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The Implications of Internet Shopping Growth on the Van Fleet and Traffic Activity

Professor Alan Braithwaite
LCP Consulting

May 2017

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About the Author

Professor Alan Braithwaite

Alan is the Founder of LCP Consulting and has spent his career working with more than 400 companies on their operations, supply chains and logistics. In 2015 he published a book with Professor Martin Christopher under the title 'Business Operations Models – becoming a disruptive competitor'. In 2016 he was awarded the Sir Robert Lawrence Award by the Chartered Institute of Logistics and Transport for his lifetime contribution to the profession.

He is also a Visiting Professor in Supply Chain Management at Cranfield University, School of Management, where he contributes to research and teaching. In this role, he is a thought leader and educator, a regular speaker at conferences, and the author of many papers and articles.

In recent years he has taken an academic and consulting interest in freight transport policy. In the course of this work he has published widely, including being the lead author of the Chartered Institute of Logistics and Transport – Freight Vision 2035. He is a recognised thinker on the future of urban logistics in the face of the challenges of congestion and pollution.

LCP Consulting

LCP is a specialist operations and supply chain consultancy, which is now part of BearingPoint – a leading global business consulting firm with broad management and technology capabilities. LCP's focus is on advising companies how to simultaneously improve customer experience and enhance their bottom lines through their operations. The firm has a strong retail practice where it has become a leader in retail e-commerce and advised many high street names on their operational development. This deep experience has helped to inform this analysis and report.

Acknowledgements

My thanks are due to the RAC Foundation for asking me to prepare this analysis and report. Also I must recognise their support and challenge during the course of the work; it is the better for it. The team at LCP have provided industry experience and detailed background analysis. Many connections, including with the CILT, MDS Transmodal, The Transport Systems Catapult, Transport for London and UK Warehousing Association have also helped with sources and validation. The opinions and conclusions are mine and should not be taken to represent those of any other organisation.

Disclaimer

This report has been prepared for the RAC Foundation by Professor Alan Braithwaite (LCP Consulting). Any errors or omissions are the author's sole responsibility. The report content reflects the views of the author and not necessarily those of the RAC Foundation.

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Foreword

Britain's consumers have taken enthusiastically to the world of internet shopping, with potentially significant implications for our traditional town centre and high street retail outlets. Might there also be similarly significant implications for the volume of traffic on our congested roads?

Meanwhile, official statistics reveal a dramatic increase in van traffic over recent years, leading some commentators to suggest a causal link – more home deliveries, more vans, and more traffic.

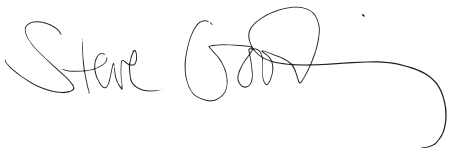
So we commissioned Professor Alan Braithwaite to investigate whether that causal link might be real – is internet shopping behind the rise in van traffic, as more and more of us shop online for goods to be delivered straight to our homes?

Alan's research suggests that the answer is a pretty emphatic 'no'.

True, in congested city centres the fact that many office staff choose to have their personal purchases delivered to their place of work is making traffic managers' lives more difficult, because the available road capacity is already exhausted. But in the round it seems we have to look elsewhere for the drivers of ever-increasing van use.

Having your shopping delivered to your home after the evening rush hour could be having a positive impact on traffic levels. What's less clear are the wider implications of a retail supply chain that is striving to offer an ever swifter service for their click-happy customers.

Steve Gooding



Director, RAC Foundation

List of Abbreviations

B2B	business-to-business
B2C	business-to-consumer
C2X	consumer-to-business and/or consumer-to-consumer
Defra	Department for Environment, Food & Rural Affairs
DfT	Department for Transport
DVLA	Driver and Vehicle Licensing Agency
FTA	Freight Transport Association
GVW	gross vehicle weight
HGV	heavy goods vehicle
IMRG	Interactive Media in Retail Group
LBCC	London Boroughs Consolidation Centre
LCV	light commercial vehicle
NO_x	nitrogen oxides
NTS	National Travel Survey
ONS	Office for National Statistics
$PM_{2.5}$	particulate matter of median diameter 2.5 microns or less: fine particulate matter
PM_{10}	particulate matter of median diameter 10 microns or less: coarse particulate matter
TfL	Transport for London
UKWA	United Kingdom Warehousing Association

Executive Summary

This paper has been has commissioned by the RAC Foundation to investigate the implications of e-commerce and Internet shopping on the van parc and its effects on traffic activity and congestion. Ipsos MORI research commissioned by the RAC Foundation at the same time as this report[1] shows that 85% of people doing Christmas shopping (and 73% of all adults) reported doing so online for at least some of their Christmas gifts in 2015; 10% of them reported they did all of their Christmas shopping online, and an additional 28% more than half of it. At the time of the survey, 17% of adults thought that they would buy more online for Christmas 2016 than they did in 2015, while 12% believed they would buy less (Ipsos MORI, 2016a; 2016b: 2).

Of the adults who bought presents online for Christmas in 2015, 88% used home delivery methods to receive these goods; around one in four (26%) used click-and-collect methods to do so. The vans (light commercial vehicles – LCVs) that deliver these online orders are sometimes demonised for causing congestion and hazard.

This paper assembles both primary and secondary research in an attempt to explore and explain the role that vans used for Internet delivery play in the overall traffic problem. Is the criticism of them fairly levelled or not?

The statistics and analysis have been drawn from multiple sources of data recorded in different time periods. It has been necessary to draw conclusions by triangulation[2], inference, application of industrial experience, and some inductive logic leaps.

Defining what a 'van' is at the outset may be useful for readers. They are goods vehicles below 3.5 tonnes in weight including the payload. These are exempt from most of the heavy goods vehicle (HGV) regulations relating to tachograph reporting, driving times, more rigorous MOT testing and operator licensing. Vans are VAT-recoverable for businesses, and are designed for carrying a variety of types of goods. The most common type is the panel van (the ubiquitous 'white van'), but the term also encompasses minibuses, Luton vans (the design with a box body extending over the cab), tippers, flatbeds, dropsides and pickups.

Statistics show that vans are the fastest-growing traffic segment in the UK, with 70% growth in road miles over the last 20 years, compared to 12% for cars and 5.5% for lorries; this growth is forecast to continue under all economic scenarios (DfT, 2016a: 2).

The growth in vans is contributing to traffic congestion that is both acute and chronic, costing the economy billions of pounds annually, as measured using traffic sensors and analysed using 'big data' methods – London is the second worst city in Europe, and Greater Manchester ranks 18th – and the UK is Europe's third most congested country (INRIX, 2017).

The implications for pollution caused by this traffic growth and congestion are severe – slow

1 Conducted by online survey for adults aged 16–75 on 28 October and 1 November 2016.
2 In qualitative research, triangulation is a technique that facilitates validation of data through cross-verification from two or more sources.

speeds increase emission of NO_x (nitrogen oxides) and particulates from diesel engines; vans contribute 15% of London traffic – and a higher proportion of diesel vehicular traffic. The current estimate of premature deaths in London alone due to poor air quality from all sources is 9,400 annually (in 2010), with traffic as the biggest contributor (Walton et al., 2015).

References by the media to these and other sources frequently point the finger at Internet shopping as the traffic congestion bogeyman. It is asserted that the vans that are servicing the fast-growing e-commerce market are the primary cause of traffic congestion and air quality problems. None of these sources substantiate the assertion. To test this hypothesis, primary research was carried out on the van parc[3] as a whole, and on the fleets that are used in package and grocery home delivery. Secondary sources on e-commerce growth, van use and traffic generation have also been compiled. The analysis of the van parc and van traffic shows that:

- The van parc is indeed growing fast, with historic growth rates in vans on the road of around 5% annually, outstripping recent compound growth in van mileage of 3.5%; both these growth rates are faster than the economy as a whole.
- The growth in the van parc does not show an obvious replacement of HGVs; the parc of smaller HGVs is only around 60,000 vehicles (as compared with 3.7 million vans) and continues to grow slowly.
- Vans appear to have their own economic momentum for reasons of convenience – vans provide compelling business value in terms of their convenience in time and place, and this is driving service-sector growth; vans are generally poorly used in terms of their payload.

For parcel delivery activity, the analysis reveals that:

- e-Commerce parcel volumes are growing at 9% annually, a rate that is expected to fall to 6% a year over the next four years; despite the reduction in growth, this is significantly above the average growth in vans.
- This rate of parcel growth is less than that of the online retail market, which is growing at between 10% and 12% a year; the difference is due to the innovation, customer acceptance – and hence growth – of click-and-collect.
- Retailers are trying to increase customer convenience and mitigate the unrecovered costs of home delivery by providing click-and-collect options.
- The vans in use by package and grocery e-commerce delivery operators comprise a small part (less than 4%) of the van parc. However, they run much greater mileage than the average van; hence road occupancy of parcel vans (on-the-road miles) is closer to 10% of van traffic.
- Therefore around one in ten of the vans that people encounter on the roads in their daily lives are engaged in parcel and packet delivery, whether to consumers or businesses.
- In overall traffic terms this translates into only around 1.5% of all movements (cars, lorries, vans, buses and coaches) in London where congestion is the worst in the country; London is used as a worst-case scenario in the analysis.

3 The parc is the total number of vehicles registered and taxed to run on the road by category – in this case vans.

- Vans for home delivery do operate in peak traffic periods, but a large part of their activity is at less congested times of the day and in locations away from the major pinch points in the road traffic network.

This analysis points to the unfairness of singling out e-commerce delivery vans as a major cause of traffic growth and congestion. It is an important part of the traffic mix, but not a dominant one.

There are further important insights into what is actually happening:

- Cairns' research, published in 2005 (Cairns, 2005), reported on modelling work that suggested that Internet home delivery of groceries would reduce car traffic for grocery shopping by as much as 70% – implying that home delivery could be a benefit to traffic rather than a challenge, by substituting fewer vans for many cars. This has proved to be an overestimate.
- Nonetheless, the 2015 National Travel Survey for England shows that the number of personal shopping trips by car as a driver and passenger, and the distances driven for that shopping, have reduced by 14% and 19% respectively since 2002 (DfT, 2016b; DfT, 2016c).
- Moreover, the Ipsos MORI poll for the RAC Foundation undertaken in October and November 2016 found that a net 12% of respondents in urban areas (9% in rural areas) reported making fewer shopping trips in a vehicle than they did 12 months previously (Ipsos MORI, 2016a).
- Indeed, individuals' travel by car as a driver or passenger for all purposes has declined by 13% in terms of number of trips and by 10% in total miles travelled over the last 20 years – it is population growth that is behind increased car use, which accounts for more than 75% of all road traffic (DfT, 2016d: 20).

These sources are directionally consistent, pointing to a reduction in overall shopping traffic, even though the scale of the reduction is not as great as Cairns forecast, and the timescales do not align with Cairns' work.

The overall conclusion is that, while vans are a growing contributor to traffic and congestion, e-commerce is a smaller contributor to the overall picture than is often asserted. Indeed, it appears that it has actually had a limited positive effect.

The topic of the 'van growth problem' needs further research to build the metadata that can guide policy. Without that understanding, the risk is that policy measures made on the basis of false assumptions can quickly gather momentum. Focusing on just one area of van activity, or indeed on van usage as a whole, could result in missing the bigger picture of how personal and work-related travel, and all van and lorry activity, are related.

The pattern of van and lorry activity across our cities and towns and on major and minor roads is not uniform in its profile, purpose and impact. What happens in Norwich is quite different from what goes on in Newham or Nottingham. The concept of freight 'clusters' is proposed in this report as the basis for analysing the need for and impact of freight traffic in a way that can meaningfully support the development of local policy. This idea is

based on the analysis in *Feeding London 2030: Facing the logistical challenge*, published by the United Kingdom Warehousing Association, which showed that the commercial activities in the 300 towns that have their own high streets, which can be thought of as making up London, vary greatly. The freight and logistics attributes of individual localities are not homogeneous (UKWA, 2016). Using cluster analysis would provide the platform for designing specific proposals for freight vehicle reduction through appropriate organisation of deliveries in a locality.

Clusters could be supported by new models for urban logistics centres which are among some rapidly emerging innovations in city logistics. Some of these solutions respond to the demands of population growth and the macro problem of congestion; others answer to the economics, convenience and sustainability of e-commerce growth. Micro-hubs, electric vehicles, drones and delivery robots are all part of the future, and the digital revolution is central to enabling such innovations.

Policymakers could usefully take time to understand the potential of these new innovations, and to create favourable conditions for their full-scale market adoption.

Vans are the fastest-growing traffic segment in the UK, with **70%** growth in road miles over the **last 20 years**, compared to 12% for cars and 5.5% for lorries

The **van fleet (parc)** is growing **fast. Historic** growth rates in vans on the road **of around 5% annually** which his greater than annual **growth in van mileage of 3.5%**

In 2016, the total UK market for **e-commerce deliveries** was **2.7bn packages** of which **1.8bn** were for the "business-to-consumer" segment

e-Commerce parcel volumes are growing at **9% annually**, a rate that is expected to fall to 6% a year over the next four years

The vans in use by **package and grocery e-commerce** delivery operators comprise **less than 4%** of the **van parc** and make up close to **10%** of **van traffic**

In overall traffic terms, vans used to service **internet shopping** orders account for only **1.5%** of traffic **in London** where congestion is the worst in the country

Vans for home delivery do **operate in peak traffic** periods, **but** a large part of their activity is at **less congested times of the day** and in **locations away** from the major pinch points

This analysis points to the unfairness of singling out **e-commerce delivery vans** as a major cause of traffic growth and congestion. It is an **important** part of the traffic mix, but **not a dominant one**

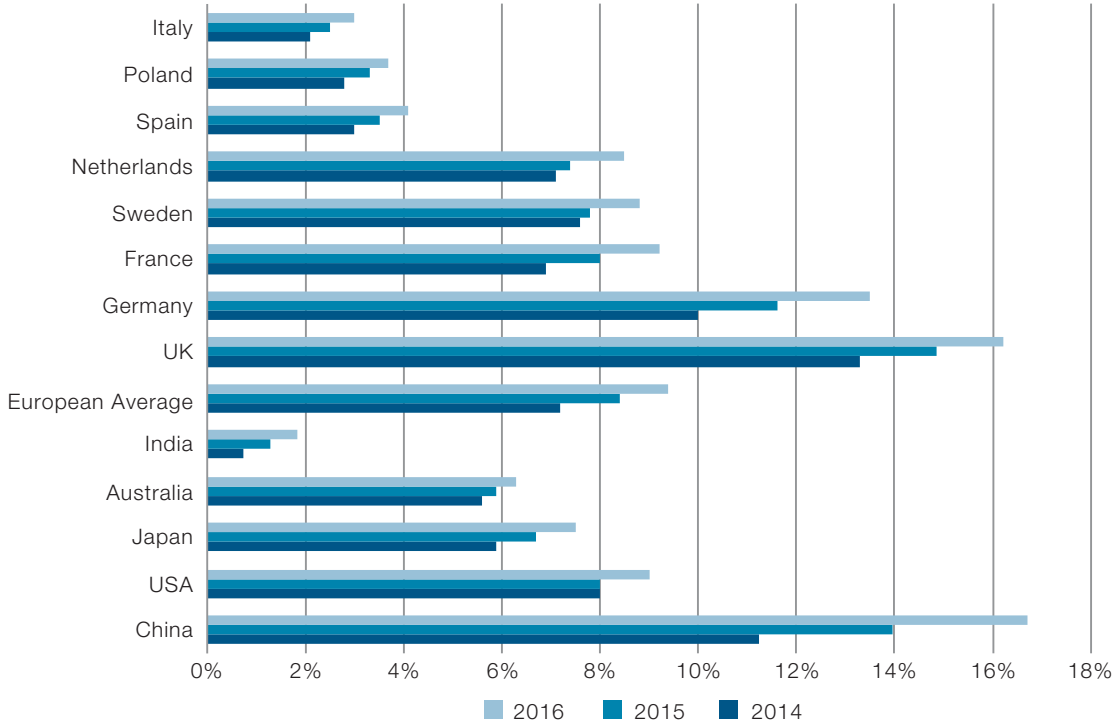
1. The Rise and Rise of Internet Retailing

This chapter provides an overview of the development of retail e-commerce, the competitive nature of the industry, and how that is driving the demand for ever-faster parcel delivery services.

