rate)

# Evaluation method (5)




**QRS:**

Receives multiple overflow streams

Is also as an M|G|c|c queue

Approximation:

Inventory level at QRS is independent of inventory levels at cars

=> Simple approximation for First Visit Fill Rate

# Optimization: Greedy heuristic

- Bring all items in one model
- Cost factors:
  - Inventory holding costs
  - Costs for deliveries from QRS
- Start with zero base stock levels
- Add iteratively stock:
  - Per item per stockpoint: Compute increase in (First Day Fill Rate)
  - Increase stock for combination with highest ratio
- Stop criterium:
  - Constraint for First Day Fill Rate satisfied
  - No further decrease in costs if extra parts are added

# Content

- Introduction
- Mathematical principles
- **Fieldstock model**
  - **Calculation expected usage**
  - **Points of attention**
- Pilot projects
- Full implementation
- Project outline

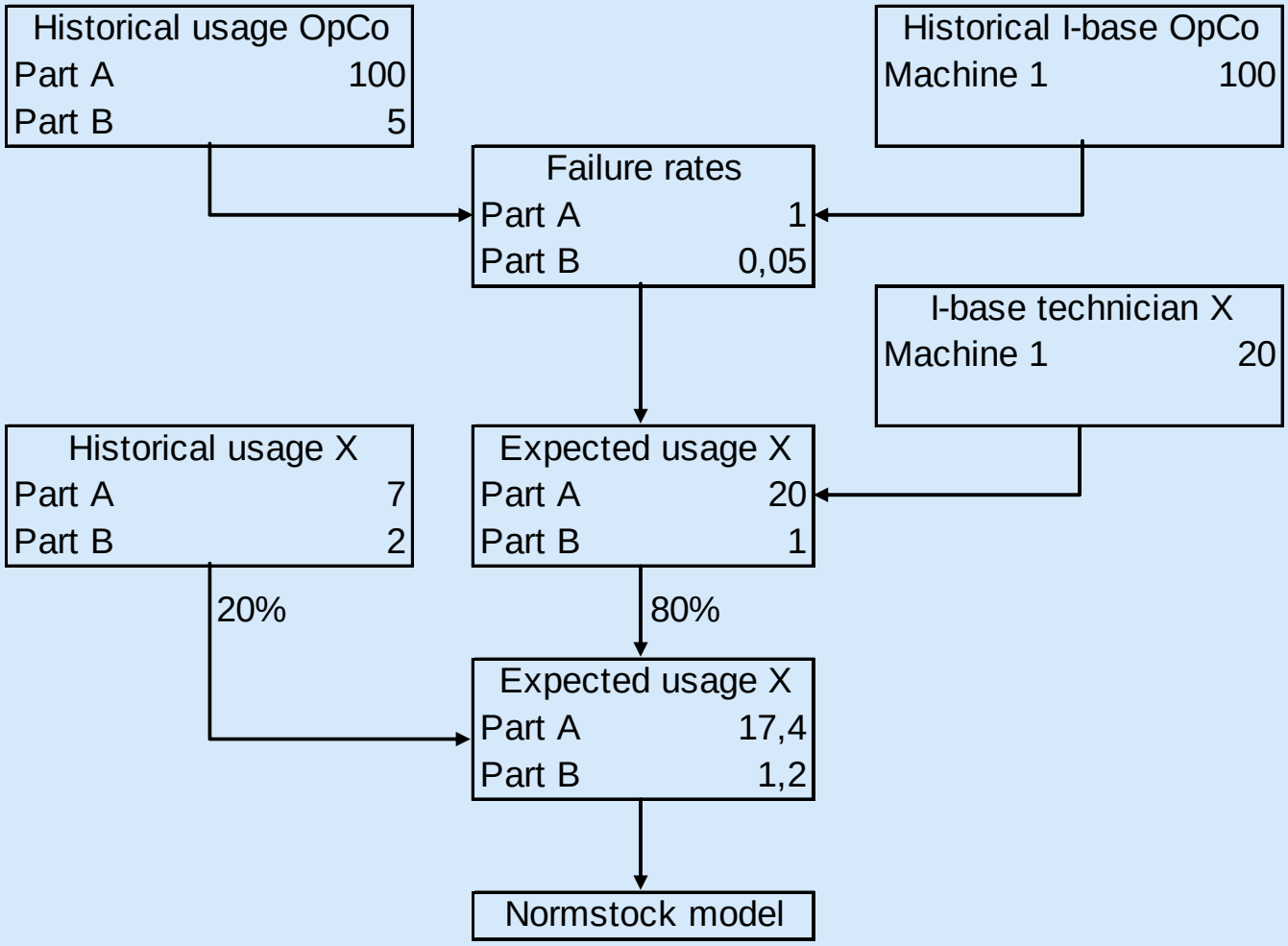
# Scope of the fieldstock model

- Field stock: car stocks and QRS's
- Objective of model
  - Achieve the targeted second visit rate due to parts with the lowest costs possible

- Two steps
  1. Calculate expected usage per car stock: developed independent of field stock model
  2. Calculate required stock for QRS and car stock

# Calculation expected usage

## Expected usage calculation had to be added to give the fieldstock model the correct input



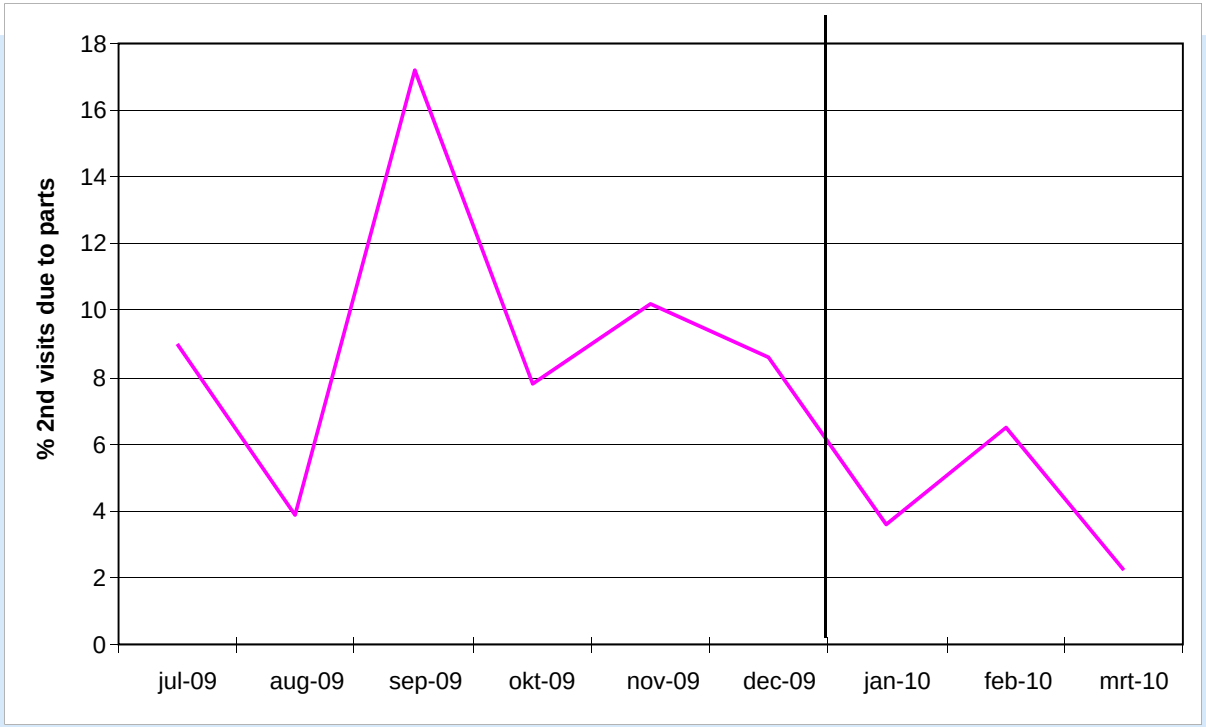
# Points of attention and adjustments

- Special parts for which results have to be adjusted;
  - Large parts
  - Usage quantity
  - Fragile parts
- Copy volume is not taken into account
  - Some parts break down based on their usage
- Rubbish in = rubbish out
  - Wrong reporting results in wrong normstocks

