



# Delivering the goods

Harnessing technology to drive  
the transport of the future





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# Executive summary

A technology revolution is upon us, but what does this mean for the world of transport? We know that, thanks to artificial intelligence (AI), the steering wheel will eventually become an endangered species. And while it's tempting to peek into what might be happening across the edgier extremities of freight's future – such as drones that can carry shipping containers or floating warehouses in the stratosphere – for this report we wanted to focus on the technologies that are going to have relevance to the plans of transport businesses over the next three to five years, and study what is tangible and realisable in that timeframe.

We've carried out a body of quantitative research that probes 250 stakeholder attitudes towards new transport technologies – those already gaining traction as well as some that are just around the corner. We've quantified adoption rates and barriers in four geographical locales by engaging with planners, commissioners and those in the sector who are creating or actually deploying some of this new tech. Those we spoke to have shared their insights to help us contextualise the gap between innovation and application.

This gap is all the more remarkable because 86 per cent of total respondents in our survey agree that changing customer expectations is a key factor driving technological adoption. The thought leaders we interviewed told us that scepticism quickly subsided when technologies were trialled and

successfully proved their business potential. Rather than being just technology-focused, what this all distils down to is a conversation more about applications – the tools for delivering goods.

It's now normal to order goods in the morning and have them delivered in the afternoon. Soon, things will be delivered to our mobile devices, rather than to a static address, so technologies oriented around tracking, IoT and the use of sensors are already acquiring increased congruity with the transport sector, especially in the retail space. Therefore, the application and implications of these technologies become more pertinent, and this report includes specific commentary about the alchemy that happens when the right mix of technologies converge.

Technology often outpaces the law, but we're already several steps ahead in many areas; for example, we're beginning to witness the ascendancy of "smart contracts". Contracts are transitioning from their static, natural-language form and being turned into pieces of IT infrastructure that can be integrated with existing enterprise systems using blockchain technology in combination with associated technologies, especially IoT.

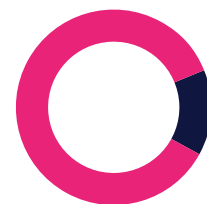
## Big data

A key finding from our research is that big data analytics is the most adopted technology in every geography, when ranked against blockchain, 3D printing, AI and autonomous vehicles, smart energy

storage/electrification and IoT and telematics. AI is significantly increasing in importance, forecast to jump from the fourth – to the second-most-adopted technology over the next decade – pointing to the acceleration of applications such as autonomous vehicles. Our survey further found that manufacturers have more readily adopted disruptive technologies compared to the more risk-averse service providers, which is likely to be down to manufacturers' heightened investing in R&D, and the demands on their business to remain innovative.

Our report's shortlist of technology paradigms – big data analytics, blockchain, electrification and AI – promise (often in combination with each other or in conjunction with other associated technologies) to make the entire transport sector more agile, thanks to smarter routing of vehicles or through the ability of trucks, trains, ships and planes to predict mechanical anomalies and instigate pre-emptive maintenance procedures before they break down.

Beyond these operational efficiencies, all of this means we can mitigate waste and avoid unproductive journeys that squander fuel or exacerbate traffic congestion. That's not only good for business; it means we can go beyond just delivering the goods – we can deliver the future.




86%

of total respondents in our survey agree that changing customer expectations is a key factor driving technological adoption

# AI at play

*The benefits of using artificial intelligence in transport are clear, but can it live up to the hype?*





Some of the earliest deployments of artificial intelligence (AI) were in the world of logistics. During the mid-1950s Cold War days, Nato's scientists stealthily harnessed the learning potential of this "embryonic new science" for a single purpose: to simulate the logistical challenges of moving phenomenal quantities of manpower and materiel, and evaluate how these resources would interact in various doomsday scenarios. Decades passed and, without defence budgets, AI remained a Cinderella science, plodding the esoteric corridors of academia but never finding its commercial niche.

With a newfound ability to integrate with IoT, blockchain, sensors and big data, AI is out of the bunker and back in the logistics arena. However, 68 per cent of our respondents think that AI and its benefits for commercial transport are overhyped, so is it proving its mettle?

#### Key benefits

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Much of the attention surrounding AI focuses on vehicles and the momentum towards autonomy. A total of 52 per cent of respondents most frequently rank "cost savings



**Harnessing the power of AI will mean we can really concentrate on the complex legal things and not get too bogged down in some of the more administrative functions**

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**Lynn West,**  
Head of Contract, Legal  
Affairs & Bid Approval,  
Bombardier Transportation

and reductions” as a top-three benefit of AI, followed by process efficiency improvements, and an increase in speed in movements of goods. This is mirrored across APAC and UK/Europe, whereas MENA and North America most frequently rank “new business and revenue opportunities” as a top-three benefit of AI, proving that firms in these regions are poised to uncover AI’s potential for increasing the sales of their products and services.

“We’re exploring with DWF and others what technology is out there and what benefits, if any, it could bring to our daily life. We’re starting to use some of the AI tools to extract data very quickly, which has previously been a very important and necessary but laborious task for us”, says Lynn West, Head of Contract, Legal Affairs & Bid Approval at Bombardier Transportation, the rail industry multinational whose installed base of rolling stock exceeds 100,000 rail cars and

locomotives worldwide. “We were surprised about how accurate some of these tools are with extracting that type of information from the document – how quickly they learned and how responsive they are, and the end result is you almost wouldn’t know a human hadn’t done it.”

