The Physical Internet as the new paradigm for supply chain management in urban logistics

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Are they happy with that?
Are they ready to share?
- Current research evidences that translating the working principles of the Digital Internet into the routing of freight, has huge potentials to be the real game-changer.
- **Physical Internet (PI)** is hub-to-hub freight movements concept based on an open network rather than directly moving from origin to destination. From ownership and exclusivity to commodity/service (like the Internet already did)
- In PI Parcels will be moving in an automatic way and each part of the network is working in efficiency and in a sustainable manner.

**Urban logistics is an innovation key driver as support to the last mile, which has a huge impact in the supply chain**
In Europe, urban logistics represents the 28% of the total transport costs and contributes in producing from up to 50% of total traffic air pollution. Recently, new trends are emerging in urban logistics (e.g. e-commerce, sharing economy, autonomous vehicles). Collaborative transportation systems have become an increasingly popular practice due to the crisis. However, the concept of cooperation and competition and data-sharing still requires further development and research.
INDIVIDUAL INITIATIVES!

Huge margins for acting against inefficiencies
ALICE and urban logistics

The industry-led European Technology Platform ALICE (Alliance for Logistics Innovation through Collaboration) established in 2013, has the ultimate challenge to contribute to a European industry resilient by a true “people, planet and profit” oriented logistics and supply chain sector.

The ALICE Working group 5 is related to Urban Logistics

Establishing a framework for a more consistent approach of urban logistics issues throughout Physical Internet.
Milestones on UL to PI

2020 Defining and assessing new opportunities and Business Models

2030 Efficient and automated distribution systems

2040 Fully integrated urban logistics in the city mobility system

2050 Physical Internet (2050)
The Urban Freight Research Roadmap

This document is a Research Roadmap on urban freight and logistics delivered jointly by ERTRAC, the European Road Transport Research Advisory Council, and ALICE, Alliance for Logistics Innovation through Collaboration in Europe.

The goal of the roadmap is to identify research priorities related to urban freight, returns and urban logistics and to contribute to the definition of research programs for the actors of the sector, including Horizon 2020, the European Programme for Research and Innovation.

It was developed in 2014 and updated in 2016.
The scope of the roadmap is to address urban freight transport, defined as all movements of goods into, out of, through or within the urban area, made by light or heavy vehicles, including:

- Delivery of goods (business & home).
- Service transport and demolition traffic.
- Shopping trips made by private households.
- Reverse logistics for waste removal and for returns management.
- Service vans for maintenance, supply and removal of parts.
Motivation behind the Urban freight Roadmap

The following issues in Europe were taken into account:

- **Concentration** of population in cities (72% European population - live in cities, towns and suburbs, 80% in 2020).
- Urban freight as an important **traffic component** in cities (corresponding to 10 - 15% of vehicle equivalent miles).
- Very **low load factors** for delivery vehicles in cities (e.g. 38% for vans in London).
- Urban freight being responsible for 25% of **urban transport related CO2** emissions and other transport related pollutants (e.g. PM, NOx).
- Urban freight service **companies generally being very small** (85% of short distance truck companies have less than five employees).
- Urban freight accounting for a significant part of **ambient noise**.
- Changing **urban freight patterns** due growth of e-Commerce, teleworking, ageing population, more densely populated urban areas.
- European Policy for zero **CO2 emissions in cities by 2030**
• Identifying and assessing opportunities in urban freight towards a more efficient integration and management of urban freight in the transport system of the city
• Define new Business Models and Innovative Services.
• Increase Safety and security in urban freight.
• Achieve Cleaner and more efficient vehicles.
The ALICE WG5 on UL environment builds upon different research areas and the working group urban logistics vision is to achieve a **full integration of freight flows in cities’ operations and activities** that allow citizens to access the goods they require, supporting sustainable and efficient development.

Research areas have the following targets:

- **Increase energy efficiency**, which can be achieved by improving the efficiency of the whole urban logistics system added to the expected gains in the energy efficiency of vehicles.
- **Improve the urban environment** by increasing air quality and reducing noise.
- **Increase customer satisfaction** by delivering the goods on time and improving the reliability of the system.
- **Increase safety and security** reducing injuries and fatalities and also cargo lost or damage. Reducing risk of using trucks for terrorist attack.
Research period 2018-2020:
As result of benchmarking and dense bottom up consultation with stakeholders, research topics to be activated as “Call for Innovation” and are presented:

- Logistics in the full circular economy: New business models for horizontal and vertical collaboration
- Integrated data framework and Big Data analytics assisting decision-making in urban freight transport
- Exploring new opportunities for achieving effective integration of urban freight and personal mobility services and networks
- Improving the link between urban and long distance freight transport services and infrastructures
- New business models for logistics services based on sharing economy
- Bringing Logistics into urban planning
- Interoperable standard modular loading units’ operation in the urban context: autonomous deliveries
- Safety and security in urban freight
Logistics in the full circular economy: New business models for horizontal and vertical collaboration

