City logistics innovations:
game-changers or over-hyped curiosities

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City Logistics / Urban Freight Problems

Coincidence of a high level logistical activity and high density of population

Economic inefficiency:

- high delivery costs
- under-utilisation of vehicle fleets
- traffic congestion

Environmental damage:

- air pollution / climate change
- noise irritation
- accidents
- visual intrusion

EU target:

‘Achieve essentially CO$_2$-free city logistics by 2030 – in major urban centres’

2011 Transport White paper
Logistics Futurology

- mega-trend

- game-changer

continued urbanization
growth of urban freight traffic
decentralization of retailing
switch to online retailing
greening of vehicle fleet
etc

- omni-channel logistics
- unattended delivery
- crowd-shipping
- freight ‘uberization’
- drones
- 3D printing
City Logistics Innovations: *from curiosity to mainstream?*

- **Cargo cycles**
- **Cargo trolleys**
- **Cargo trams**
- **Underground rail**
- **Surface rail**
- **Water-borne freight**
Delivery Servicing Plans (London)

**Operational Innovations**

**Urban Freight Consolidation Schemes**
- Cities without Binnenstadservice
- Collective warehouse Binnenstadservice

**Mobile Transhipment Points**
- Delivery Servicing Plans (DSP)
- Off-hours / night-time delivery

**Public Policy Innovations**

**Freight Quality Partnerships**

<table>
<thead>
<tr>
<th>Company</th>
<th>Description</th>
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<tbody>
<tr>
<td>Ferrari Regent St</td>
<td>Consolidation of every 3 loads into 1</td>
</tr>
<tr>
<td>Anthropologie</td>
<td>Consolidation of 80-100 small supplier consignments / week into 4 loads</td>
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<tr>
<td>TFL (Palestra)</td>
<td>Deliveries reduced by 20% (from 250/week)</td>
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<tr>
<td>Emirates Stadium</td>
<td>Deliveries reduced by 20%, consolidated food &amp; milk deliveries</td>
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<td>Fire Brigade</td>
<td>Consolidation Centre £90,000 supply chain saving</td>
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<tr>
<td>University</td>
<td>Stationary deliveries reduced by 80% - average invoice value £28, cost to process £20</td>
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Growth of Online Retailing in Europe and the US

Growth of European Online Retail Sales 2012-2017

Source: Forrester Research

Growth of US Online Retail Sales 2012-2017

Year-on-year growth of share of total retail sales

Source: Forrester Research

% of total online retail sales

Mobile online retail sales (US)

Source: eMarketer (2013)

omni-channel logistics

Seamless, consistent and integrated shopping experience across all marketing channels that is personalized, relevant and meaningful.
Comparison of the Carbon Intensity of Conventional and Online Book Retailing

Source: Edwards, McKinnon and Cullinane, 2009

Online retail supply chain’s CO₂ advantage:

Over shopping by car: 8.3 x
Over shopping by bus: 2.8 x

Underpinned by numerous assumptions
Unattended Delivery Options for Online Consumer Orders

- Home access system
- Integral box
- External boxes
  - fixed
  - mobile
- Collection points
  - train station
  - park and ride
- unattended delivery to the home
- average 40% reduction in trips, fuel use and emissions
  *based on Finnish research*

- rapid growth of ‘click-and-collect’ from shops / ‘pick-ups’

Logistics of online retailing not simply a substitution of a car-borne shopping trip by a van delivery to the home – it is broad diversification of order fulfilment channels and methods
Crowd Sourcing of Parcel Deliveries: Crowdshipping

- exploiting new spirit of collaboration
- commercialisation of social networking

Benefits:
- accelerates last mile distribution
- more flexible, life-style-adjusted delivery
- fewer failed deliveries
- low marginal cost / improved asset utilisation
- lower traffic levels, emissions and congestion

Problems:
- increased risk of theft, loss and damage
- inadvertant delivery of illicit products
- vulnerable to criminal / terrorist activity

Amazon trialling delivery of parcels by taxi in Los Angeles

Financial times (15 Oct 2014)
10 reasons why distribution by drone is unlikely to work

Very limited distance range and payload weight – *in the absence of a battery miracle*

Impossible inventory trade-off between product range and decentralised distribution

Lacks the scale economies of hub-spoke distribution and last-mile groupage

Household reception system very difficult and costly to standardise and operate

Accident / liability risk: *to people, aircraft etc*

Security risk: *ideal target-practice for guns and air rifles*

Dependence on the weather

Public concern about privacy and environmental quality

Demand for premium same-day delivery – *small segment of online market*

Authorities very unlikely to approve use of urban air-space by delivery drones

Drones are ‘not a mass phenomenon’

(Frank Appel, CEO of DHL)
3-D Printing / Additive Manufacturing / ‘Fabbing’

Constraints on the Mass Use of 3D Printing

- Very expensive relative to scale economies of batch production
- Need to attach high value to customised products
- Technical difficulty in producing all but simple parts
- Limited range of materials used – constrains functionality
- Layering and bonding process causes intrinsic weakness

Need mass adoption to have much impact on urban traffic levels

- Bulk delivery of printer filament replaces many separate product deliveries
- Supply chain simplification – *eliminates numerous nodes and links*
- Minimal return flow of unwanted product / waste

Home-made toys – *entry point for the domestic market?*

Hasbro aims to make 3D printing child’s play

*European Executive: Health Care & Technology*
Position of 3D Printing on the Gartner 2014 Hype Cycle

- Over-hyping of consumer applications?
- Spare parts
- Component manufacture
- Dental / body parts

- Consumer 3D Printing
- Enterprise 3D Printing
Verdict on the ‘game-changers’

**Drones** – yet another curiosity

**Crowdshipping / freight-passenger vehicle synergies:** major opportunities if social attitudes, collaborative business models, IT systems and regulatory policy are well aligned.

**Consumer-based 3D printing:** potential for significant reduction in the amount of freight movement in urban areas – but scaleability will be limited

Co-ordinated implementation of the much broader range of city logistics innovations will be required

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![Decarbonisation of electricity generation chart](chart.png)

**Source:** IEA

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**IT and software developments:** e.g. predictive analytics
Carbon footprinting city logistics: where do you draw the boundary
Logistics of instant gratification

For online retailers, speed of delivery is a key competitive differentiator. Pursuit of cost-effective same-day delivery from any order point to any delivery point.

Amazon DASH

Smart fridge

Vendor management inventory (VMI) at consumer level on a JIT basis.

Potential explosion in number of home deliveries – restrained by price mechanism?

Patience is a virtue

Patience will be even more of a virtue in a low carbon world.
Possible areas for transport research

Feasibility, scaleability and impact of individual city logistics innovations

Possible synergies between these innovations

Applicability of the innovations in different urban environments

Role of public bodies in incentivizing the uptake of innovations deemed to beneficial in economic and environmental terms

Potential for modelling personal and freight flows in urban areas as an integrated ‘fulfilment’ system

Resolving methodological issues related to the carbon footprinting of city logistics and the setting of meaningful targets
Professor Alan McKinnon

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‘Oh by the way, two ping pong bats arrived by drone yesterday...why would your mother send those?’