Winds of change

Dr Phil Greening, director of the Centre for Sustainable Road Freight, describes four key ways in which technology is bringing change to transport

The purpose of the Centre for Sustainable Road Freight – a collaboration between logistics operators (such as DHL), technology providers (such as Volvo) and policymakers (DfT) – is sustainability. The Climate Change Act requires an 80% reduction in carbon emissions by 2050, to avoid an irreversible and harmful change in climate (limiting the warm-up to 2°C).

This is part of one of the four drivers that are changing the business of logistics, which determines the way goods are transported.

The first trend is the internet of things. More things are connected every day: there are currently 38 billion things connected, 10 times as many as the number of people on the internet. In two years' time, 50 billion things are predicted to be connected. They provide data; we are working out how to use that information.

Their connectivity will transform supply chains, and enable customers to have greater connection with manufacturers. That will have huge implications: how much of logistics is about moving goods around for retail? Vehicles will deliver not to shops, but to people. The internet of things is also enabling manufacturers to get to know our (customers') habits, to be able to predict when we want things. 'Things' can influence the supply chain because of artificial intelligence.

For example, consider a connected fridge that can monitor its own condition. If it detects an unusual vibration indicative of a failing compressor pump, it will broadcast that to other connected fridges and to businesses in the supply chain that are listening. They might include a warehouse that broadcasts its stock level of that part; a shop that is already planning a delivery to one of the addresses; a local service engineer who is free to make the repairs; even the component factory that will make a new unit.

This is automated preventive maintenance. The engineer is able to get around to fridges more efficiently, as well as preventing a drop in service. This is already happening in the aerospace industry: as components start to fail, they broadcast their status, so a manufacturer can start making the part before it stops working.

To adapt to such a connected world, delivery vehicles would also need to be different. Mercedes-Benz's Vision Van concept proposes using drones to deliver parcels from its roof. The attraction of drones is not because they are fashionable, but because they address the limiting factor of many delivery journeys: not weight or volume, but time. If drones, or other technology, could cut out the time required for a driver to park the van, find the parcel, walk to the address and wait for the person to answer, he or she can get around to more drops, or use fewer vehicles, per shift, and so reduce emissions.

The Vision Van includes material handling equipment in the vehicle to feed the drones with the relevant parcel; that system arranges the parcels to reduce the retrieval time. Its other advantage is in being dynamically reconfigurable; if the route changes, the parcel sequence can change, too.

AUTONOMY

The second trend is autonomy. Let's pretend that every package in a consignment could, in a limited way, speak for itself on the internet, indicating its size, location, destination and deadline. That would enable a delivery system called the 'physical internet'. The idea is to apply, to parcels, the principles of routing data packets. An email, for example, is sent over the internet by being broken up into bits of data, each of which makes its way toward the recipient via a different route. At the destination, all of the bits are then reassembled.

Doing the same thing physically would be a completely different approach to delivery, and so would have significant effects on transport: each package may travel farther; each package will have more handling. But there will be fewer trucks, and each truck would be nearly full, so the marginal cost of carrying the parcel is small. Our simulations suggest that a 20% reduction of fuel can be achieved using these methods.

There is already an EU roadmap for the physical internet, with delivery targets by 2030. That's not many vehicle changes away.

What will work be like for a truck driver of the future? That job might be compared to an aeroplane pilot. In the old days, say 30 years ago, pilots did everything – takeoff, flight, landing – just as truck drivers do now. But today, given the extent of computer involvement in flight, from autopilot to fly-by-wire to other supporting systems, pilots have become systems managers; they operate the systems that fly the plane. Truck driving may head in that direction.

The third trend is alternative fuels and vehicle routing. Over the next few years, the Centre's research is moving into energy constraints. While other industries are now decarbonising – power now, and heating coming next – transport is likely to become the biggest CO_2 emitter by 2050. That means that the green spotlight will turn to transport, which hasn't developed as far as other industries.

How can we reduce carbon emissions? There is a powerful move toward electricity as a power source. Smart grid technology controls energy supply,

FACT

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balancing production and demand of energy by controlling household appliances, for example. But electric vehicles are not so easy to engineer for freight purposes, except perhaps using a motorway catenary system, although that involves building new infrastructure. On the other hand, if it turns out that vehicle range is limited by batteries, then maybe warehouses need to be in different places.

Finally, there is a transformation coming in supply chains. In abstract and generalised terms, there are three types of supply chains. In the past, vertically integrated manufacturers, for example, controlled all the steps involved in production of their products, from raw materials to finished goods. Today, commerce relies on 'intermediation'; increasing specialisation has led to a world of collaboration, in which business happens through the actions of specialists acting on information that they receive. Thanks to big data and the internet of things, we are heading to self-organised supply networks, in which computers of different sorts and at different levels coordinate the entire network.

The world is changing, and the speed of change is increasing. While it took 50 years for one in four Americans to adopt electricity, the worldwide web took only seven years to become popular. While it took 150 years for the UK to double its GDP a hundred years ago, those of China and India can double in 15 years. That means that the most dramatic changes in logistics will not take place in the western world, but in emerging economies – the ones that are doubling their GDP. Their lack of existing transport infrastructure, instead of being a disadvantage, may in fact enable them to adapt better to future technology. The western world's existing infrastructure may hold it back.

Change will not come from within the logistics world. Data companies are challenging incumbents, and changing the design parameters of future vehicles. Examples include: Apple and McLaren discussing collaboration; Alibaba offering a collaborative logistics platform; MyWays (DHL) crowdsourcing logistics; and Google filing a patent for a delivery vehicle.

Tech companies are investing because the value of logistics today is more powerful than moving a parcel from A to B. Its value is in the understanding obtained of the world from moving a parcel; the surrounding intelligence. Value creation is moving to data; it is no longer about the physical movement of stuff. The bottom line is that people are going to need data skills – data is the currency of the future. ■