**Challenge:**

- Integrate supply networks, including the reverse part of the chains, to make full utilization of resources within and across supply chains

**Outcome:**

- New (business) models that increase the global efficiency of supply chains
- Demonstrators of design of hub operations, transport, packaging systems and handling technologies
- Overcome regulation barriers and definition of incentive schemes

**Impact & targets:**

- Energy efficiency gains
- Reduction of env. impact
- Reduction of logistics costs thanks to opportunities of synergic flows
- Increase asset availability and quality
- Increasing customer and market acceptance
Implementation Plan – proposal of topics

Integrated data framework and Big Data analytics assisting decision-making in urban freight transport

**Challenge:**
- Big data analytics will offer greater opportunities to link freight operator’s decision making with city planners decision making

**Outcome:**
- Structured knowledge base on current applications of Big Data in urban freight transport
- Business cases, achieving positive impacts on energy use, environment and resilience of cities
- Roadmap of research to mitigate gaps between private & public decision-making

**Impact & targets:**
- Better use of predictive analysis to achieve economies of scale in accessing data
- Resilient use of city transport network
- Faster development of big data program and regulation frameworks in public sector
Exploring new opportunities for achieving effective integration of urban freight and personal mobility services and networks

**Challenge:**
- Further exploitation of the potential of integration between urban freight and passengers transport networks
- Freight/passenger integrated mobility planning

**Outcome:**
- Tools, methods and data sources to identify opportunities of flows integration and support the development of integrated mobility plans
- New concepts and technologies contributing to a better integration of freight and passenger flows
- Development of business models offering mobility as a service (MaaS)
- New concepts and technologies for a better integration of flows

**Impact & targets:**
- Increased use of assets and infrastructures
- Reduction of congestion and CO2 through use of public transport network for freight
Challenge:
• Reduce freight transport movements, congestion and to increase the load factor in urban areas through optimization of the links between urban and long distance transport

Outcome:
• Tools for urban planners to decide on optimal location and size of connected urban hubs and transport means
• Evaluate different business and governance models
• Pilot solutions for optimising the use of UCC and micro platforms exploiting horizontal and vertical collaboration

Impact & targets:
• Increased use of assets and infrastructures
• Reduction of congestion and CO2 through optimization of traffic between hubs and urban areas, improvement of load factor and use of green vehicles
Implementation Plan – proposal of topics

New business models for logistics services based on sharing economy

Challenge:

• Find new approaches to find unexplored potentials or emerging peer-to-peer (P2P) business / business – to – consumers (B2C) opportunities in freight market

Outcome:

• Truly innovative, sustainable and long lasting forms of cooperation, business and social models for urban logistics services
• New governance models and related marketplace rules
• Business-led roadmaps ensuring a seamless and significant market take up and roll out of collaborative meta-business models

Impact & targets:

• Increased load factors
• Operational cost reduction
• Reduction of lead-time
• Better infrastructures capacity use
**Implementation Plan – proposal of topics**

**Bringing Logistics into urban planning**

**Challenge:**
- Define conditions towards proper consideration of urban logistics infrastructure needs and urban design aspects in Sustainable Urban Logistics Plans integrated in overall mobility plans

**Outcome:**
- Recommendations on architectural design and integration of logistic facilities in urban areas
- Analytical economic models to support stakeholder analysis
- Large-scale demonstrators on logistics planning for urban city planners

**Impact & targets:**
- Increased use of assets and infrastructures
- Reduction of congestion and CO2 through optimization of traffic and better vehicle utilisation
Implementation Plan – proposal of topics

Interoperable standard modular loading units’ operation in the urban context: autonomous deliveries

**Challenge:**
- Modular urban loading need to be designed and tested for different urban scenarios and demonstrate the full advantages
- Pave the way towards a global standardisation to realize full benefits.

**Outcome:**
- Development of modular urban load unit compatible with regular containers and vehicles
- Development of technologies to transfer standard loads between vehicles
- Large scale pilot project

**Impact & targets:**
- Improvement of load factors and vehicle utilization
- Reduction of CO2 emission thanks to traffic reduction
- Reduction of handling costs and time in last mile operations
- Increase safety and security of cargo
Implementation Plan – proposal of topics

Safety and security in urban freight

Challenge:
• Solutions to guarantee a safe urban delivery system minimizing the risk for freight operators and ensuring peoples’ privacy and security at the same time

Outcome:
• Efficient, reliable and safe solutions enabling the decoupling of the delivery and the collection of the goods
• Solutions to improve security and safety by assessing the potentials of improvements of human machine interfaces, policies, vehicles and information and ICT