# Content

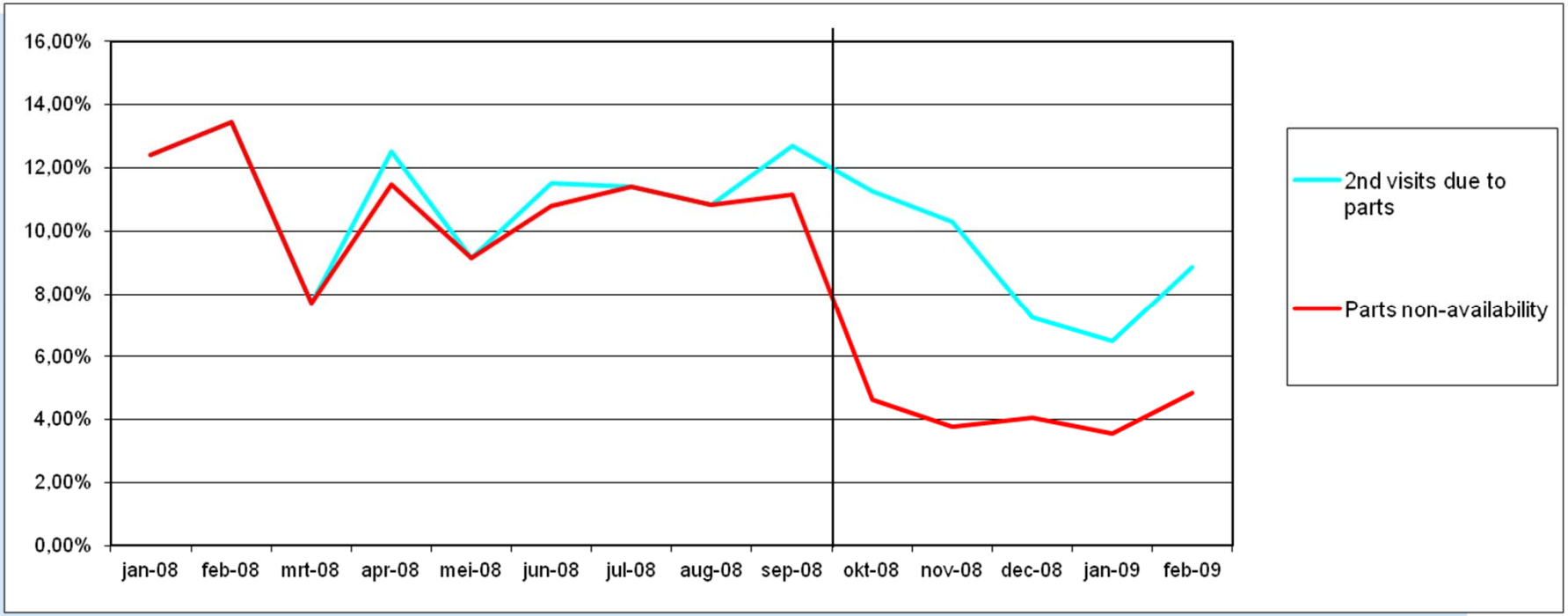
- Introduction
- Mathematical principles
- Fieldstock model
  - Calculation expected usage
  - Points of attention
- **Pilot projects**
- Full implementation
- Project outline

# Pilot region Germany




- Pilot project Océ Germany
  - 7 technicians
  - 1 QRS
- Second visits due to parts
  - July 2009-December 2009; 9,5%
  - January 2010-March 2010; 4,1%