1.1 The growth in e-commerce and its importance in the UK

The growth in Internet retailing is arguably the most significant structural change in the domestic marketplace seen in the last 20 years; the UK is the Western world's leader in terms of reported online market share. Figure 1.1 shows the online share of both global and EU retail markets derived from various sources.

Figure 1.1: The relative scale and recent growth of online retail revenues, within the EU and worldwide



Source: Data combined and averaged from Forrester Research, The Centre for Retail Research and eMarketer

The reported share and scale of Internet retailing by country varies somewhat depending on the statistical sources accessed, and there are also problems with data capture in such a rapidly evolving industry; however, the figures all converge around the numbers shown. Growth in the e-commerce channel is typically running at 12% to 15% compound, with smaller markets growing faster and larger markets seeing slower compound growth as a result of the percentage effects of scale. However, it is worth noting that, at the turn of the century, Forrester Research forecast optimistically that 10% of retail would be online by 2005 (Forrester, 2000); that explosion in demand has taken longer to happen, but the trend now seems inexorable.

1.2 Changing patterns of e-commerce access – the growth of mobile

The speed of adoption of Internet retailing by UK consumers has made the UK a global benchmark, although it is true that the US and Chinese markets are bigger in absolute scale, and China is comparable to the UK in terms of proportions. Most recently the use of mobile devices – tablets and phones – has fuelled growth by enabling 'shopping-on-the-move'; this is now termed 'm-commerce'.

The magazine and website InternetRetailing (Skeldon, 2015) reported for 2015 that:

> "The UK's shoppers are set to spend £14.95 billion via mobile devices in 2015, an increase of 77.8% on £8.41 billion in 2014, while PC spending will grow by just 2%, finds international research conducted by RetailMeNot, the operator of Vouchercodes.co.uk."

That study forecast that in 2015 mobile devices would account for 28.6% of all online purchases, with 16.5% made with smartphones and 12.1% on tablets. Personal computers (PCs) will still dominate the online market with 71.4% of sales, but that is significantly down on the 81.3% share seen in 2014. The forecast is that the hold of desktop PCs on e-commerce will progressively decline. The report also found that the UK was forecast to account for 39.4% of all m-commerce sales in Europe in 2015 (Skeldon, 2015).

Across Europe, the report forecasts that m-commerce sales would grow by 88.8% in 2015, while UK growth was expected to be 77.8%. However, an equally big impact of mobile is its role as a 'shopping companion' with almost 75% of mobile users regularly visiting retailers' websites for pre-purchase search and investigation.

Table 1.1 shows data and forecasts on mobile commerce as reported by eMarketer; this is consistent with, but exceeds, the conclusions from the InternetRetailing report. The forecast is that by 2020, 10% of all retail sales, and nearly 45% of e-commerce sales, will be by mobile device (eMarketer, 2016):

Table 1.1: UK retail m-commerce sales actual and forecast, 2014–20

	UK retail m-commerce sales, 2014-2020						
Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Retail m-commerce sales (billions)	£14.61	£20.09	£25.19	£30.19	£34.46	£38.56	£42.51
% change	70.8%	37.5%	25.4%	19.9%	14.1%	11.9%	10.3%
% retail e-commerce sales	27.7%	33.3%	37.1%	40.4%	42.3%	43.7%	44.7%
% total retail sales	3.6%	5.0%	6.3%	7.5%	8.4%	9.3%	10.1%

Source: eMarketer (2016)
Note: Includes products or services ordered using the Internet via mobile devices, regardless of the method of payment or fulfilment; includes sales on tablets; excludes travel and event tickets.

There are two operating models of Internet retailing:

- 'Pure play' online retailers – companies that sell only online and do not sell through shops; some of the most notable of these are Amazon, eBay, ao.com (formerly Appliances Online), Ocado and the ShopDirect group (which grew out of Littlewoods).
- Omnichannel retailers – companies that have both an online presence and physical shops, sometimes known as 'bricks and clicks'. Omnichannel retailers are trying to provide an integrated offer with range, price and service consistency between their websites and shops. Customers can browse, buy and return on whatever

basis they find most convenient, without any difficulty. This is not always easy to achieve operationally. Companies like Next, John Lewis, Argos, Tesco and Marks & Spencer are notable exponents of omnichannel retailing. Not all retailers are as developed in their operational integration, owing to factors such as limited shop coverage, business size and the ranges offered – or simply business maturity.

1.3 Retailers' responses to e-commerce growth and customer preferences

Research by LCP Consulting on the relative merits and evolution of the omnichannel model has been carried out over the last three years (LCP Consulting, 2013; 2014; 2015) by means of interviews with executives, retail board directors and function managers in the UK and USA. More than half of the respondents worked for retailers with more than 5,000 employees, and more than a quarter for retailers with over 20,000 employees; all had a turnover in excess of £50 million.

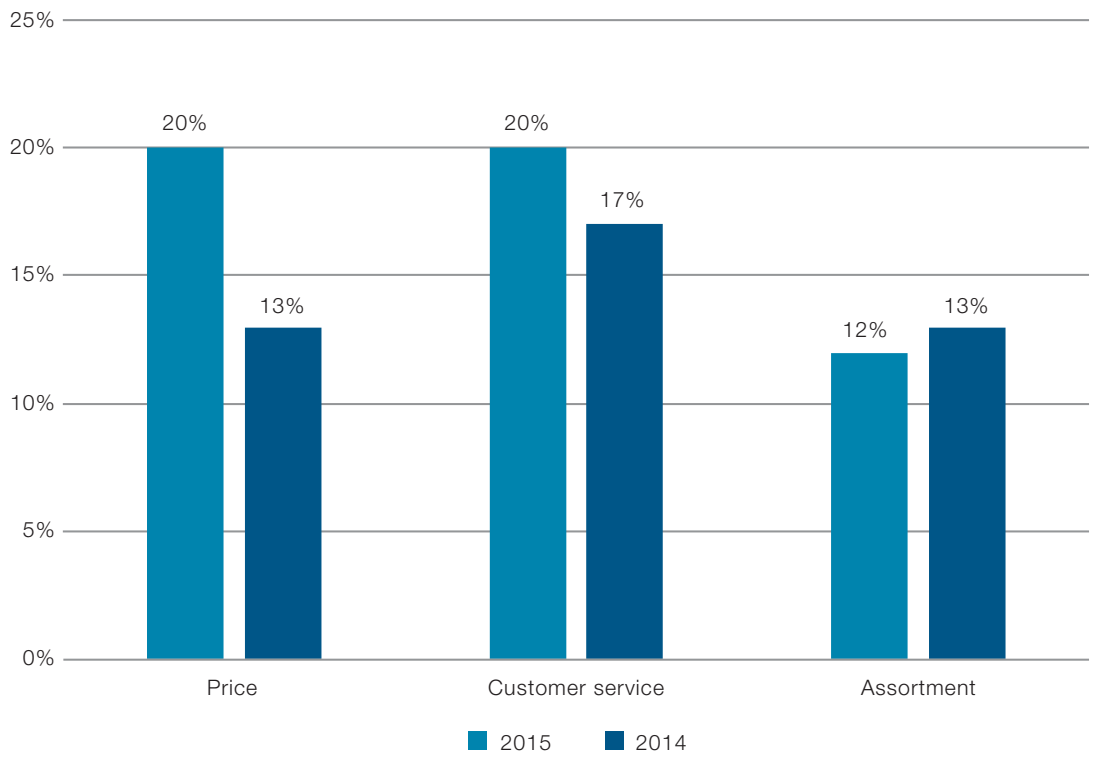
Some headlines from this research were that:

- Omnichannel retailers (of those interviewed) are investing 3% of their turnover and roughly £5 billion over five years in operational capabilities to capture the growth in e-commerce. In many cases the return on this investment is unclear, as the future behaviours of customers, and of the systems and service interfaces required, are not known. It is a dash for growth and share (LCP Consulting, 2013: 5, 19).
- "It's all about the customer" – today's customers are more demanding than ever. Shopper behaviour is fuelled by the desire to receive an increasingly personalised retail experience. In an ever more digital world, competition is now multifaceted therefore, for retailers to succeed, the highest of quality must be provided across every single touchpoint along the customer journey. (LCP Consulting, 2014: 4).
- The three main advantages of moving to an omnichannel model are sales, customer service and operating model.[4] Omnichannel leaders reported achieving improved sales growth as compared with the rest of the sample, securing enduring differentiation and a competitive advantage by being able to respond to ever-increasing customer expectations; they give more consistent delivery of the customer promise and hence drive up loyalty (LCP Consulting, 2015: 10).

The research looked for the three main factors that underlie customers' purchase decisions. Figure 1.2 shows that among customers' priorities, both price and service leapt ahead in 2015 compared with the previous year, increasing by seven and three percentage points respectively.

4 The operating model is the configuration of the service offer, the pricing and charges, and the operational structure that achieves the overall business economics.

Figure 1.2: The three main factors underlying customer purchase decisions



Source: LCP Consulting (2015:12)

1.4 The customer delivery event: critical to retention and profit

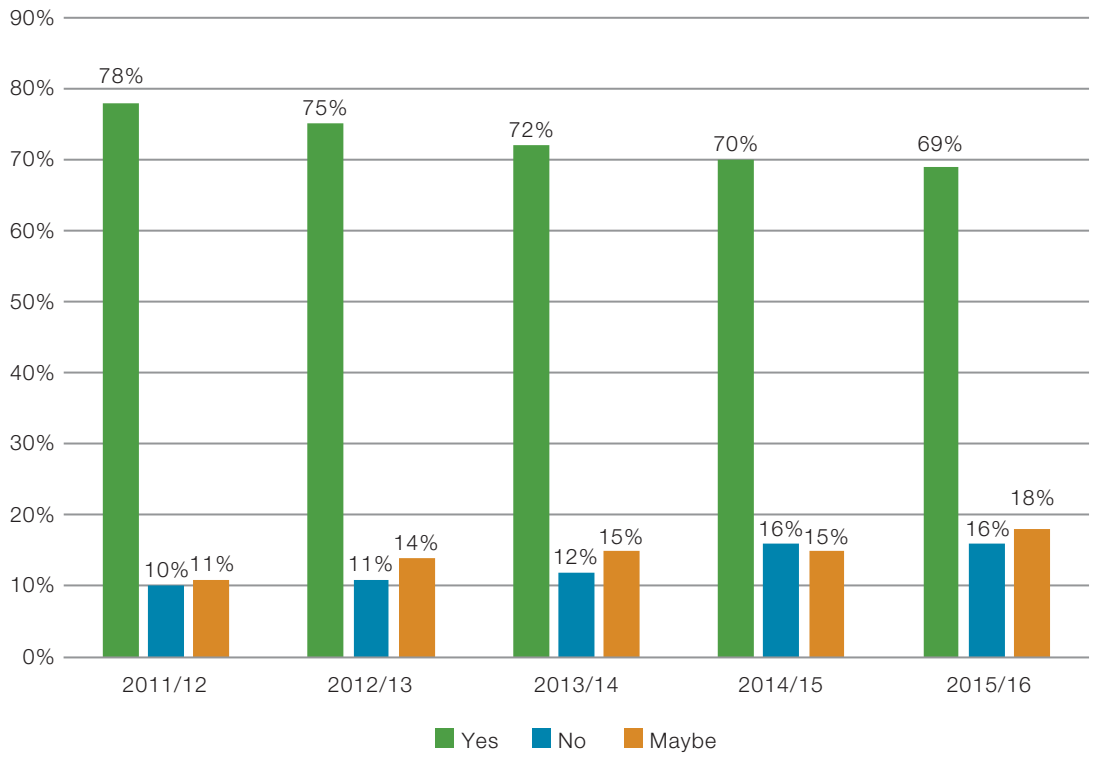
Customers are indeed demanding – they want the best in both price and service. A key part of service is speed. LCP Consulting's respondents were asked in 2015 to rate the likelihood of the following statement: "Within the next one to three years, the majority of my online deliveries will be the same day or next day." On a scale of 1 to 5 (with 5 being the most likely), UK retailers scored 3.8 (LCP Consulting, 2015: 23). Speed is 'of the essence', and that will only increase.

The Supply Chain Director of Argos is quoted in the report as saying (LCP Consulting, 2015: 14):

> "Home delivery is one of the biggest brand impacts on retailers both positively and negatively. When it goes right it is a big plus, and when it goes wrong it's a drag on customer perception of the brand."

This conclusion is supported by research from IMRG (Interactive Media in Retail Group) which found that future purchases of around 70% of customers may be strongly influenced by the quality of delivery experience. While this number is in gradual decline, as illustrated in Figure 1.3, the risk of a poor delivery experience is absolutely clear (IMRG, 2016a).

Figure 1.3: Does a good delivery experience influence repeat purchase?



Source: IMRG (2016a)

It might be expected that with growth comes profitability, but that is not actually the case. There is widespread commentary to the effect that online and omnichannel retailing is margin-erosive unless the operating structures and commercial control are well designed and implemented. This was identified in the LCP Consulting research detailed earlier in its discussion of creating sustainable business models. (LCP Consulting, 2015). Darrell Rigby, writing in the Harvard Business Review, confirms that "Online shopping isn't as profitable as you think." This article identifies that pure play online retailing does not guarantee to generate good profitability, and that omnichannel players can easily experience degradation of the economics of their shops as a result of growth in the online offer (Rigby, 2014). Recent announcements by the John Lewis Partnership of staff reductions confirm this strategic issue.

1.5 Fast-track service based on vans: a core competitive lever

In summary, this section has highlighted the phenomenal rate of growth in the e-commerce market in the UK, and its position as a world leader. Retailers are investing ahead of the curve simply to stay in the game – some with clearly defined business models, others just to catch up. Customers are firmly in control, enabled by ubiquitous Internet searching using mobile technology; they are responding to competitive offers and are demanding the best in terms of both price and service. It is clear that they are also expected to demand increased speed of delivery, with next-day and same-day becoming the norm. The market expectation is, increasingly, that retailers will be able to respond instantly.

Almost every delivery is made by van at present; the only alternative is where the customer collects their order – known as 'click-and-collect'. Vans, the core subject of this report, are taking the strain of the growth.

And the pressure on home delivery services from this trend is huge, since it is the final point of contact with the customer, influencing their future purchase decisions – particularly if it disappoints. It is also a major component of the cost-to-serve (the profitability or otherwise of a customer account) in a market that is challenged for profitability.

In this context, it is important to understand how the burgeoning e-commerce marketplace is causing an increase in van activity, as they rush from place to place under both time and cost pressure. The next chapter looks at the volume of activity in the package and parcel market, and how that market is currently served by vans.