Impact & targets:
• Increased customer satisfaction
• Reductions of failed deliveries
• Reduction of cargo loss due to theft or damage
• Improvement of resilience and robustness of urban freight systems
ALICE main achievements in UL

Milestones achieved:

- UF Roadmap first release: **November 2014**
- Recommendations for Urban Mobility topics H2020 2016-2016: **January 2015**
- **SETRIS project funded in 2015** Strengthening European Transport Research and Innovation Strategies (funds from the EU Horizon 2020)

Activities done during 2015-16-17:

- **Follow up past & current projects in UL** and best practices benchmarking
- Deeper analysis of impacts that Roadmaps shall imply, of **barriers** affecting the **change industry take up**.
- **Expected impacts and related indicators** and ways to measurement progress.
- **Implementation plans** for the Roadmaps (new strategic challenges)
- Joint Roadmaps from new research needs and challenges (in SeTRIS)
- Collaborative Innovation Day in Brussels (May 2017) sharing projects outcomes and catch up new prospects for urban logistics research and new challenges
- **Final Conference for Collaborative Innovation Day Meetings held 27th September 2017**
The collaborative innovation day: topics addressed

The first workshop was held in May 2017 with key results and gaps for UL identified.

The workshop started from the assumption that urban freight affects in a relevant way the quality of people’s life.

In this context, it is fundamental to understand the potential for stakeholders cooperation, including the need of new business models, in order to improve city logistics efficiency and sustainability.

The different interests of actors involved in urban logistics (local authorities, shippers, retailers and logistics service providers and consumers) need to be addressed to find solutions satisfying all of them.

The main stakeholders’ achievements and future plans for City Logistics were presented at the workshop focusing on the challenges of reducing congestion, reducing emissions, increasing cooperation and enhancing land use and planning.
More in detail, the topics addressed during the third workshop were:

- **SULP** (Sustainable Urban Logistics Plans): Are they needed? How to include regional connections? The Sustainable Urban Logistics Plan (SULP) is a specific Plan for designing logistics solutions within mid-term horizon and managing urban freight processes. It should consider the integration between networks and operations, the improvement of the interaction between long distance freight transport and urban freight including also the regional area.

- **Private and Public collaboration**; new procurement strategies. Local authorities could encourage zero emission transport, stimulating operators to provide more sustainable transport solutions via procurement strategies, which should properly consider the development of city hubs such as (urban or extra-urban) consolidation centres.
The collaborative innovation day: topics addressed

- **New Consumption patterns**: Technology-driven or responding to social demand? The full integration of urban freight in the city depends on the evolution of people lifestyle. Different models of urban development and regional land uses together with demographic trends and the new behavioural patterns such as teleworking or e-commerce impact the organization of last-mile delivery.

Available technologies allow door-to-door delivery at any time, thus generating a number of trips that impact strongly on the urban traffic. New business models, like **crowd-shipping** or **crowd-delivering**, can have an impact on the demand for passenger transport and goods transport, that could become either complementary or antagonistic.

The consequences of these new **consumption patterns should be evaluated** to implement measures able to harness the opportunities offered by technological development and preserve the quality of life in cities.
1 - More attention to city logistics planning and development is needed from city authorities in SUMP. Growth of e-commerce and also new delivery business in cities are changing the framework in which citizens access services and goods.

This is creating a paradigm change in city logistics that is impacting the city liveability. Currently measures are focused on banning diesel trucks and other restrictions for the movement of goods. This should be accompanied with clear measures and clearer understanding and planning of logistics activities in cities to ensure citizens proper access to services and goods.

Within SUMP, Logistics Plans should be addressed and considered to get this achievement.
2 - Increased Public-Private Collaboration is needed in the City Logistics domain. Some cities are facing problems derived from congestion and emissions. While this is happening, studies show that urban delivery vehicles in cities can have a utilization rate as low as 24%.

In order to make efficient and smart utilization of city transport infrastructure, a model for the city logistics needs to be developed and further private-public collaboration can support further integration of traffic flows in cities. Examples such as concessionary systems associated to greener city logistics models need to be further explored and exploited.
City Logistics is currently in a paradigm change that needs to be better understood to realize societal and environmental opportunities. E-commerce is growing at a doubledigit rate in almost every country in Europe which entails a tremendous increase in city deliveries.

While this is seen as a major contributor to traffic, emissions and congestion, there is still an opportunity to achieve a transformation to a more efficient delivery capability decoupled from environmental and mobility nuisances. In parallel, new technologies such as modularisation of transport units, autonomous delivery vehicles and drones are presented as potential technologies to be implemented in the near future. Impact of these solutions and the way these systems could transform city dynamics need to be further explored and understood.

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