Public transport crowdshipping: an economic analysis

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Agenda

- Introduction
- Methodology
- Results
- Implications
- Conclusion

Introduction (1)

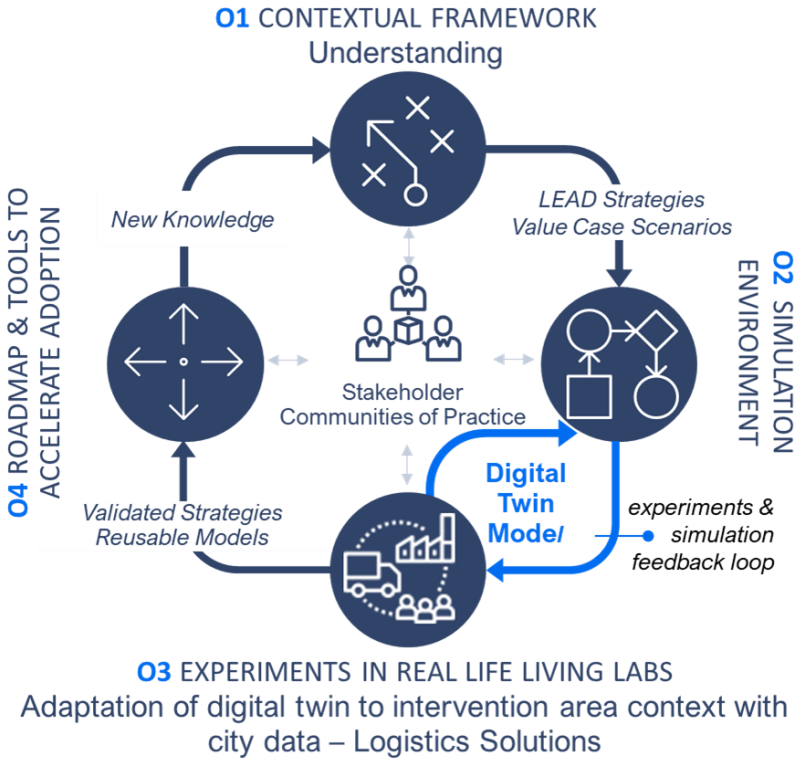
- The combination of urban freight transport (UFT) and passenger transport (PT) is one of the ways to improve mobility in cities - integrated within local policy-making and institutional settings
- Three ways of integrating passenger and freight transport:
  - sharing road capacities
  - sharing public transport services
  - sharing consolidation facilities
- The improvement of both forms of transport can only be done through a shared approach.

Introduction (2)

- An emergent and promising sharing economy concept at urban scale is the combination of passenger&freight transport via a crowdshipping service (UFT+PT+CS)
- It can be a good solution to reduce the overall number of trips and generate environmental/social benefits
- There is a lot of research on Crowdshipping (environmental and economic perspective)…less so on UFT+PT+CS
- This paper investigates the market segment in which such a system can take place

LEAD project

Green Crowdshipping through the mass transit network



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Methodology

- Systematic review:
  - Data base: Google Scholar and Scopus
  - Time interval: 2014-2022
  - Document type: Peer-reviewed journal articles or conference papers

Crowdshipping	Urban Logistics	Transport
Crowd-shipping	Urban Freight Transport	Green Delivery
Crowdsourced delivery/deliveries	Urban Logistics	Sustainable/sustainability
Crowd logistics	City Logistics	Passenger Transport
On-demand logistics	Green Logistics	Public Transport
Sharing Economy	Transportation	
Cargo-Hitching	Last-mile/ Last-mile delivery/ Last-mile logistics	

- SWOT analysis on UFT+PT+CS

Systematic review

- 69 papers reviewed, into 4 categories:
  - Supply (people that can act as crowdshippers)
  - Operations and management (aspects of CS companies)
  - Demand (consumers that can use CS services)
  - Review (bibliometric review papers)