2. The Parcel Market Serving e-Commerce

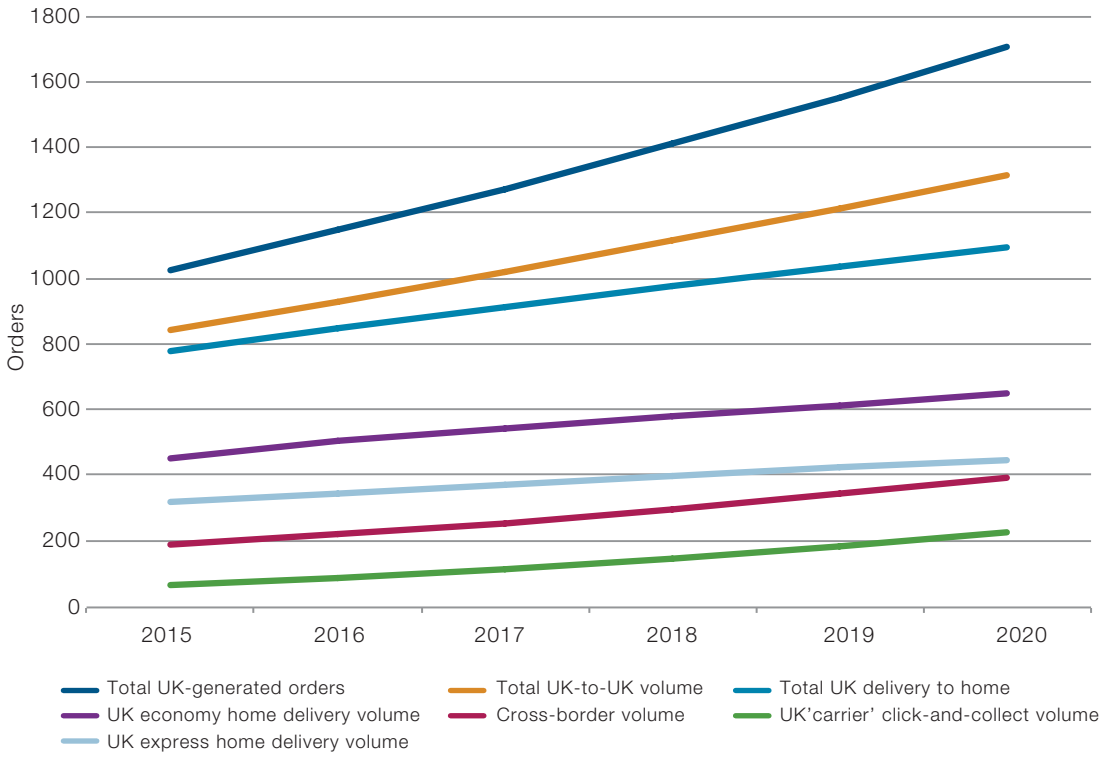
The levels of activity in the Internet home delivery market are astonishing, and this chapter describes its scale and provides forecasts for growth.

2.1 Estimating the scale of the parcel market

While the statistics assembled by different sources vary, figures generated by IMRG using data provided by MetaPack, the leading package routeing, labelling and tracking provider, are a key starting point. This dataset is extrapolated from a large sample of 200 retailers, and is calibrated against online retail sales as tracked by Capgemini. The correlation is reported to be very strong – so the trending is considered as accurate as possible.

Their analysis points to more than 1 billion orders having been generated by UK e-commerce fulfilment in 2015, with the forecast that this will increase to 1.7 billion by 2020. The data is shown in Figure 2.1, which splits the scale of the market by domestic and international, and then further subdivides the domestic market by economy and premium carriers, and click-and-collect. It is important to remember this covers only business-to-consumer (B2C) data stemming from e-commerce. Also the most common condition is that one order equates to one delivery and one parcel; however orders can create more than one parcel for delivery at the same time, or at different times. The mix varies by retailer and national statistics are not available.

Figure 2.1: UK e-commerce market: levels of ordering and delivery activity



Source: Extracted from IMRG Metapack Delivery Index Report October 2016

This IMRG MetaPack volume index and forecast shows the domestic order (UK-to-UK) total of 840 million for 2015. Given that there were 27 million households in 2015 as reported by the Office for National Statistics (ONS, 2016), this number implies that each UK household places on average 31.1 orders per year, or 2.6 per month. Their forecast for UK-to-UK orders for 2020 suggests there will be 1.3 billion orders – nearly one order per week on average for every household.

Key additional points from the forecasts are:

- overall UK-to-UK growth will initially be 12% per year, declining to 10% per year in 2020;
- total UK home delivery growth will be 9.0% per year, declining to 5.6% per year;
- click-and-collect is forecast to grow by 32% in 2016 and over 30% per year till 2020, when its annual growth rate declines to 17.5%; and
- parcel carriers are therefore losing share to an emerging click-and-collect service, which will be described later in this section.

This data and forecast is not the whole picture, however, as parcel carriers carry business-to-business (B2B) parcels too, and also consumer-to-business (returns and repairs) and consumer-to-consumer packages (for example family parcels); these latter two are termed together as 'C2X'. An attempt has been made below to triangulate this data with further sources to ensure as much clarity as possible about all packages handled, whatever the business purpose.

Table 2.1 shows the total UK market for parcels, and the Royal Mail subset, including the B2B segment, amounted to 1.7 billion parcels in 2013, as analysed and reported by Postal and Logistics Consulting Worldwide for the Citizens Advice (Postal and Logistics Consulting Worldwide, 2015).

Table 2.1: Total UK parcels market as at 2013 reported by Postal and Logistics Consultants

Market segment	Split (%)	Volume (m)	Royal Mail market share (%)	Royal Mail volume (m)
B2B	38%	655	40%	261
B2C	56%	965	50%	482
C2X	6%	103	80%	83
Total		**1,723**		**826**

Source: Postal and Logistics Consulting Worldwide (2015: 29)

More recently the total Royal Mail parcel volume was stated in its Report and Accounts for 2015 as in excess of 1.1 billion per year, including nearly 170 million packages for international shipment. By applying an overall annual growth rate of 4% from 2013 to 2015 and adding in the international volume, the 2013 and 2015 numbers for Royal Mail from these two sources are aligned quite closely.

However, the total B2C market shown in Table 2.1 amounted to 965 million parcels in 2013, which suggests that the 2015 figure from IMRG of 840 million (Figure 2.1) is understated by some 370 million packages, based on an estimated 2015 total of 1.2 billion, derived using the market growth rate of 12% a year from IMRG MetaPack. Explanations for the difference are hard to pin down, but will include the following factors:

- eBay, and marketplaces[5] in general, are excluded from the IMRG numbers;
- export and import volumes are not clearly defined, and might not have been included in the IMRG numbers;
- B2B and B2C volumes may have intermingled;
- amazon.co.uk, including the volumes of its independent sellers, is not fully factored in, since it has been moving its volume towards its own Amazon logistics and does not participate in the IMRG data capture; its volumes with Royal Mail are in the numbers in Table 2.1.

These areas could easily account for the discrepancy. But the scale of the e-commerce delivery market is further increased in the following areas:

- Grocery online retailing is currently worth another £8.6 billion and is running at around 86 million orders per year (Allen et al., 2017: 25, Table 3.1). It is forecast to increase to between £15 billion and £18 billion by 2020, which implies 150 million to 180 million orders at an average of £100 per order. Average order values are known to be falling (Ocado, 2017), so the number of orders could realistically be 200 million by 2020.

5 Marketplaces are digital platforms giving many independent traders customer access on a single website; eBay is perhaps the most well known.

- The figures do not include the captive click-and-collect volumes of major retailers such as Argos, John Lewis and Marks and Spencer, which industry sources indicate to comprise between 30% and 50% of such companies' orders.

Using the insights from this analysis and triangulation (cross-checking) of sources, and grossing up from the Postal and Logistics Consulting Worldwide's 2015 report, an attempt has been made to create a consolidated best estimate of the scale of the total parcel market for all channels and segments. This is shown in Table 2.2 and gives a further uplift on the previous numbers.

Table 2.2: Compilation of a best view of the total UK parcels market, 2016

Parcel segment	Million parcels	Source
Business-to-business	**737**	Postal and Logistics Consultant's report 2013 grossed up by 4% p.a.
Business-to-consumer		
General merchandise	1,550	Derived from IMRG Metapack, adjusted by LCP for gaps using carrier volume estimates
Food	86	Derived from IGD data by LCP Consulting
Captive click-and-collect	200	Estimated by LCP Consulting
	1,836	
Consumer-to-X	**109**	Postal and Logistics Consultant's report 2013 grossed up by GDP growth
Total market	**2,682**	
B2C share of all deliveries	**68%**	
B2C total transactions	**1,836**	**Million transactions including click-and-collect**

Source: Analysis by LCP Consulting

Table 2.2 shows that the total market for e-commerce deliveries is now dominated by the B2C segment, with 68% of the entire market. Out of a total market of 2.7 billion packages, e-commerce accounts for around 1.8 billion deliveries and collections for 2016.

2.2 The van resources that service the parcel delivery market

With the scale of the delivery challenge established, its impact on the courier and delivery resources engaged in satisfying customers' expectations for reliable delivery can be examined. Again it is a case of piecing together the picture from a variety of sources.

The Van Excellence Report 2015–16 published by the Freight Transport Association (FTA, 2015) provides an outstanding appreciation of the importance of vans in the economy, and focuses in part on the importance of vans for e-commerce. The principal points from the report that are germane to this study are:

- There are 13,000 postal and courier firms in the UK, with the largest being Royal Mail.
- The post and parcel sector has an estimated fleet of 312,000 vehicles, of which 255,000 are company-owned, 42,000 are registered to individuals, and 15,000 are involved in grocery home delivery.

- The Van-Dependency Index (the number of vans per £1 million of economic gross value added) for the postal and courier segment is the highest of any sector using vans at 28.73; the next highest figure is that for specialised construction trades, where the index is considerably less, at 15.9.
- It states that postal and courier vans between them constituted around 8% of the van parc of 3.7 million vehicles in the UK at the end of Q2 2015.

On the role of vans in e-commerce, the FTA report states (FTA, 2015: 16) that:

> "The e-commerce revolution, which has seen changing UK purchasing patterns, could not be sustained without the LCV parc."

The Van Excellence Report provides a useful anchor reference of the relative importance of vans for e-commerce in terms of the total van parc, and hence the generation of traffic – the main purpose of this report. It suggests that vans for parcel, post and grocery delivery total just 8% of the total vans on the road – in other words they form an important, but not a dominant, segment of van usage.

An attempt was made to validate the 8% proportion stated in the report on a bottom-up basis, by both extrapolating the need for vans using average daily delivery activity and looking at the major operators' fleet sizes – and the characteristics of the vans they use.

The total parcel market, at 2.7 billion packages (see Table 2.2) including B2B and C2X packages, would require just 110,000 vehicles if every van ran for six days per week excluding bank holidays, and delivered 80 packages per day on average. Against this average, on the upside, industry experts working with delivery companies Yodel and Interlink/DPD have confirmed that a parcel delivery target is typically 120 to 150 per van day; a recent BBC programme on Amazon confirmed 150 per day as being required of drivers. At the lower end, where there is a different business model, Hermes couriers and Royal Mail postmen can be making as few as 20 to 80 parcel deliveries per day. An average of 80 appears to be a good starting point, and this top-down analysis suggests that the FTA estimate of the active fleet is too high.

Industry sources were used to compile a bottom up picture of van fleets, which generated the numbers shown in Table 2.3.

Table 2.3: The major operators of van fleets in business-to-business (B2B) and business-to-consumer (B2C) package delivery

Segment	Operator	Vans	Vehicle type
Economy–mostly B2C			
	Royal Mail incl. Parcelforce	49,000	Small and medium vans
	Hermes couriers	9,500	Lifestyle couriers-cars, car-derived and small vans
	Amazon couriers	3,800	Subcontractors out of 12 depots
	Yodel	6,000	Mostly medium and large vans
		68,300	
B2B and B2C Premium			
	Interlink	2,500	Mostly 3.5-tonne vans
	DPD	3,500	Mostly 3.5-tonne vans
	DHL International	1,500	Mostly 3.5-tonne vans
	UK Mail	2,400	Medium and large vans
	APC	5,000	Mostly 3.5-tonne vans
	Tufnells	800	Mostly 7.5-tonnes GVW
	DX	2,800	Medium and large vans
	UPS	2,200	Medium and large vans
	Fedex	2,700	Medium and large vans
	TNT	3,500	Mix of 3.5-tonne and 7.5 tonne
	Remaining operators	20,000	Applying the 80:20 rule
		46,900	
Grocery Home Delivery			
	Tesco	4,000	3.5-tonne GVW vans
	Asda	2,500	3.5-tonne GVW vans
	Sainsbury	1,800	3.5-tonne GVW vans
	Iceland	1,700	3.5-tonne GVW vans
	Ocado	1,400	3.5-tonne GVW vans
	Waitrose	700	3.5-tonne GVW vans
	Morrisons	500	3.5-tonne GVW vans
	Abel and Cole	200	3.5-tonne GVW vans
		12,800	
Total		**128,000**	

Source: LCP Consulting; Triangle Research (2016); Internet research and industry inquiry

This compilation of the major van fleets may not be perfect, but is close to the 110,000 number derived earlier on the basis of delivery activity. Neither analysis approaches the 312,000 vans in the Van Excellence Report. However, for grocery home delivery the number of vans reported as in use, at 12,800, is close to the 15,000 in the Van Excellence Report.

Vans are used to deliver food to restaurants, plumbing supplies to building sites, printed matter to newsagents, and for so many other non-Internet activities. Some of these will fall into the general courier category, delivering anything from parts to printed material and providing regional express delivery services. This wider courier fleet is inside the larger FTA number of 312,000 vehicles; however, industry experience is that few of these vans deliver the volumes defined in Table 2.2, except perhaps at peak demand.

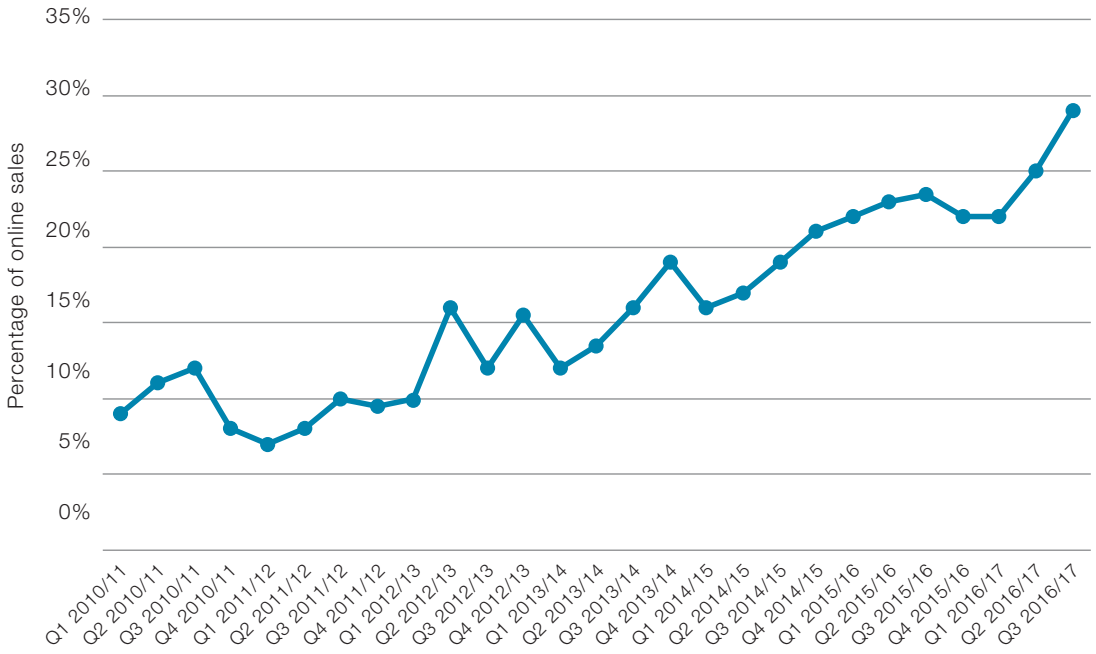
These two pieces of analysis point to the share of the van parc used to service the parcel market and grocery e-commerce market as being less than 4% – rather than the 8% headlined earlier in this chapter. Since e-commerce represents only 68% of all parcel traffic, the attribution of the parc specifically to e-commerce could be as low as 2.5%.

