Dynamic Scheduling for Logistics Service Providers

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BVL 6TH INTERNATIONAL SCIENTIFIC SYMPOSIUM ON LOGISTICS

June 14th, 2012
Hamburg, Germany
1. Introduction and research interest

2. State-of-the-art in ICT, T&T and scheduling

3. Problems and GNSS solutions in LSP scheduling

4. Case study

5. Conclusion
1. Introduction

- LSP face strong influences from \textit{industry} as well as technology developments:
  - Successful research in information and communication technologies \textit{ICT};
  - increased \textit{competition} within the market;
  - \textit{environmental} awareness of loaders and customers;
  - rapid \textit{growth of transport volume} in the future.

- LSP have to be flexible and dynamic because of service speed and strong deviations of incoming orders - but often business strategies are \textbf{based on human knowledge instead of ICT}.

- Especially \textbf{dynamic scheduling} seems very useful - but the \textbf{major challenge} is not to solve most imaginable vehicle routing problems like VRPPPTW or MDFFVRP but to quantify \textbf{increased efficiency} to raise acceptance by employees & LSP.
2. State-of-the-art

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
  - Use 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
2. State-of-the-art

**Quasi-continuous T&T**

- Shipment Barcode/RFID
- GPS location
- Realtime communication
- Acknowledgement of receipt by customer
- Holistic track & trace system in logistics networks

**Depot**
- Barcode/RFID-identification
- Assignment of shipments to receiving depot
- Assignment of shipments to liner traffic
- Clearing up of vehicle allocation
- Assignment of shipment to tour
3. Problems in LSP Scheduling

- “Two sides of the coin”: The personal acceptance of the employees who have to work with a scheduling system is limited because of skepticism. But most publications show theoretical benefits and cost reductions (Schorpp 2010).

- Powell et al. (2000) and Powell et al. (2002) show problems for transferring dynamic planning algorithms into real life:
  - Many systems do not support daily operations within dispatching systems – employees would have to change their operations, which in fact is not easy during running production or plan execution.
  - Background of this human interface challenge is a different solution approach - in dynamic real-life environments it is impossible to check a suggested solution, dispatcher will continue old solution.

- Therefore the global result drops if the user is non-compliant with the software solution and vice versa.
3. Problems in LSP Scheduling

Learning circle

1. Learning orientation
2. Learning activities
3. Level / share of process relevant explicit knowledge in a company
4. Motivation & attractiveness of individual learning by accessible explicit knowledge
5. Positive motivation feedback and thereby increased individual learning motivation
Several examples for suggestions in dynamic scheduling, e.g. Slater 2002
Supporting planning and scheduling

- Supply chain scheduling with a holistic logistics view

3. GPS Solutions LSP Scheduling
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Supporting planning and scheduling

- Better and more reliable support for daily operations

Delay in inbound transport process

Information of the delay

Re-Scheduling

Delayed departure, traffic jam, breakdown

- Automatic and forwarder independent information about the delay integrated in tour planning software

Delay of shipment delivery can be avoided

- Enough reaction time so that the last-mile planning can be executed with the information about a delay
3. GPS Solutions LSP Scheduling

ild GPS.LAB
Main Haul System / National Direct Line and Hub-Spoke Network

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4. Case Study

**Example for Dynamic Last-Mile-Scheduling at SCHENKER (16.03.12)**

Truck 402 Düsseldorf waits for delayed shipments (achieving same-day delivery)

Area of tour 406: Mettmann with extensions (2, 13, 8)

Area of Tour 402: Düsseldorf

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4. Case Study

Example for Dynamic Last-Mile-Scheduling at SCHENKER (16.03.12)

Truck 406 Mettman delivers 3 shipments from tour 402 and has only 4 kilometers more to drive.

Area of Tour 402: Dusseldorf

Area of tour 406: Mettman

Shipments 2, 8, 13 on tour 406 from tour 402.
5. Conclusion

Vehicle waits, switching shipments in time onto other vehicle(s)

Cancellation of vehicle, assignment of remaining shipments onto other vehicle(s)

Vehicle waits until all shipments arrive

Vehicle starts, (a) switching of delayed shipments on other vehicle(s); 
(b) onto new vehicle(s) with delayed shipments (depending on existing timetable for departure of last mile vehicles)

Decision algorithm draft

Duration of delay

Quantity of shipments delayed

0 ≤ q ≤ Duration of delay

p

Klumpp et al.: Dynamic Scheduling for Logistics Service Providers
5. Conclusion

- Research paper has shown the state-of-the-art as well as problems in business practice regarding dynamic scheduling for e.g. last mile tour planning for LSP companies.
- Case study for DB Schenker Duisburg showed possible mechanisms and business values for an automated dynamic scheduling process.
- Shown draft decision algorithm may be the research basis for further development of such systems.
- This could prove to be an important field for generating business value in saving costs as well as improving the logistics and ecological performance (win-win).
- Further research: Test applications, piloting and implementation; education and qualification requirements.
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Thank you for your attention.

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June 14th, 2012
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Acknowledgment: This research is connected to the national excellence research cluster LogistikRuhr (www.effizienzcluster.de), funded by the German Federal Ministry of Education and Research (BMBF) in the project funding line 01|C10L19D.