# Results pilot region France

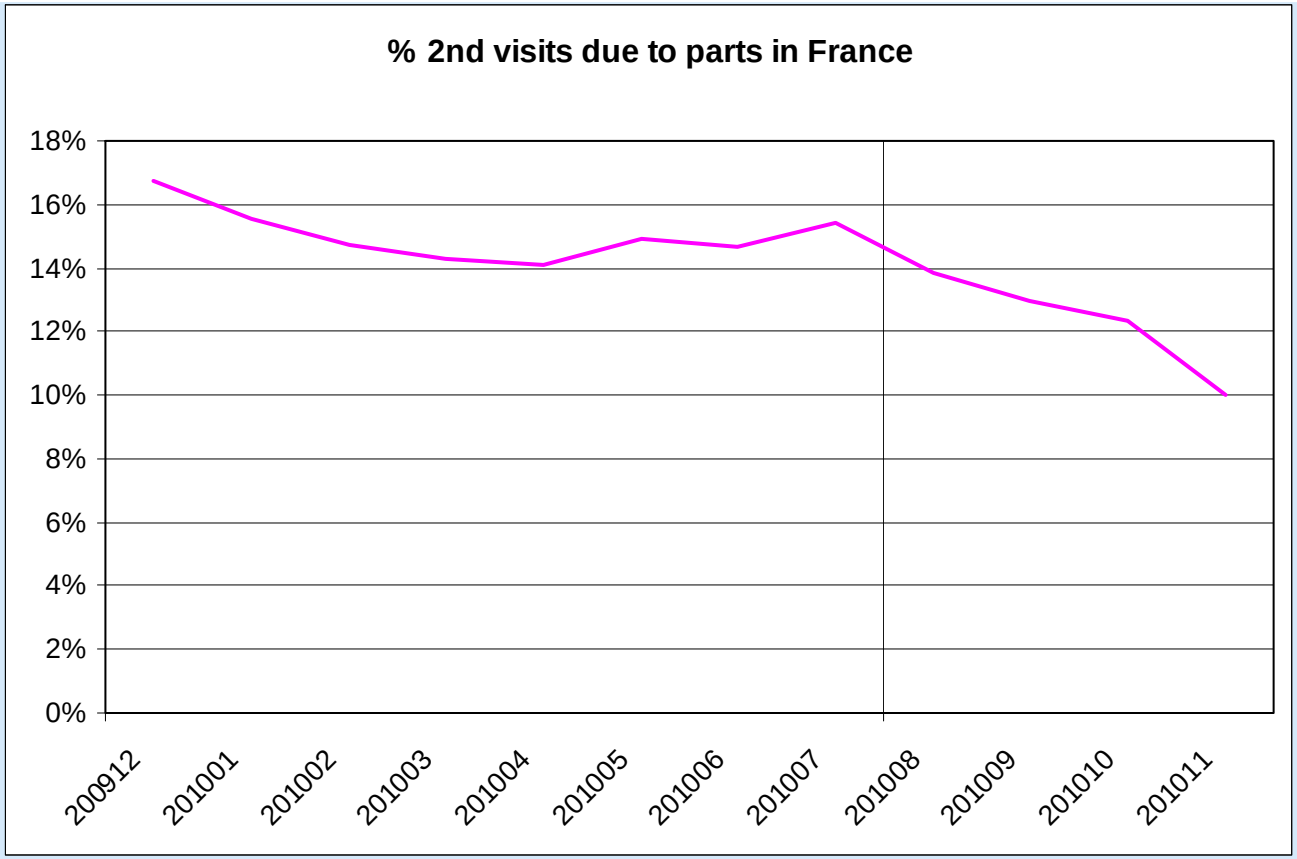



- Pilot project Océ France
  - 6 technicians
  - 1 QRS
- Red line shows increased parts availability; from 10% to 4%
- Second visits also decreased, but not as sharp as parts availability
- Technicians behavior results in different results

# Content

- Introduction
- Mathematical principles
- Fieldstock model
  - Calculation expected usage
  - Points of attention
- Pilot projects
- **Full implementation results**
- Project outline