2.3 The impact of the growth in click-and-collect on delivery volumes

To develop a picture of the growth in van activity for parcel delivery between 2016 and 2020, it is necessary to first derive a forecast of how the continued increase in click-and-collect might erode the potential need for courier and parcel traffic. Earlier in this section, click-and-collect was shown to be limiting parcel delivery growth to between one half and two thirds of the growth in the e-commerce market. This is a critical projection, and the underlying trend needs to be described further, since it will influence the future growth in van use for e-commerce.

The IMRG/Capgemini Quarterly Benchmarking Index reported in 2016 on the trend for e-retail shopping using click-and-collect. This is shown in Figure 2.2; the main point is that the use of click-and-collect has increased from 10% of the market for online orders to 29% in the space of four years (IMRG, 2016b).

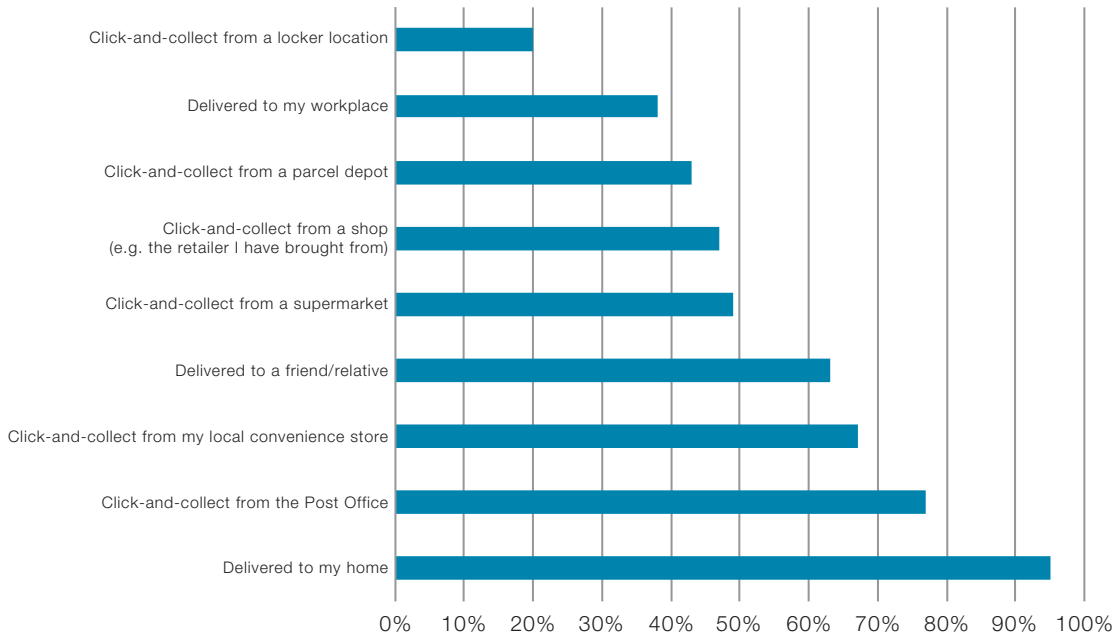
Figure 2.2: Click-and-collect sales as a percentage of sales completed online



Source: IMRG (2016b)

Customers can have many different preferred delivery methods, including click-and-collect, as is shown in Figure 2.3.

Figure 2.3: Customer preferences for fulfilment methods

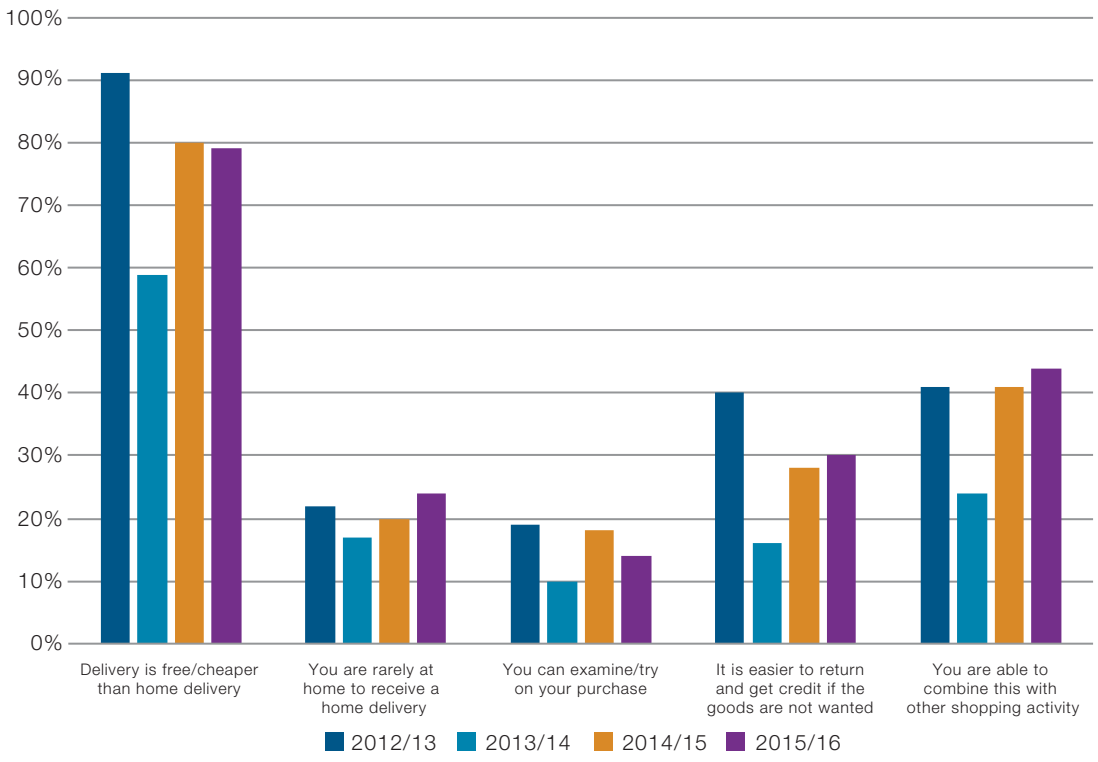


Source: IMRG (2016a)

The data in the figure comes from a 2016 report from CollectPlus on the cost of waiting for a delivery. The percentage preferences in this chart sum to more than 100%, which is explained by customers accepting goods down different channels depending on their specific circumstances at the moment of purchase – although home delivery is clearly their first choice. The use of click-and-collect is enabled by their use of mobile technology, and is driven by convenience when they are on the go (IMRG, 2016a).

Figure 2.4 provides a view on what motivates customers' decisions to collect from a shop, and shows that price remains the major factor; all the experience of the author is that delivery or collection method is extremely sensitive to the cost charged for the event. One retailer that changed their terms to favour collection over delivery saw a 60% shift in preference within the space of three weeks. Customers make quite careful and rather quick choices between cost and convenience.

Figure 2.4: Motivations to use click-and-collect



Source: IMRG (2016a)

The implication of this analysis is that if retailers start seeking to optimise their profitability rather than continue trying to grab e-commerce market share, the forecast of parcel growth as against click-and-collect is likely to move further in favour of click-and-collect. Since the typical cost to retailers of a delivery is in the range £3 to £5, while that for a click-and-collect is between £1 and £1.50, retailers who have been funding the home delivery as a marketing cost stand to gain savings of millions of pounds.[6]

2.4 Developing a forecast of parcel volumes for 2020

Using the information compiled in this section, an estimate of the parcel market and the likely capacity required to service its projected growth has been developed, starting from the estimate of the total parcel market given in Table 2.2. It has been derived from projections of growth in e-commerce package delivery declining from 9% in 2016 to 5% in 2020 – allowing for its partial substitution by click-and-collect. The market for B2B has been assumed to grow in line with the economy as a whole. The high-level delivery metrics for the sector have been carried over. The headline forecast is:

- The market for online e-commerce parcels is expected to grow by 600 million parcels between 2015 and 2020 covering both delivered and click and collect.
- The overall market for B2C, B2B, grocery and C2X is expected to grow by between 800 and 900 million parcels and deliveries by 2020.
- The total activity in the market to be serviced by vans or click and collect in 2020 is therefore estimated at around 3.5 billion deliveries and collections, of which around 3.1 billion will be deliveries.
- The core fleet of vehicles for servicing all parcel deliveries represents less than 4% of the van parc (around 130,000 vans), and the proportion attributable to e-commerce is around 2.5%.
- Using the metrics established earlier in this chapter, the van fleet will increase by not more than a further 35,000 vehicles (net addition to the parc) by 2020.
- This is a 1% increase over five years on a van parc that is currently estimated at 3.7 million.

On the basis of this evidence, the case against vans for e-commerce deliveries as a traffic 'bête noire' does not appear to be strong. But the role of vans in relation to traffic congestion and air quality still needs to be examined, as this may show that this small percentage of the parc is contributing disproportionately to the acknowledged problems. The next chapter looks at traffic patterns, vans and congestion.

6 Figures based on the author's industry experience.

3. Vans and Traffic Generation

3.1 Van traffic growth in the total traffic mix

The Department for Transport (DfT) produces regular road traffic forecasts derived from its National Transport Model. The last report was produced in 2015, it concluded that national traffic is forecast to increase under all scenarios for economic growth and travel behaviour (DfT, 2015a: 6, para 13). Key findings are that:

- All scenarios have overall traffic growing by a range of 19% to 55% between 2010 and 2040 (DfT, 2015a: 39).
- In scenario 3 (a central forecast where trip rates trends are extrapolated) , cars are predicted to grow by 9%, vans by 79%, and HGVs by 22% (DfT, 2015a; 42:43).
- Vans made up 14% of traffic in 2010,in scenario 3 this proportion is forecast to be as high as 21% by 2040 in England (see Table 3.1).

The 2015 DfT report provides a data table that has been extracted and analysed, data for scenario 3 is shown in Table 3.1 as this forecast is based in extrapolated trends in trip rates. It is the relative expectations of the van segment in the traffic mix that is of the greatest interest.

Table 3.1: DfT forecast of van traffic in the overall traffic mix for 2035 and 2040 by area type, England, 2015

		London	Large urban areas	Other urban areas	Rural areas	All areas
Billion vehicle miles						
Vans	**2010**	**2.7**	**8.6**	**6.3**	**17.4**	**35.1**
	2035	**4.5**	**14.3**	**10.5**	**28.9**	**58.2**
	2040	**4.8**	**15.4**	**11.3**	**31.2**	**62.7**
All traffic	2010	18.4	62.4	48.6	124.5	254.0
	2035	20.6	69.0	52.1	156.1	297.8
	2040	20.8	69.6	52.0	160.5	303.0
Mileage % share of road type by mode						
Vans	**2010**	**8%**	**25%**	**18%**	**50%**	**100%**
	2035	**8%**	**25%**	**18%**	**50%**	**100%**
	2040	**8%**	**25%**	**18%**	**50%**	**100%**
All traffic	2010	7%	25%	19%	49%	100%
	2035	7%	23%	17%	52%	100%
	2040	7%	23%	17%	53%	100%
Mileage % share of mode by road type						
Vans	**2010**	**15%**	**14%**	**13%**	**14%**	**14%**
	2035	**22%**	**21%**	**20%**	**19%**	**20%**
	2040	**23%**	**22%**	**22%**	**19%**	**21%**

Source: DfT (2015b) with additional analysis

The analysis reveals some important insights:

- In 2010, vans/LCVs contributed 14% of all traffic from around 10% of the parc while HGVs contributed 5% of the miles from 1.2% of the parc.
- Average miles per van is currently estimated at 12,900 per year as compared to 8,000 for cars and 34,000 for HGVs (DfT, 2016e; DfT, 2016f).
- Van mileage growth to 2040 is forecast to be 79%; by comparison, the figure for cars is 9% and for HGVs 22%.
- At the end of the forecast period to 2040, vans are forecast to be creating 21% of all traffic miles and 23% in London.
- 53% of all van traffic will be on 'other roads', which means roads other than in urban situations: rural, motorway, trunk and principal. This share is exceeded only by HGVs, of which 65% travel on these roads.
- In cities, vans make up proportionately more of the traffic mix than the national average, in contrast to HGVs. Vans in London contribute 15% of all traffic, rising to 23% of all traffic by 2040, in comparison to HGVs at 3%.
- Vans are clearly a key component of both commerce and traffic creation – the prospect of vans contributing up to 22% of city traffic by 2040 is an understandable concern for city traffic managers.

3.2 The composition of the van parc

It is important, then, to understand and better explain the make-up and trends within the UK's van fleet. Analysis of the van parc based on data published by the Driver and Vehicle Licensing Agency (DVLA) (DfT, 2016g) has been carried out, applying size segments of the van parc. The classification of vans for the purpose of this analysis has been as follows, and is illustrated in Figure 3.1:

- Small vans, typically up to 2 tonnes gross vehicle weight (GVW) – this includes car-derived vans and small specialist vans. The market leaders in this segment include the Ford Transit Courier and the Volkswagen Caddy. Car-derived vans include the Fiesta van and the Corsa van.
- Medium vans, typically up to around 2.7 tonnes GVW – this is the segment that is most favoured by the service industries, and the leaders include the smaller Transit variants, the VW Transporter and the Mercedes Vito.
- Large vans, up to the tachograph threshold of 3.5 tonnes GVW – it is vehicles from this segment that are often (but not exclusively) deployed for parcel deliveries. The market leaders are the Mercedes Sprinter and larger Ford Transits.
- Pickup trucks – this is a segment that is both commercial and lifestyle-oriented, with leading brands including Mitsubishi, Ford and Toyota. These vehicles play no significant role in parcel activity.

Figure 3.1: Illustration of the type of van by size

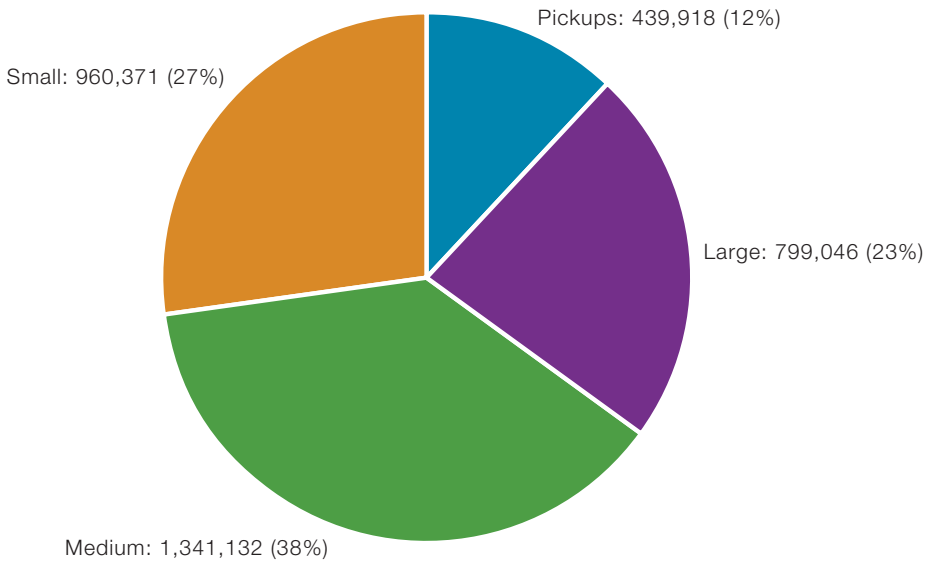
Small Medium Large Pickup

Source: Internet pictures compiled by author

The DVLA data holds approximately 45,000 lines of van models covering the registration and parc history by model. The total parc from this analysis for 2015 is 3.54 million vehicles, which is consistent with the 3.6 million that is often quoted as a headline number for the year. This data has been classified manually into the small, medium, large and pickup segments, and the size and growth of each segment has been analysed.

