DYNAMIC SCHEDULING IN LOGISTICS WITH AGENT-BASED SIMULATION

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Essen, Germany
1. Context and Research Interest
2. Case Study Framework and Data
3. Agent-based Scenario
4. Conclusions and Outlook
1. Context and Research Interest

- **Importance of ICT** for logistics processes because of:
  - Rising flexibility & variability
  - Increasing transport volume
  - High security levels
  - Short reaction times

- Modern **cargo telematics** offer several added value:
  - Identification & localization
  - Support for future planning
  - Consulting / identify bottlenecks
  - Increase learning capabilities

(Slater 2002)
1. Context and Research Interest

**Track & Trace solutions in logistics practice**

- **Discrete**
  - Barcoding
    - Event-Monitoring
    - Application in parcel transport and with groupage freight
  - RFID
    - Event-Monitoring
    - Application in automotive and retail supply chains

- **'Quasi-continuous'**
  - Combination of discrete (vehicle) & continuous (shipment) device
    - Usage of GPS Handhelds at Last-Mile
    - Application in groupage freight or production logistics

- **Continuous**
  - GPS
    - Since 1995
    - From 2020 GALILEO (EU)
    - Application in road and railway telematic systems
  - GSM
    - Very inprecise
    - Only few applications for SCEM

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**Nov-12**

DYNAMIC SCHEDULING IN LOGISTICS WITH AGENT-BASED SIMULATION
1. Context and Research Interest

**Quasi-continuous T&T**

- **Shipment Barcode/RFID**
- **Depot**
  - Barcode/RFID-identification
  - Assignment of shipments to receiving depot
  - Assignment of shipments to liner traffic
  - Clearing up of vehicle allocation
- **Depot**
  - Barcode/RFID-identification
  - Assignment of shipment to tour

**Holistic track & trace system in logistics networks**

- GPS-location
- Realtime communication
- Acknowledgement of receipt by the customer
2. Case Study Framework & Data

Typical Main Haul System / National Direct Line and Hub-Spoke Network
2. Case Study Framework & Data

Groupage freight network with main haul and last mile

- Example data set of August 2012
- 24,384 inbound shipments for a depot on 23 working days
- Total of 1,104 incoming trucks, total weight of all shipments: 7,014,516 kg
- Out of these 96 trucks were delayed by more than 10 minutes in arrival, totaling for 8.7 %
- The maximum delay was even 13 hours for one truck
- About half of the days with only 1 to 4 delayed trucks and the other half of the working days with 5 to 10 delayed trucks
- No single working day without any delayed truck and only three days with only one delayed truck – and August is not representative
2. Case Study Framework & Data

Inbound Shipments for one transport from Munich

- Delay of *one hour* on 3rd of August 2012, 20 shipments

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3. Agent-based Scenario

- Characteristics of Agent Systems

1. Adaptability
2. Autonomy
3. Collaboration
4. Knowledgeable
5. Mobility
6. Persistence
AGENT-BASED LAST MILE DYNAMIC SCHEDULING SYSTEM

GPS

Scheduling Manager

Route 920
Route 925
Route 926

LATE!
ALERT!

Tracking Agent
Planning Agent

OK
WAIT!
OK
4. Conclusions and Outlook

- **AI** is today not really used in daily logistics operations – but *software agents can be feasible technology* because they can (i) contain self learning algorithms based upon artificial intelligence to autonomously derive rescheduling suggestions from real-time transport status information, (ii) run on different hardware so that the required performance can be compiled and (iii) allow user intervention so that the dispatcher can decide on the actions to be taken.

- The generally **estimated business value** for a agent-based **dynamic scheduling system** in groupage freight depots amounts to more than 11,500 Euro per month in reduced costs or increased earnings due to delivery on time and with heads-up information.
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Thank you for your attention.

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