# Full implementation France




- Inventory levels remained unchanged

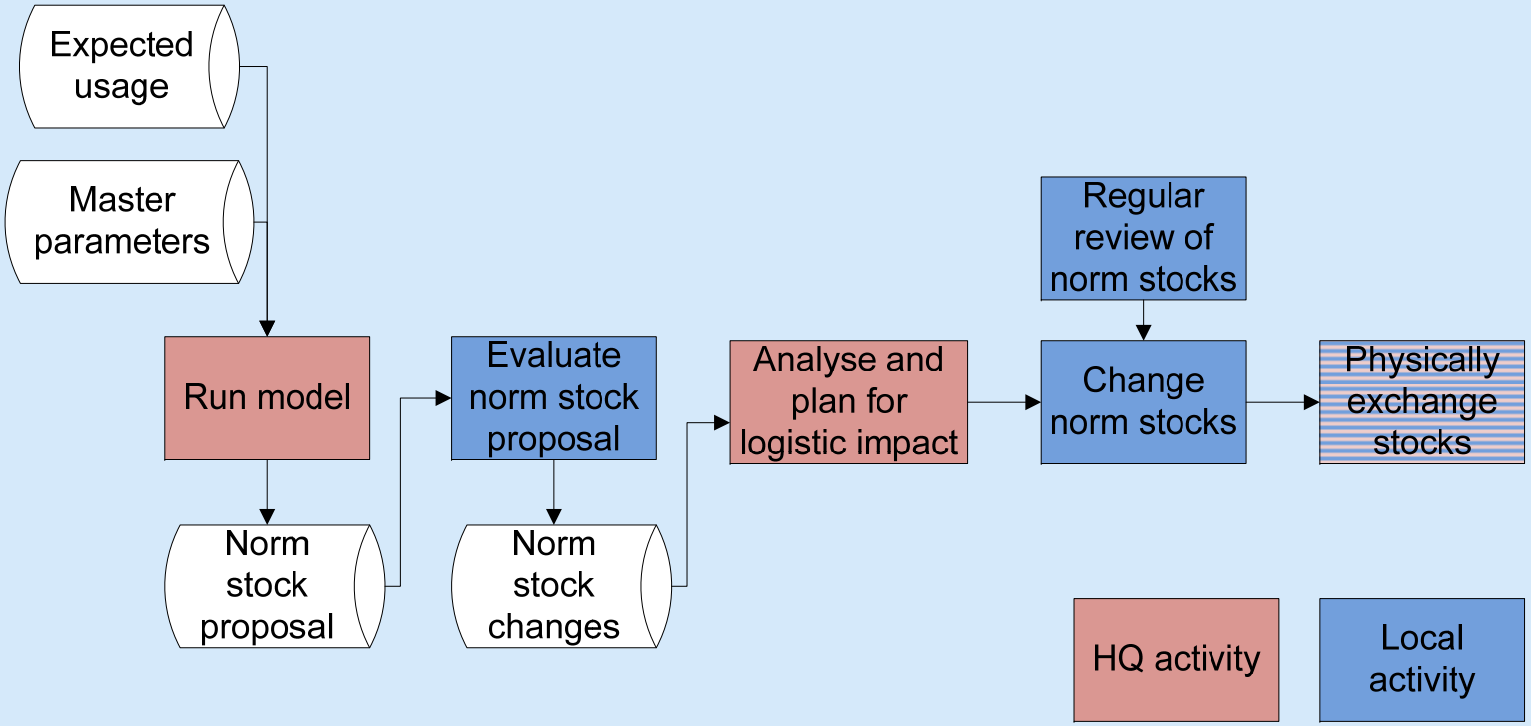
# Implementation results USA

- Scope
  - QRS inventory
  - Car stocks out of scope
  - 45 QRS's USA-wide
- Results
  - $ 3,0 mln inventory reduction (21%)
  - Service levels remained unchanged

# Content

- Introduction
- Mathematical principles
- Fieldstock model
  - Calculation expected usage
  - Points of attention
- Pilot projects
- Full implementation results
- **Project outline**

# Project outline




| | Decription | weeks 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | data preparation | | | | | | | | | | | | | | | | | | | | | | |
| 2 | create norm stock proposal | | | | | | | | | | | | | | | | | | | | | | |
| 3 | feedback norm stock proposal | | | | | | | | | | | | | | | | | | | | | | |
| 4 | last adjustments normstock | | | | | | | | | | | | | | | | | | | | | | |
| 5 | analyse logistics impact | | | | | | | | | | | | | | | | | | | | | | |
| 6 | prepare execution planning | | | | | | | | | | | | | | | | | | | | | | |
| 7 | execution | | | | | | | | | | | | | | | | | | | | | | |


océ
Printing for
Professionals