Figure 3.2 shows the distribution of the van parc by classification of van. The medium segment is the largest grouping at 1.34 million vans – 38% of the van parc. Pickups account for just 440,000 vehicles (12%).

Figure 3.2: The distribution of the van parc by vehicle type, 2015



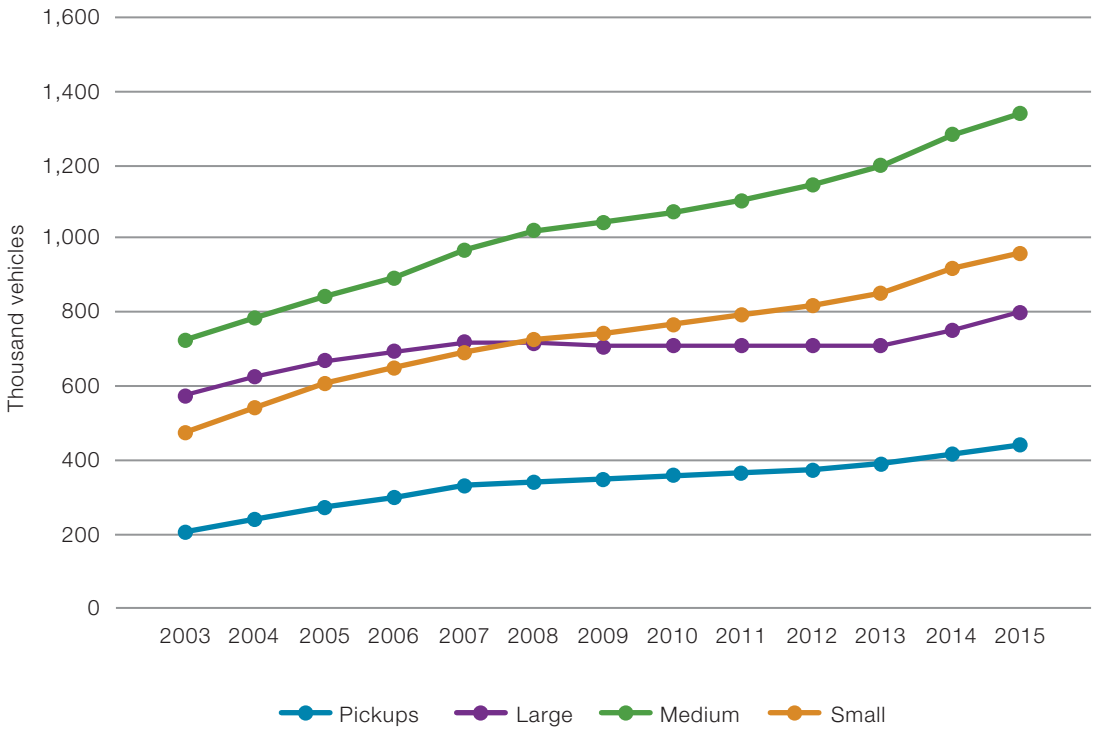
Source: LCP Consulting analysis of DVLA data

3.3 How the van parc is growing

Figure 3.3 shows the growth in the van parc by segment over the period 2003 to 2015. This chart shows that the medium segment is not only the biggest but has also been fast-growing in terms of the average growth rate of annual registrations. Small vans have overtaken large vans during the period under review. Analysis of these numbers shows:

- Average annual growth rates were 2.8% for large vans, 5.3% for medium vans and 6.1% for small vans.
- These rates are faster than that of economy as a whole, which has not been growing above 4% a year, and has typically done so at a rate of around 2% per year, except during the recession of 2008/9.

Figure 3.3: Trend in van parc growth by segment, 2003–15

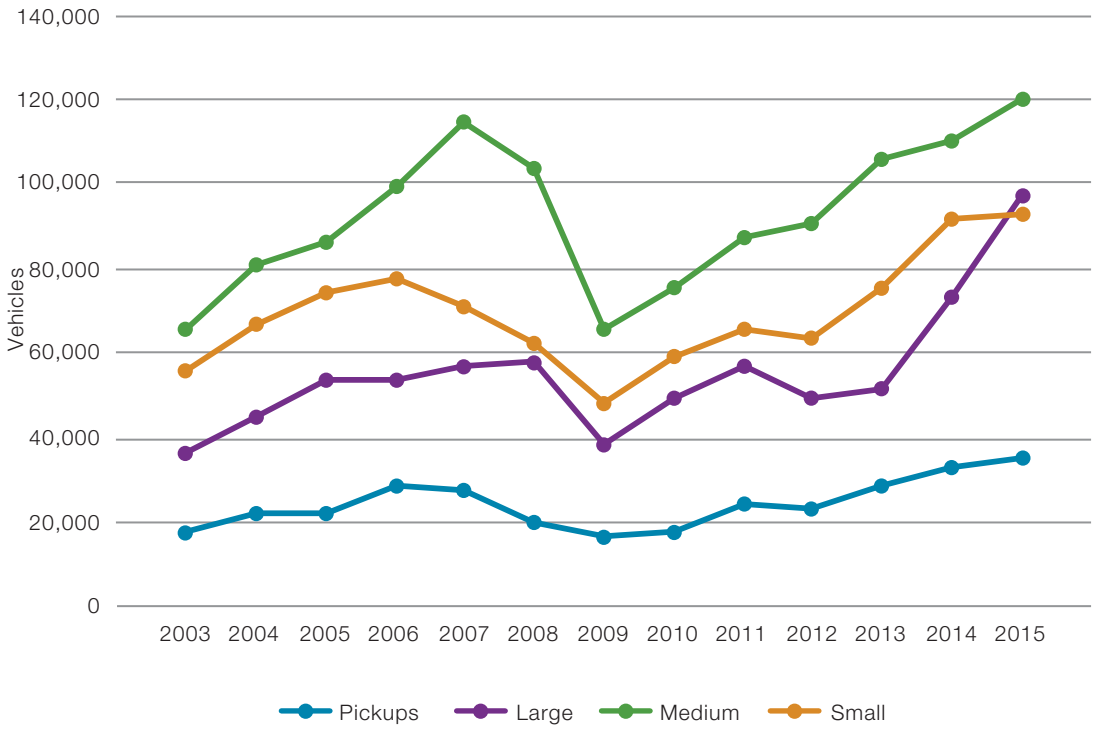


Source: LCP Consulting analysis of DVLA data

The parc at the end of a year is the number of existing vehicles at the start of the year, plus registrations that year, minus retirements (through scrapping).

This picture masks the recent trend in registrations. Figure 3.4 shows that registrations in the last three years for the 'large' segment have surged to within 20,000 units of the 'medium' segment. Year-on-year growth in registrations in the 'large' segment were 42% and 33% in 2014 and 2015 respectively. However, the impact of retirements in this segment reduced the parc increase in 2015 to 50,000 vehicles.

Figure 3.4: Trend in new van registrations by segment, 2003–15



Source: LCP Consulting analysis of DVLA data

As Table 2.3 showed, the dominant van type in parcels and e-commerce is the large van, so this recent surge in large van registrations could be attributed to the e-commerce phenomenon. However, the scale of the growth in the parc is much greater than the prediction of the need for an additional net 35,000 vehicles in e-commerce deliveries by 2020.

It is reasonable to expect that the newer vans are running very much greater mileage than the average for the LCV sector of *c.*10,000 miles a year. Experience of the author supports the view that typical mileages are:

- parcel operators – 20,000 miles to 30,000 miles per year; and
- grocery home delivery – 25,000 miles to 50,000 miles per year.

The high-level implication of this observation is an expected increase in the share of on-the-road activity of e-commerce and parcel vans in the van parc. Using a factor of 2.5 times average mileage (12,500 miles × 2.5 = 31,250 miles) takes the on-the-road traffic experience of the package and grocery delivery segment up to around 10% of all van traffic. In simple terms, this suggests that one van in ten experienced by the public in the streetscape is associated with all parcel and grocery delivery.

This is an important share but not the leading share; once again, the conclusion is that something else is happening in van usage that is more than e-commerce. The growth in vans is indeed a burgeoning problem for traffic, but e-commerce and package delivery growth is merely one factor, rather than the key factor, behind increases in registrations and

the size of the van parc. Other important sectors are food distribution, construction and business services; the mix of these activities and their use of vans constitutes a research gap.

A similar analysis has been carried out on the HGV parc to understand whether there is an obvious substitution effect by vans for the lower weight band of HGVs – the 7.5-tonne GVW segment. That analysis shows annual registrations of such HGVs declining by 2,500 units between 2013 and 2014 at the same time that the registrations of 3.5-tonne vans increased by around 25,000. Since one would expect no more than a 1:3 substitution, and bearing in mind that the historic decline in the 7.5-tonne segment of HGVs has been around 1% per year, it is safe to conclude that any shift from lorries to vans is heavily masked by other factors affecting van use.

3.4 The place of vans and e-commerce in traffic growth

In summary, vans are the most significant component of traffic growth – forecast to rise to 20% to 21% of all traffic miles by 2040. In urban areas they contribute a higher share of traffic in proportion to HGVs than is the case on roads generally. The UK van fleet has been growing at between 3% and 6% per year (depending on van size), and this has been, and will continue to be, well above the overall rate of growth in the economy. Looking at average miles run per van, and the reported miles of parcel operators, the sub-4% share of the parc attributable to all parcels increases to around 10% when measured by vehicle-miles travelled; e-commerce parcels is a subset of this accounting for around two thirds of it. This means that the delivery of parcels for business and consumers is an important part of the UK van fleet mix, but not a dominant one.

The next chapter looks at travel patterns and congestion to provide a general appreciation of how people are organising their lives, and how that affects road usage, and in particular van activity. The role of vans in the resulting congestion and their impact on air quality will be reviewed.

4. Traffic Congestion, Air Quality and e-Commerce

This chapter reviews the impact of e-commerce on travel, traffic and air quality in the context of the sustained commentary that parcel delivery growth is a major cause of transport problems.

4.1 e-Commerce impacts on personal travel

The substitution of van deliveries for personal travel for shopping was a topic of concern and academic research in 2004 and 2005, when suggestions were first raised that the country would be overrun by vans delivering our groceries. Cairns conducted modelling and assembled a comprehensive picture of similar research to explore the impact of the adoption of Internet ordering on travel for grocery shopping. The timing of this research meant that grocery e-commerce's market share was still lower than 1%, by comparison with its levels in 2016 of around 6.5%. Back in 2004, there was little or no precedent of established practice in the industry (Cairns, 2005).

The key conclusions from Cairns' own modelling and analysis and which also cited the studies from both Palmer (2001) and Punakivi et al. (2001) all

converged on forecasts of reductions in customers' weekly shopping trips ranging from 70% to 90%. The work suggested that, within the limitations of the modelling and applying plausible assumptions at the time, including take up of the service, the growth in home delivery e-commerce for grocery should be cautiously welcomed by policymakers.

The actual outcome based on the National Travel Survey (NTS) is rather less than Cairns' forecast – around an 18% reduction in miles for all shopping trips, which is estimated to translate into a reduction of 30% for grocery shopping in isolation. Key reasons for this change appear to be:

- The forecasts for grocery e-commerce market share were over-optimistic at up to 10% by 2005 – it was 6.5% in 2016.
- The growth in convenience shops and hard-discount operators such as Aldi and Lidl has been a more significant trend in the time period, holding back the trend towards online grocery shopping.
- Assumptions about delivery capacity, timing of deliveries and scheduling potential did not reflect practice as it now has been established.

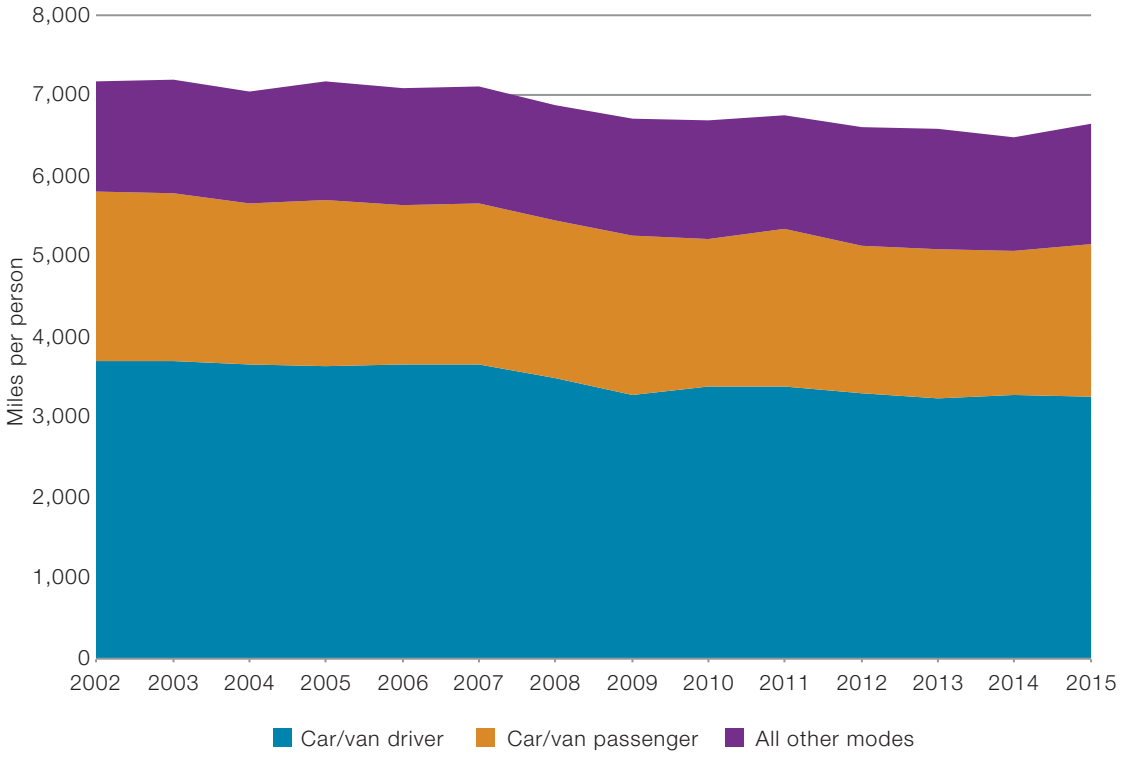
Notwithstanding this qualification, a degree of positive impact of e-commerce on overall passenger traffic was an important signpost.