Main Area	Category	Sub-Category	Number of Papers
CS	Demand	Behaviour	3
		Willingness to accept	2
	Operations and Management	Environment	3
		Matching	13
		Optimization of the delivery	16
		Routing	1
	Review	Review	7
	Supply	Behaviour	4
		Willingness to Work	5
UFT + PT	Operations and Management	Environment	2
		Optimization of the Delivery	7
	Review	Review	6

Advantages and Disadvantages of CS model

	Advantages	Disadvantages
Supply (logistic operators and crowd)	• Lower delivery cost • Crowd's remuneration • Increase in service level (e-commerce) • Optimized service (fewer vehicles) • Environmentally friendly system • Better online platforms	• Dependence on crowd's willingness to take parcels • Detour, waiting time, trip time • Delivery with a strict deadline (instant deliveries) • Non-professional service • Environmental sustainability depends on trip types • The need for a synchronization platform
Demand (consumers)	• Service flexibility • Environmental benefits • Sense of community	• Service reliability (lack of experience) • Delivery transparency • Residency location (distance from big centres)

SWOT analysis

Authors	Article	Type of transit system
Serafini et al. (2018)	Sustainable CS using public transport: a case study evaluation in Rome	Public transport Metro
Galkin et al. (2021)	Monitoring the congestion of urban public transport systems for the possibility of introducing the crowd shipping delivery in Bratislava	Public Transport Metro and Bus
Le Pira et al. (2021)	Opportunities for integration between mobility as a service (MAAS) and freight transport: a conceptual model	Public Transport
Gatta et al. (2019)	Public transport-based CS for sustainable city logistics: assessing economic and environmental impacts	Public transport Metro
Gatta et al. (2018)	Sustainable urban freight transport adopting public transport-based CS for B2C deliveries	Public transport Metro
Buldeo Rai et al. (2017)	Crowd logistics: an opportunity for more sustainable urban freight transport?	Review Paper
Galkin et al. (2019)	Investigating using urban public transport for freight deliveries	Public transport buses, trolleybuses and trams
Fessler et al. (2022)	A public transport-based CS concept as a sustainable last-mile solution: assessing user preferences with a stated choice experiment	Public Transport
Giuffrida et al. (2021)	On the spatial feasibility of CS services in university communities	Public transport
Marcucci et al. (2017)	Connected shared mobility for passengers and freight: investigating the potential of CS in urban areas	Public transport
Serafini et al. (2018)	Sustainable CS using public transport: a case study evaluation in Rome	Public transport
Elbert and Rentschler (2021)	Freight on urban public transportation: A systematic literature review	Public transport
Cavallaro and Nocera (2021)	Integration of passenger and freight transport: A concept-centric literature review	Public transport

Results

Strengths	Weaknesses
• Higher positive environmental impacts • Possibility to improve capacity utilization in PT • Competitive advantage • Managing increased deliveries	• Synchronization • Reliability of the service • Remuneration • Geographical scale of the service
Opportunities	**Threats**
• Coordination of Stakeholders • The presence of urban facilities - parcel lockers • User acceptance • Location of pick-up and delivery of the parcels • Environmental Awareness	• Collaboration dependent (between all stakeholders) • Availability/reliability of public transport • Crowd motivation/choice (detour, behaviour) • Dependent on the population mobility patterns • Legal issues - workforce, data sharing

Implications

- **Framework**: densely populated area with several transport links, availability and accessibility of collection points/parcel lockers/pick-up points
- **Service characteristics**: Lower price and higher service quality (delivery time windows; unpredictability). A high level of efficiency is encountered in small/medium items (between 0,1 and 5kg).
- **Needs**: Behavioural, technical and market analysis. Legal issues related to the workforce and data sharing when dealing with integrated platforms. Online platforms that can enable the synchronization of the stakeholders.

Conclusion

- Public transport crowdshipping is a prominent solution, but more complex
- It should not be seen as an isolated industry, but as an option to build an interconnected system
- Its feasibility is dependent on several factors
- The public sector should support this solution

Future research

- Quantitative analysis
- Real case implementation

Thanks for your attention

For more information, please visit: www.trelab.it

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