Parcel delivery in urban areas: opportunities and threats for the mix of new business models and technologies

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SIDT 2017 – Bari, September, 14-15, 2017
Agenda

- Overview
- Methodology adopted
- Simulations
- Results
- Conclusions and Future Developments
Overview

Demographic growth

Urbanization

eCommerce

JustInTime and Time Sensitive Delivery

World trade volume growth

Externalities

New delivery options
Research questions

- Who are the different players in the transportation and parcel delivery system?
- Which are their business models (including the cost structure)?
- How a mix of traditional and green logistics might coexist in the urban parcel delivery?
- Can we define mixed-fleet policies?
Methodology adopted

- Qualitative and Quantitative methods
  - Approach less adopted in literature
  - Integration of business and operational model

- GUEST Methodology
  - SWOT Analysis, ICE Diagram, etc.
  - Business Model Canvas

- Monte Carlo Simulation
Qualitative results:

- different players emerged
- Behaviors, synergies and conflicts
- Cost structure (social and operative)
Infrastructure

Decision Support System

Problem description / Operational context

City network graph  a
Vehicles & Travel Times  b
Behavioral & socio-demographical data  c
City constraints  d

Problem objectives and constraints  e

Modify component(s)  a / b / c / d / e

Simulator

Optimizer

Post optimization
Input data I

3 Instance set I1, I2, I3
- 1000 – 4000 deliveries
- City of Turin
- Years 2014/2015

Instances
- Type of delivery

MAILER 0-3 kg
SMALL DELIVERY 3-5 kg
LARGE DELIVERY >5 kg

Destination
- Latitude and Longitude

Time Window

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Classes of parcels
- Van
  - All
- Cargo Bike
  - Mailer and Small Delivery < 5kg

Speed
- Van
  - 20 km/h in city center
  - 35 km/h in semi-center
- Cargo bike
  - 20 km/h in center and semi-center
Input data II

**Service Time**

- **Driver**
  - 4 min for Large Delivery
  - 3 min for Mailer and Small Delivery

- **Biker**
  - 2 min

**Capacity**

- **Van**
  - 700 kg

- **Cargo Bike + Messenger Bag**
  - 70 kg
**SCENARIO S_0 BENCHMARK**

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Operating Scenarios I

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Key performance indicators

- Number of Equivalent Vehicles (nVEq)
- Number of Deliveries per hour (nC/h)
- CO2 Savings (CO2Sav)

**Diagram:**
- Equivalent CO2
- CO2 Direct
- CO2 Indirect
Results I

- Reduction of nVEq – 50%
- Rapid saturation of vans
- Loss of efficiency (nC/h) of the traditional courier
  - 15% outsourcing the mailers 0-3 kg
  - 34% outsourcing also the small deliveries 3-5 kg
Cycle logistics courier performance is affected by the geographical area.

Higher efficiency reduction serving semi-center.
Results III

Reduction of the environmental impact

✈ Green Vehicle + Routing optimization

✈ Reduction of the distance traveled by the traditional courier – 25%

✈ Emission reduction – 40 - 45% ~ 14 ton/anno

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Internal Fleet
- 0-3 kg in center and semi-center
- 3-5 kg in center
- Remaining

External Fleet
- 0-3 kg in center and semi-center
- Remaining
- Renegotiation of contractual scheme
Conclusions and Future development

- Need to guarantee the equilibrium between different operators
  - Avoid cannibalization of business models
  - Win-win strategy and profitability
- High service quality level perceived by final customers
- Important role of environmental impact
- Need of continuous process of optimizing activities by DSS

How the dynamics in City Logistics change considering other new delivery options (e.g., lockers)?
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