The NTS was cited in Cairns' work, but without the effects of the nascent trend of e-commerce having been observable in the statistics. This data is now available and the NTS for England (DfT, 2016d) provides some fascinating insights into the changing patterns of personal travel and shopping trips. It is a survey that is conducted annually and tracks long-term trends in levels of, and reasons for, personal travel. Some key points from its pages (all being statistics for England rather than the whole UK) are:

- In the 43 years from 1972 to 2015, personal travel has increased in miles by 49% but actual trip numbers have declined by 4% to 914 per year – 2.5 per day including walking (DfT, 2016d: 6).
- In the same time frame, average speed has increased from 12.7 mph to 18.0 mph, and trip length from 4.7 miles to 7.3 miles (DfT, 2016h).
- In the more recent horizon from 2002 to 2015, trip numbers, distance and time travelled have all declined – by about 13%, 7% and 4% respectively (DfT, 2016h).
- The average annual mileage of a car was 7,900 in 2015 (DfT, 2016i), and trips made by car constituted 64% of all trips (DfT, 2016e). Mileage by all modes has shown a decline over the more recent period, as illustrated in Figure 4.1.
- 19% of trips (DfT, 2016k) and 11% of distance (DfT, 2016l) travelled by all modes are for the purpose of shopping, and this has declined in number and distance by 18% and 17% respectively since 2002.
- Compared to 2002, people are making 39 trips fewer per year to shop (DfT, 2016k), travelling 154 miles less (DfT, 2016l), and their individual trip length has increased by 1% (DfT, 2016m).
- In 2015, on average people made 177 shopping trips per year (more than three per week) (DfT, 2016k) and the average trip length was 4.2 miles (DfT, 2016m).
- 66% of shopping trips were made by car or van in 2015 (DfT, 2016b), and

this accounted for 12% of miles travelled by these modes (as either driver or passenger) (DfT, 2016c).

Figure 4.1: Trends in travel distance by mode, England, 2002–15



Source: DfT (2016n)

4.2 Travel for shopping and journey substitution

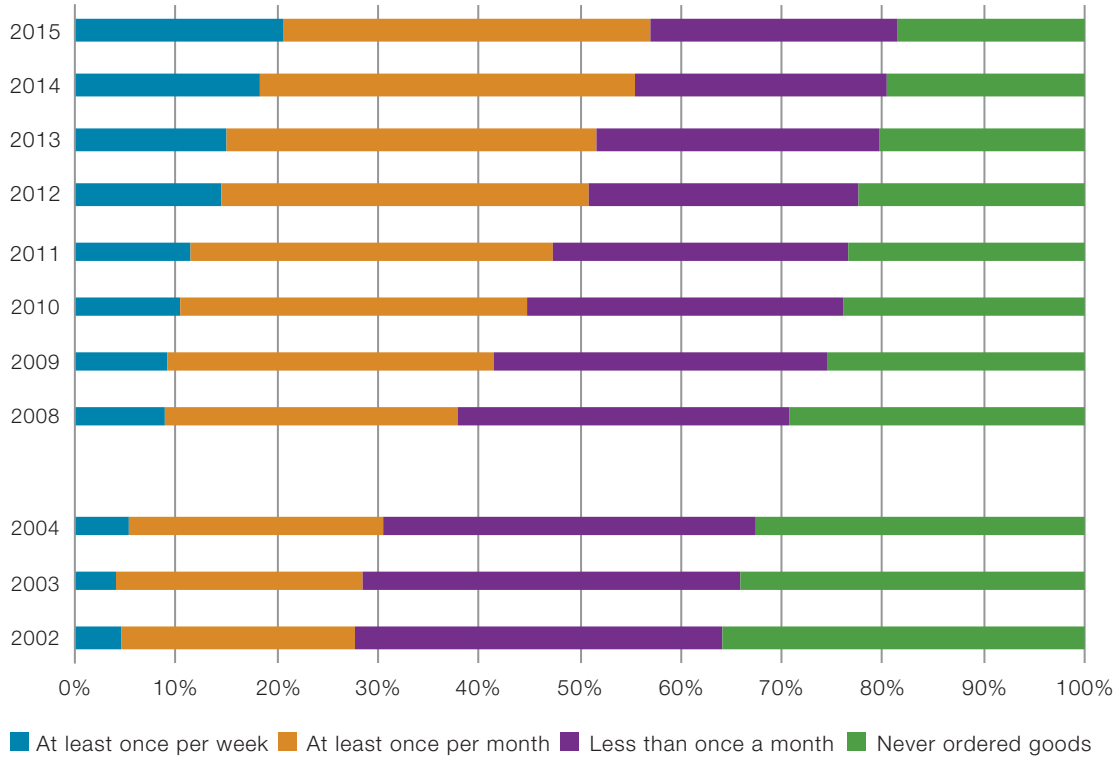
Consistent with Cairns' predictions, the NTS observes that "a potential explanatory factor for the fall in shopping trips is the spread of online shopping and the increase in delivery of goods at home" (DfT 2016d: 30). It offers some useful insights into the frequency with which households have goods and services delivered, as shown in Figure 4.2. In 2015, 80% of English households ordered goods for home delivery during the year, with just over 20% ordering at least once per week (DfT 2016d: 30).

The report goes on to observe that (DfT 2016d: 30):

> "The effect on shopping trips, however, is not straightforward, as there are two competing explanations: while, in some cases, online purchases may replace a shopping trip, in other cases it may result in a new trip, for example to collect the item."

This is the click-and-collect trend discussed earlier. Analysis by age in the report shows that younger people (17 to 39) make fewer shopping trips than older people; the over-60s make nearly twice as many trips and are much less likely to buy online.

Figure 4.2: Frequency of household delivery of goods, England, 2002–4 and 2008–15

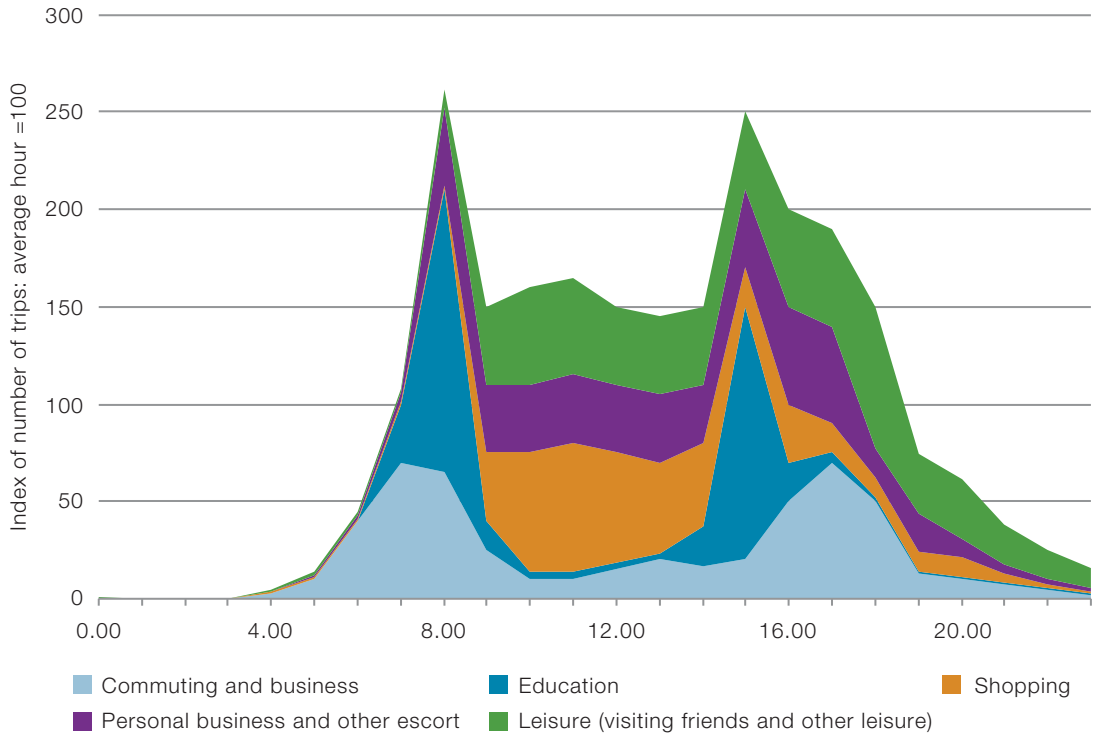


Source: DfT (2016o)

4.3 Travel timing and its impact on congestion

The NTS also explores the combination of time and purpose of personal travel. Figure 4.3 shows the pattern during the day, for weekdays. It also found that 20% of all shopping trips are made on a Saturday, which is generally much less of a pinch point for traffic congestion.

Figure 4.3: Personal trips by start time and purpose, weekdays, England, 2011/15



Source: DfT (2016p)

It is immediately obvious that weekday shopping trips for the most part avoid starting in the peak travel periods that are attributable to commuting, education and business.

While the use of online retail will replace some passenger journeys, the injection of the parcel vans into the peak period will add to peaks while the associated purchase will reduce passenger traffic at off-peak periods. Parcel operators have little choice but to launch their vehicles into the peak traffic in an effort to maximise their delivery vehicle utilisation, even though they recognise that efficiency at peak times is compromised. Increasingly operators are adjusting schedules to run later into the evening; this is proving convenient for customers and increases travel speeds.

Figure 4.3 points to congestion peaks based on personal travel by car. But that accounts for only 80% of the traffic, as was recorded in the national traffic forecasts from DfT (2015a: 41, para 3.25). Buses, vans and HGVs must be added to complete the picture.

A report by Professor David Begg for the Greener Journeys campaign presents the congestion picture and its implications from the point of view of the bus industry (Begg, 2016). The thrust of the argument is that the bus sector is "caught in the vortex of three vicious downward spirals" (Begg, 2016: 7): slower speeds, reduced reliability, reduced passenger numbers and hence higher costs and fares, reducing passengers further. Bus journey times have increased by almost 50% in the more congested urban areas over the last 50 years.

The Cabinet Office Report on Urban Transport from 2009 calculated the cost of congestion to the urban economy to be at least £10.9 billion annually, while the costs to society of poor air quality, physical inactivity and road accidents are each similar to congestion, together are estimated to cost as much as £29.1 billion in urban areas (Cabinet Office, 2009: 22). The Commission for Integrated Transport (2001) reported that the UK has the most congested road network in Europe, and data from TomTom and INRIX (a global leader of connected car services and transportation analytics) shows that congestion in the UK's biggest cities is 14% worse than it was just five years ago. Average journeys in the UK took 29% longer than they would in free-flowing conditions, up from a 25% delay in 2015. The worst cities are listed as London, Manchester, Edinburgh, Brighton, Hull and Bristol.

Professor Begg makes the point powerfully that traffic volumes are regulated by congestion, and that this is a brake on the economy. The report is unarguable in its observations on the overall impact of congestion on road speeds and bus passenger travel. The key causes of congestion in urban areas are given as delivery vans, private hire vehicles, roadworks and traffic lights. The report asserts on page 28 that (Begg, 2016: 28):

> "The rapid growth in delivery vans is a result of the proliferation of online shopping. This represents a double blow to the bus sector: first, it increases operating costs due to more congested roads, and second, there is less revenue for buses as fewer shopping trips are made."

However, this assessment is contradicted by the earlier analysis on the contribution of all parcel delivery activity as amounting to not more than 10% of all vans on the road, and that this represents 1.5% of all traffic in London, based on DfT's traffic data in Table 3.1. Neither does it align with the suggestion from Cairns' work and NTS that e-commerce is potentially traffic-reducing.

So while Professor Begg is right in his concern for the sustainability of bus travel as a result of congestion, placing the problem at the door of e-commerce is not supported by the analysis in this report.

Nonetheless, congestion is a very real problem, and one which has an impact not on buses only, but also on passenger and freight movements. Examination of 2015 INRIX data (INRIX, 2016), made publicly available through their website for 72 corridors in London covering 478 miles and including some trunk roads and motorways, shows that:

- average free-flow speed = 31 mph;
- peak period average speed = 18 mph; and
- worst journey average speed = 13 mph.

It is also clear from the data that the worst peak times and the worst journey times of the day vary according to the corridor. This means that congestion is context- and demand-sensitive. The experience is that changes in traffic volume or road capacity (due to road works, accidents, breakdowns or traffic lights) affect road speeds disproportionately.

4.4 Implications of commercial vehicles (vans and lorries) on congestion and air quality

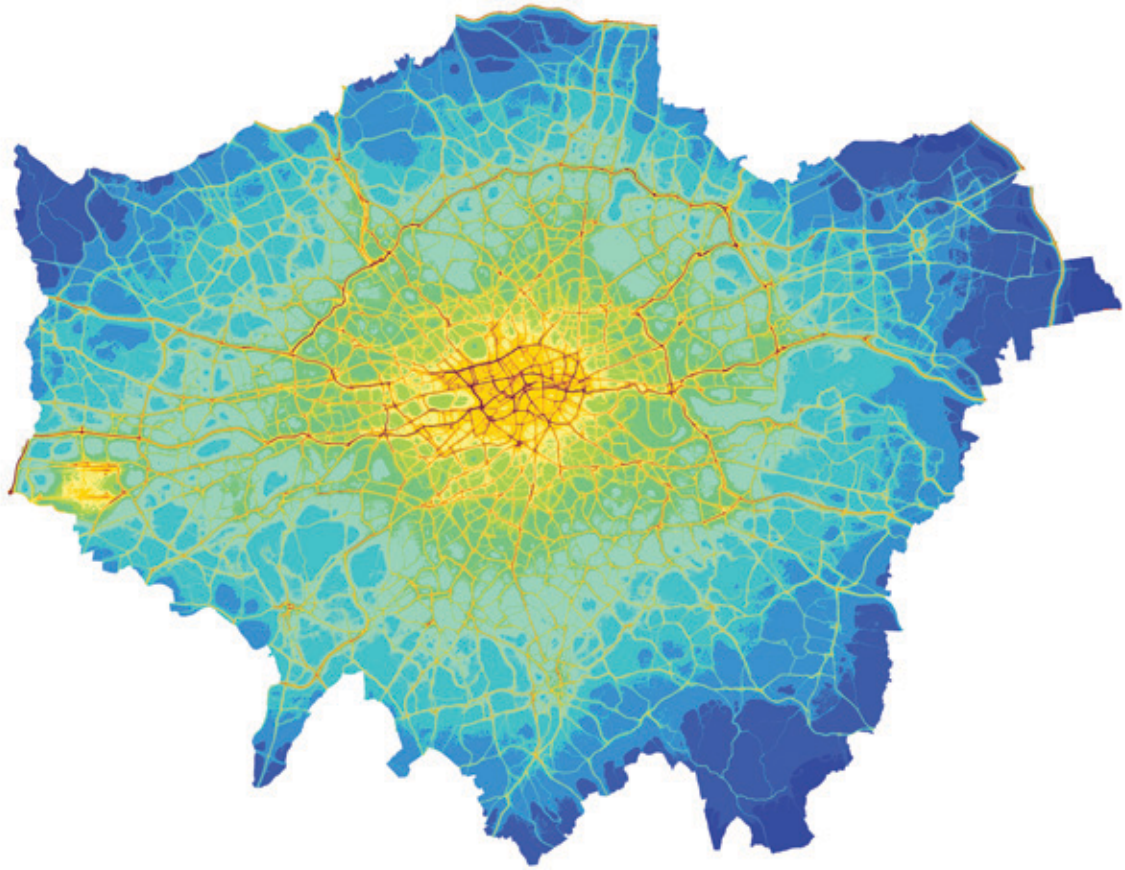
Modelling carried out for a Master's Thesis at Cranfield University (Liu, 2014) analysed the impact of congestion on a delivery fleet of 30 vehicles operating in London, in an attempt to test the effect of a reduction in road speeds on the requirement for fleet capacity to undertake B2B customer deliveries. The vehicles were vans with a payload potential of 900 kg operating from a single depot for London. Customers' delivery requirements were quite exacting in terms of the time of day specified for delivery. Simulation showed that the fleet cost and capacity under expected conditions of congestion was roughly double that needed if the vans operated in free-flow conditions. This is a powerful insight into the cost of congestion; for this one company, the cost impact modelled was around £2 million a year.

There are 217,000 registered vans in London, and TfL in their Travel in London Report 8 point to just under 200,000 vans crossing the inner London cordon daily, and nearly 350,000 crossing the boundary cordon daily (TfL, 2015: 66, Figure 3.14). Some vans will cross more than one cordon in a day; others will cross none, and are hence not counted in the TfL statistics. However, if the efficiency of 50,000 of those vehicles were affected to the extent modelled in Liu's thesis, the pro-rata cost to industry would be in excess of £3 billion. While this number cannot be validated from available data, it suggests that the direct costs of congestion for freight alone dwarfs the time estimates on which congestion costs are normally estimated, as these fail to take into account the cost of the extra resource.

TfL (2011) is heavily engaged in the implications of freight traffic in London, in terms of both congestion and air quality. Mayor Khan has made the issue a priority, on the basis of expectations that 9,400 people will die prematurely each year in the Greater London area as a result of poor air quality (Walton et al., 2015). This is largely due to NO_x emissions, to which freight (HGVs and LCVs) contributes 33%, and PM_{10}[7] and $PM_{2.5}$[8] emissions, to which freight contributes 27%. Those emissions are coming from 18% of the vehicle-miles travelled. The air quality map of London issued by TfL is shown in Figure 4.4; red indicates dangerously bad air quality, and only the blue areas are within acceptable limits.

7 PM_{10}: particulate matter of median diameter 10 microns or less – coarse particulate matter.
8 $PM_{2.5}$: particulate matter of median diameter 2.5 microns or less – fine particulate matter.

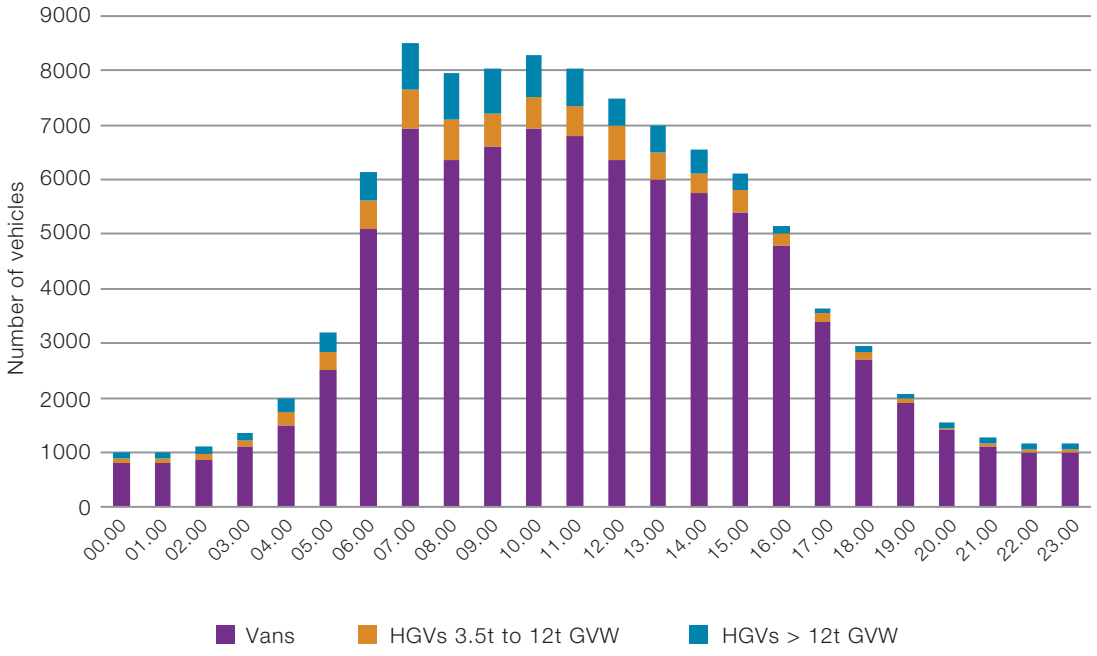
Figure 4.4: Air quality map of Greater London



Source: TfL (2016a: 18)

TfL has identified freight and logistics as a major cause of emissions; unsurprisingly, the hotspots on the map are the major congested traffic arteries through which freight enters and leaves the city. Mayor Khan and his freight team have the twin challenge of keeping the city fed and supplied, and ensuring that it is liveable and operable. Figure 4.5 shows the timing of freight flows within London's Congestion charging zone, as reported by TfL. Unlike personal travel, where two peaks are evident, the morning peak coincides with the personal commute and then the traffic continues, tailing off through the afternoon.

Figure 4.5: Profile of freight vehicle movements in London's Congestion charging zone by time of day



Source: TfL (2016d)

4.5 Strategies for mitigating the environmental and congestion impacts of freight

As well as bringing forward the implementation of the Ultra Low Emission Zone, TfL is currently working across the entire freight mix for Greater London to mitigate current causes of poor air quality and congestion through complementary measures (Ward, 2016):

- **Avoid** – minimise road trips to meet economic need by maximising vehicle fill and route density, so as to take vehicles off the road, using consolidation and smarter procurement, and click-and-collect.
- **Retime** – better match demand to capacity by retiming journeys to avoid peaks.
- **Mitigate** – reduce the environmental impact of each trip by using the right equipment, correctly maintained and driven, and offloaded quickly.

There are early signs that other cities are following the lead of London and starting to think about similar measures. There is a clear recognition that freight, as a whole, is a challenge.

This chapter would not be complete without some commentary on the impact of diesel engines on air quality. In 2015 the UK Government lost a case brought by ClientEarth in the Supreme Court for failing to take sufficient measures to bring air quality within legal limits as soon as possible. The government was required to bring forward new proposals to remedy the situation by January 2016, which consisted mainly of proposals for Clean Air Zones. Setting to one side the efficacy or otherwise of these proposals, a further development has

been consistent evidence and commentary that the latest Euro 6 engine standard for diesels does not deliver its emission targets on the road for cars and vans. Comments attributed to the European Research on Mobile Emission Sources indicate that Euro 6 engines generate NO_x emissions of more than six times the standard, against the worst-case forecast from Defra (the Department for Environment, Food & Rural Affairs) of 2.7 times (Leake, 2016).

The large number of vans circulating in the congestion zone and crossing the three London cordons, as illustrated by TfL in Figure 4.5, and in their Travel in London Report 8 on Travel in London, can be assumed to perform similarly or no better. Hence it is reasonable to hypothesise that freight is a disproportionately large contributor to poor air quality.

Understanding the real factors behind van traffic growth and the potential for mitigation is vitally important.

4.6 Vans and freight: as much a victim of congestion as a contributor

In summary, this chapter has examined the effect of online commerce on traffic congestion and air quality. The key findings are:

- The contribution of parcel delivery vans to congestion is substantially exaggerated; perhaps surprisingly, online e-commerce has probably contributed to a modest *reduction* in overall traffic.
- However, traffic congestion is a huge problem for the UK, and particularly London – and more congestion generally worsens air quality.
- Total van traffic is nevertheless a significant contributor to congestion and air pollution (and 96% of LCVs are diesel-powered), and the daily operating patterns of vans conflict heavily with the morning commute.
- The cost of congestion to freight and logistics in the economy is probably underestimated.
- The TfL programme to manage freight more sustainably in London consists of *avoiding* some journeys, *retiming* deliveries and *mitigating* environmental impact.
- The challenge of mitigating the impact of emissions is beginning to appear more imperative as evidence emerges that real-world emissions are more than six times greater than laboratory testing.

In the next chapter, some emerging logistics solutions that can provide mitigation at every level of the TfL programme are described.

5. Emerging City Logistics Models – Examples and Case Studies

Congestion and pollution is a major problem for cities, as the previous chapter detailed. The movement of freight and the logistics to keep cities supplied and serviced is an important part of the traffic and pollution mix. The delivery of parcels and grocery is only part of that mix – around 10% of van miles and 1.5% of all traffic in London, and slightly less in other cities and urban areas. London and TfL are used as a case study in this chapter to explore emerging city logistics models.

City logistics constitute a discrete problem – most of the other modes of travel are predominantly about moving people rather than moving goods or supporting services. Using the three TfL principles for freight management mentioned in Chapter 4 of *avoid the journey*, *retime* and *mitigate*, this chapter reviews briefly some of the existing and emerging initiatives that are expected to have an impact on van activity, and in turn how e-commerce could affect van traffic.

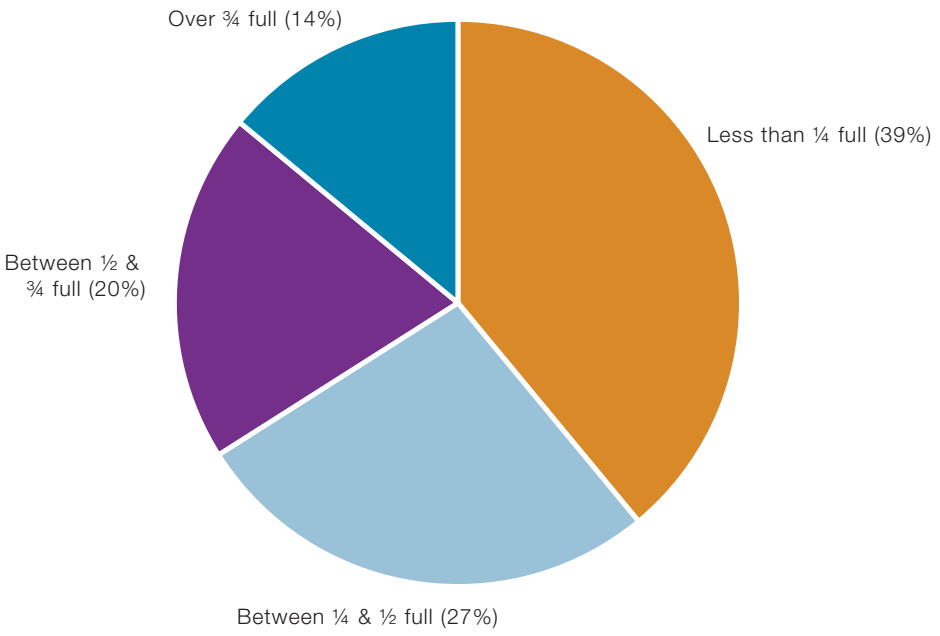
5.1 London case study – avoid the journey

Research on van use that was consolidated by TfL in a Roads Task Force Technical Note from 2011 (TfL, 2011: 5, Figure 5) showed for London (while figures of course vary nationally) that:

- 45% of privately owned vans and 32% of company-owned vans are used to travel to and from work – it seems safe to assume that the majority of these vans carry tools and equipment, as…
- …only 17% of privately owned vans and 2% of company-owned vans are used for personal journeys; and
- the two other main uses are for travelling between jobs and the collection and delivery of goods – purposes that apply to 50% of company-owned vans and 33% of privately owned vans.

On van utilisation, the analysis showed that vans are poorly utilised, with 66% being half full or less than half, as shown in Figure 5.1. The average load factor[9] is 38% from this analysis.

Figure 5.1: Van utilisation in London



Source: TfL (2011: 5, Figure 6)

These statistics point to the potential to take vans off the roads through load consolidation and alternative travel-to-work arrangements.

There are a range of consolidation initiatives emerging in London which include parcel delivery and van activity; the following are micro case studies:

9 The load factor of a vehicle is its usage as a proportion of its capacity, by either weight, volume, or both.

- **Regent Street and West End consolidation** – This scheme was initiated by the Crown Estates in response to the need to reduce congestion and improve air quality in Regent Street and the surrounding area. This required that it devised and promoted a scheme for both procurement of goods and consolidation of deliveries to its tenants. The consolidation centre is run by Clipper Logistics in North London using an electric vehicle and capturing demand of stationery, courier parcels, drinking water, provisions and all sorts of consumables as well as organising and delivering shop stock. The number of retailers now participating is 35, and the system has produced savings in vehicle movements for participating shops by 85%. The use of an electric vehicle also addresses the 'mitigate' category on TfL's agenda.
- **London Boroughs Consolidation Centre (LBCC)** – this scheme was initiated in response to delivery challenges resulting from the Borough of Camden moving to a new Civic Centre. The LBCC now serves 400 council buildings across three boroughs, and is seeking to expand into the commercial area. Operated by DHL under the LBCC banner, it is achieving a 57% reduction in vehicle trips, 69% fewer miles, and reductions in NO_x and particulates.
- **Major shops and offices** – Harrods has the scale to self-consolidate at its new distribution centre in Thatcham. Lorries arrive at the shop before the peak and return against the flow, making further trips during day when traffic is lighter.
- There is now a precedent that **planning for new office buildings** will be subject to conditions requiring the developer to establish consolidation.
- **Construction industry consolidation** – the consolidation of the flow of construction materials to major developments is being actively promoted by TfL which has recently published a directory of available facilities.

Consolidation initiatives have the effect of reducing vehicle movements and kerbside congestion. In some cases they are either promoted or mandated by the landlord or business owner; in others they are a planning and development requirement. The societal challenge for such schemes is that suppliers' vehicles still need to travel to non-participating locations in the vicinity, so both the potential and the absolute impact may be diminished unless the solution is universal.

The examples are all B2B, but do involve parcel and van activity. The competitive nature of the e-commerce market between retailers and carriers has been a barrier to consolidation in home delivery with the exception of the Gnewt case, described later in this chapter.

5.2 London case study – retime the journey

The use of consolidation centres also offers the potential for retiming deliveries into less traffic-intensive periods. The staging of goods briefly at a consolidation centre on the edge of the conurbation allows the final delivery to be launched into the delivery zone either before or after the peak commuting period. This is in addition to the benefits of consolidated deliveries.

Once again TfL has been active in this area, working with major operators to encourage retiming based on the lessons learnt from the 2012 London Olympics, when 15% of deliveries were retimed and many companies found significant benefits to their schedules (as observed from the Cranfield work cited in Chapter 4).

A presentation in May 2016 by TfL reported that 144 sites (mostly retailers) had been retimed, and that there was a target of a 500 sites to be retimed within two years (TfL, 2016b, slide 10).. It was reported that the aim is to take 4,000 heavy goods vehicles out of peak by November 2016 (Tfl, 2016c, slide 4).

However, retiming in e-commerce parcel and grocery deliveries which use vans is a more difficult proposition. Parcel vans are targeted with making up to 150 drops per day, and drop density is the key to courier operators' economics, being achieved through route planning. Usually couriers will give customers a time estimate no more refined than 'morning', 'afternoon' or 'evening'.

The Ipsos MORI survey found that 26% of urban dwellers (15% in rural areas) normally receive their e-commerce deliveries during weekday evenings or at weekends and when asked when they prefer to receive their goods 45% of urban dwellers preferred these delivery times (25% in rural areas).[10] This has a clear benefit in taking some vans off the road in peaks. Nevertheless, 34% of urban and 48% of rural dwellers still receive weekday morning deliveries. So while there has been a significant shift in preference to evenings and weekends, to which providers have responded, they still have to schedule activity during peaks, and the extended operating hours put pressure on operating costs. Further retiming of e-commerce deliveries may therefore be somewhat more difficult to achieve.

While customers' preference for delivery to the home was shown clearly in Figure 2.3, the acceptance and growth of different collection options was also apparent. In Chapter 2, the growth in click-and-collect was quantified, and was attributed to customers' on-the-go lifestyles, their uncertainty about being at home to receive the delivery, and their resistance to charges.

New solutions are emerging in the form of *click-and-collect services* and *micro-hubs*, both of which enable retiming and consolidation.

Large-scale *click-and-collect services* are provided by a range of operators including CollectPlus (referenced earlier for their research), Doddle (which focuses on train stations to service travellers) and parcel stores from companies like Hermes. These can be expected to grow in number, as they are a cheaper option for both customers and operators. Such solutions allow customers to combine their travel or shopping trips with a collection, blurring the line in the NTS between personal travel and shopping trips. Click-and-collect provides the potential for both consolidation and retiming, since deliveries to the collection point can be in bulk and do not involve a rigid customer time commitment to meet when it comes to collection.

10 Figures derived from raw data obtained from Ipsos MORI

A collection point is a kind of *micro-hub* where the customer is the final delivery agent. Such micro-hubs can also be a small local point from which to launch the final delivery. The most notable example of a micro-hub is Gnewt Cargo in London, which services a number of parcel operators. It opens the micro-hub to receive in bulk from the sortation centres or sub-depots of the operators before traffic builds up and the congestion charge takes effect. Gnewt can then schedule deliveries on the basis of very local rounds which are flexible enough to involve returning to its hub during the day; timed deliveries or responding to direct customer requests to deliver goods that are waiting at the micro-hub ('call-offs' in logistics terminology) are also possible. Gnewt now has a fleet of 100 electric vehicles that are street friendly – with a range of sizes from tricycles to medium-sized panel vans (Gnewt Cargo Limited, 2016). The benefit to the parcel networks is the avoidance of penalty charge notices (PCNs) for parking and traffic infringements, and much improved productivity. With the use of electric vehicles, the micro-hub model also addresses the *mitigate* agenda. The opportunity to combine micro-hubs with click-and-collect as neighbourhood facilities is now a point of discussion – and one that could well be encouraged by local authorities. Such solutions are now being actively investigated by EU-funded projects under the Horizon 2020 framework on city logistics, such as CityLab and UTURN (Citylab, 2017; U-TURN, 2017).

Drones and delivery robots (ground drones) are further innovations that are attracting attention. Amazon has obtained permission to test aerial drones for parcel delivery. The company announced in the summer of 2016 that a cross-government team supported by the Civil Aviation Authority gave permission to Amazon to explore three key areas: operations beyond line of sight, obstacle avoidance, and flights where one person operates multiple autonomous drones. The company has since introduced a private customer trial service of its Prime Air service (Amazon, 2017). At the same time, Starship Technologies has launched the concept of ground drones (or autonomous delivery robots) and is testing these around the world, with the London Borough of Greenwich being the UK location. Figure 5.2 provides a photograph of a ground drone running on a pavement. Ground drones will require micro-hubs to support them – the operating concepts are complementary. This technology may reduce the need for vans to deliver goods for the 'last mile' (Starship Technologies, 2016).

Figure 5.2: A ground drone delivering in Greenwich

Source: Picture provided by Starship Technologies (2016)

Both of these innovations have the potential to increase convenience for customers by giving delivery-on-demand, reducing the cost of delivery, and at the same time mitigating the environmental impact of parcel delivery. What seemed far-fetched just a year ago now looks both plausible and interesting. The digital revolution is presenting frequent and unexpected opportunities.

5.3 Mitigate the emissions and pollution impacts

The role of electric vehicles has been a recurring theme in many of the examples associated with *avoid* and *retime*. Mitigation is a complementary dimension, specifically for air quality and emissions. While the vehicle numbers on the road amount to perhaps only a few hundred, the sense is that electric vehicles for freight are finally coming of age, and that the economics are beginning to turn favourably. The EU has a policy goal of achieving near-zero city logistics emissions by 2030 (European Commission, 2011: 28) and electric freight vehicles will play a major role in this, even if the 2030 goal now appears hard to attain. An EU research project under the name FREVUE (Freight Electric Vehicles in Urban Europe) is testing a wide range of electric vans and lorries to establish the parameters of viability and provide cases of effective application (FREVUE, 2016). Companies such as UPS (see the van shown in Figure 5.3) are participating in this project and have made major investments in the technology; anecdotally from the project team, it is reported that acceptance by the public of these vehicles in use is excellent, and the drivers love them. A full report is due in June 2017 and will be available on the project website.

Figure 5.3: UPS electric van in London

Source: Picture provided by UPS

In summary, this chapter has shown potential opportunities to improve city logistics and manage van use by applying new models that can help to *avoid*, *retime* and *mitigate*. While there are plentiful case studies of pilot examples that demonstrate the viability and clear potential of new concepts and technology, the right conditions will need to be set by policymakers to motivate the market to respond to this potential and invest to make it happen at scale.

6. The Need for Further Research

This chapter considers the direction that further research might take to provide more detailed insights into freight – both vans and lorries – as a basis for more-focused policy interventions.

The figures in this report have been drawn from multiple sources of data recorded in different time periods. It has been necessary to draw conclusions by inference, application of industrial experience and some inductive logic leaps. This is not ideal and is not a basis on which evidence-based policy can be signed off. This reality is widely acknowledged: high-quality data about van traffic and its growth is absent. The FTA, in its *Van Excellence Report in 2015–16*, remarked (FTA, 2015: 11–12):

> "UK government statistics only address the UK van fleet in terms of raw vehicle numbers. National road-freight statistics only address freight transport, which is approximately 20% of van activity. DfT traffic analysis – which moves closer to an assessment of value and purpose behind vehicle movements – does not differentiate between LCVs and cars, despite the fact that their social and economic purposes are entirely different.
>
> Eurostat's figures similarly overlook the economic significance of vans by defining its area of interest as freight and passenger services, neither of which address the chief economic activity underpinned by LCVs."

TfL has worked to fill that gap, and this report relies on many of their public statements. Notwithstanding that valuable work, there remain many unanswered questions in the context of the huge significance of vans in major conurbations.

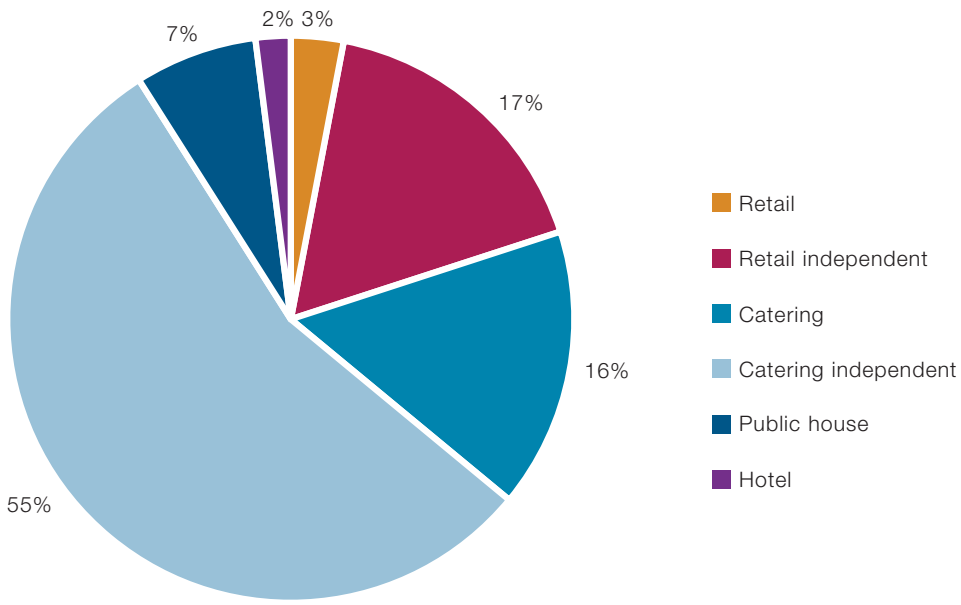
In response to the 'van problem', the European Union launched a consultation in June 2016 on increasing the scope of the road transport regulations for freight operators, potentially into the LCV segment. At present any such measures are not well supported by evidence.

So, the two basic choices for regulators are to apply generalised regulatory and cost sanctions to vans in an attempt to control practices and behaviour, or to fully understand the detail of what is actually happening with the movement of goods and services. Given the radical options for consolidation, retiming and mitigation, the data available and presented in this report does not suggest a 'one-size-fits-all' approach as being appropriate.

In November 2016, the United Kingdom Warehousing Association (UKWA) published a report by the Global 78 Consultancy under the title 'Feeding London 2030 – Facing the logistical challenge' (UKWA, 2016). The report investigates the challenges of feeding a growing London population in the face of increasing traffic congestion and the consequential difficulties for operators. It identifies that London is not a homogeneous city, but rather consists of around 300 'villages' or small towns. Each one has its own high street (or equivalent), surrounded in turn by a network of small streets with limited parking which are increasingly home to food and drink outlets, such as convenience shops or coffee shops. Each of these secures its supplies through its own channels, leading to a proliferation of delivery activity (much of which uses vans). Each also has its own topography in terms of major arteries with associated constraints on traffic capacity, parking and loading.

This observation about the make-up of London has significant implications for present-day logistics operations – one size will not fit all, or indeed many at all. It led Andrew Morgan, who conducted the research for UKWA though his company Global 78, to the idea of 'neighbourhood clusters', starting with the streets around each high street (or its equivalent). The work went on to analyse and describe the mix of activity of six significantly different clusters: Central Greenwich, Canary Wharf, Paddington Station, Canning Town, Coulsdon and Holland Park. While the mix of activity is changing all the time, the results provided a valuable relative snapshot. The food outlet profile for Greenwich is shown in Figure 6.1.

Figure 6.1: The food outlet profile of central Greenwich



Source: UKWA (2016)

The major recommendation of the *Feeding London* report is to use cluster analysis to achieve a suitably holistic view of the freight transport activity associated with food in each cluster. A nine-point methodology has been set out based on boroughs (as the administrative unit), areas (having similar characteristics within the borough), and finally neighbourhood clusters (of food outlets). These clusters might be around a high street, a business district, a transport hub, a shopping mall or similar. Effective logistics requires the ability to support the complete range of cluster locations and types. The preliminary work identified several logistical aspects for further examination in each of the six researched clusters, including access and waste.

The idea of clusters and neighbourhoods is consistent with two of the TfL strategic thrusts for freight introduced in Chapter 6: *avoid* and *retime*. In order to be more focused on appropriate measures for an individual area, the idea of cluster analysis as a means to gather information – not just for food but for the entire freight and van mix – seems eminently logical. It has the following obvious benefits:

- it quantifies the van and lorry challenge locally, so that the results can be openly discussed and conclusions be less subject to argument;
- it recognises the intrinsic characteristics of a locality, acknowledging that each will be different; and
- it sets up a manageable piece of analysis from which methods can be learnt and reproduced for other clusters in an increasingly cost-effective way.

Clusters would also be the catchment for the sort of micro-hubs describe in Chapter 5 – potentially serviced by electric vans or ground drones, as well as being click-and-collect points.

Digital methods of data capture, as well as on-the-ground inquiry, should be able to elicit activity by type and destination, timing, equipment type and utilisation, origins and onward movements. Such analysis will provide the hard facts that are widely acknowledged to be lacking, and which are needed to promote new logistics services and innovations. Local and regional authorities could then consider holistic initiatives including street design for loading and unloading capacity, micro-hubs, planning requirements for developments and, if appropriate, regulations.

This is the major recommendation of this work. Given the interest in this area from TfL, FTA and UKWA, and the resources of the Transport Systems Catapult, the Future Cities Catapult and the Digital Catapult, a collaborative approach appears both logical and likely to be viable without excessive funding.

7. Conclusions and Recommendations

The first chapter described the phenomenal rate of growth in the e-commerce market in the UK and its leading position in such commerce. Customers are firmly in control, enabled by ubiquitous Internet searching using mobile technology; they are responding to competitive offers and are demanding the best in terms of both price and service. It is clear that they are also expected to demand increased speed of delivery, with next-day and same-day becoming the norm.

The pressure on home delivery services from this trend is huge, since it is the final point of contact with the customer, influencing their future purchase decisions – particularly if it disappoints. It is also a major component of the cost of doing business in a market that is challenged for profitability.

Vans are central to meeting customers' expectations. The only alternative at present is where the customer collects their order – a process known as 'click-and-collect'. Emerging technologies such as drones and robots may play a role in the future, but the impacts of these are unknown.

The second chapter analysed the scale of the parcel market and the likely capacity needed to service it and its projected growth. Key insights from this analysis are:

- The overall market for online e-commerce parcels is expected to grow by 600 million parcels between 2015 and 2020.
- The overall market for business-to-business, business-to-consumer, grocery and C2X (consumer-to-business and consumer-to-consumer) is expected to grow by 800 million parcels by 2020.
- The total activity in the market to be serviced by vans in 2020 is therefore estimated at 3.5 billion deliveries and collections.
- The current van fleet to service the total parcel and grocery delivery market is around 128,000 vans (see Table 2.3), which is less than 4% of the total van parc.
- The van fleet to service the growth forecast will increase by not more than a further 35,000 vehicles, which is a 1% increase over five years on the current parc that is currently estimated at 3.6 million vans.

From this evidence, the case against vans for e-commerce deliveries as a traffic 'bête noire' does not appear strong.

However, in Chapter 3 it was shown that vans are the most significant area of traffic growth – forecast to rise to 20% of all traffic miles by around 2035–40. The UK van fleet has been growing at 3% to 6% per year (depending on van size), and this has been, and will continue to be, well above the overall rate of growth in the economy.

A review of average miles run per van, compared to the reported miles of parcel operators, shows that the on-the-road presence of vans attributable to parcel deliveries increases to *c.*10%. This means that the delivery of parcels for business and consumers is an important, but not dominant, part of the UK van fleet mix and the traffic it generates.

Chapter 4 examined the effect of online commerce and package delivery on traffic congestion and air quality. It concluded that:

- Traffic congestion is a huge problem for the UK – and with that comes poor air quality. London is the second worst city in Europe, and the UK ranks third for congestion.
- The cost of congestion to freight and logistics in the economy is probably underestimated in the headline statements on the costs of congestion.
- Perhaps surprisingly, online e-commerce has probably contributed to a modest *reduction* in overall traffic; parcel delivery vans' contribution to congestion is substantially exaggerated.
- Total van traffic is nevertheless a significant contributor to congestion and air pollution (and 96% of light commercial vehicles are diesel-powered), and the daily operating cycles of vans conflict heavily with the morning commute.
- The Transport for London programme to manage freight more sustainably in London consists of *avoiding* some journeys, *retiming* deliveries and *mitigating* environmental impact.

- While there have been step change improvements in air pollution emissions from transport since 1990 as a result of advances in engine technology, the challenge of further mitigating the impact of emissions is beginning to appear more imperative. Evidence is emerging that that real-world emissions of diesel engines from cars and vans are more than six times greater than laboratory testing has hitherto indicated, and double the Defra (the Department for Environment, Food & Rural Affairs) air quality planning estimates.

In this context, Chapter 5 reviewed emerging models for city logistics covering all service segments. It showed potential opportunities to improve city logistics and manage van use by applying new models that can help to *avoid*, *retime* and *mitigate*. There are plentiful case studies that point to the viability and the potential of new concepts and the technology is clear: consolidation centres, micro-hubs, click-and-collect points, drones both in the air and on the ground. To make these developments a reality and working at scale needs the right conditions to be set by policymakers to motivate the market to respond to this potential and invest to make them happen.

Such investment requires evidence and favourable planning. Chapter 6 considered the limitations of the analysis in this report and the need for further research. The analysis that has been pieced together in this paper comes from various sources – there is not a consistent and agreed view on the application and impact of vans to and on different segments of the market. To remedy this situation, the idea of cluster analysis is proposed to fully understand the freight and logistics impacts on localities, and the potential for measures that maximise gain with minimum pain. Every locale will be different in terms of need and difficulty. By making this analysis a generic and reproducible process, the aim is to obtain scalability and engage communities in developing their own solutions.

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