### Adoption rates

Some 48 per cent of manufacturers and service providers have already adopted some form of AI, whereas planners and commissioners believe adoption rates across the industry are significantly higher – at 74 per cent – likely due to their focus on their planning pipeline and what may be possible in the near future rather than the present.

In North America, 44 per cent have already adopted the technology, with the US leading the way with regard to autonomous trucks in particular. AI can be “trained” to interpret the data

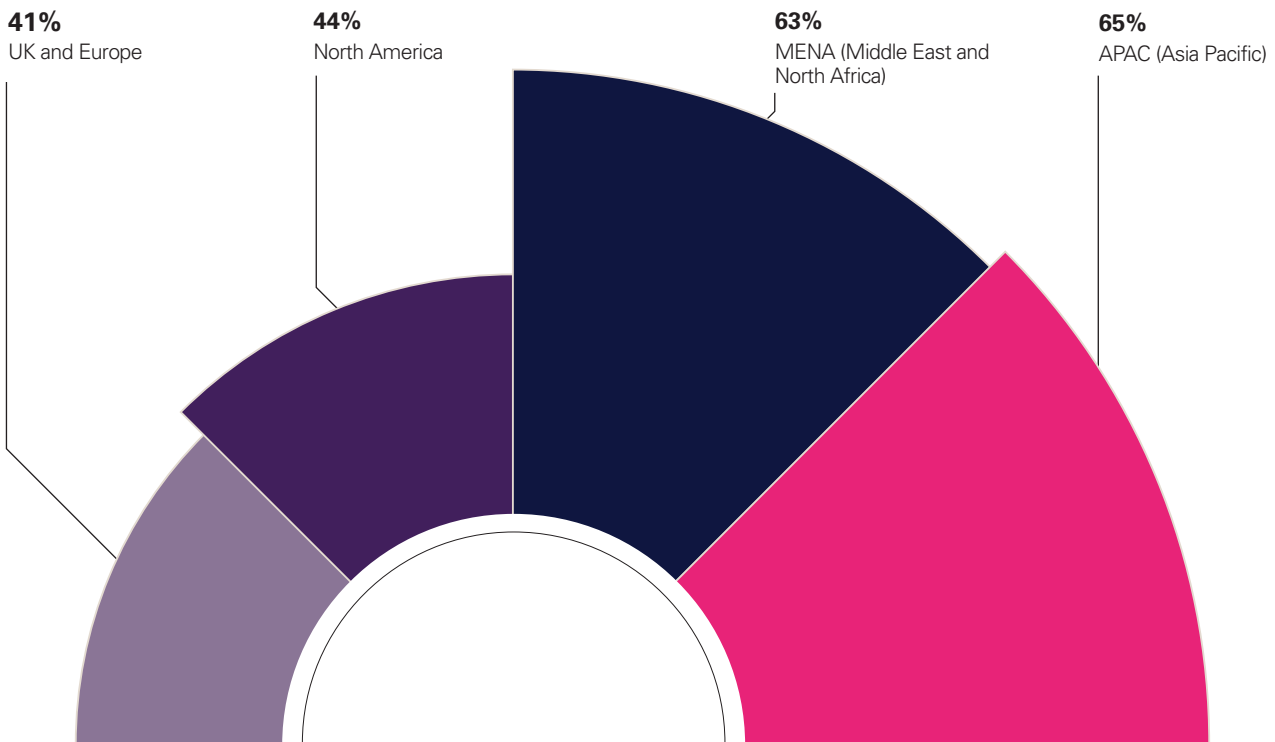
collected from a vehicle’s LIDAR – the laser-based tech that detects every object in its path – and then develop human-like decision-making skills to adapt to traffic situations. A significant AI milestone was reached in October 2016, when startup Otto (now part of Uber) drove an autonomously driven truck fully loaded with Budweiser beer more than 120 miles on the I-25 from Fort Collins, Colorado, through Denver to Colorado Springs, completing the world’s first commercial shipment by a self-driving truck.

### Barriers to change

Our survey found that security concerns are driving a disinclination to adopt AI technologies for planners and commissioners, as well as manufacturers and service providers. The impact its adoption would have on job losses is also a core concern for both parties, though manufacturers are further put off by

## Current adoption of AI technology is higher in MENA and APAC regions

Percentage of total respondents in each region that are adopting AI

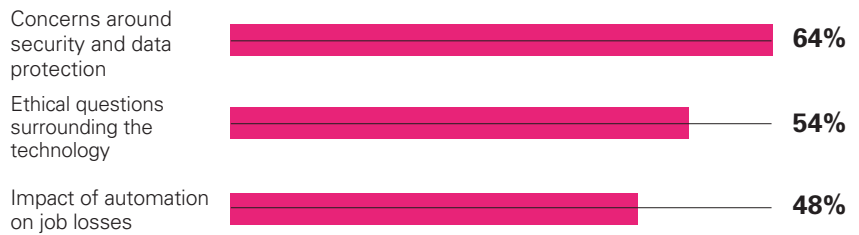


the financial investment, whereas planners and commissioners fear the ethical questions surrounding the technology will inhibit its adoption across the industry.

The potentially negative effect AI will have on the human workforce has been a perennial anxiety since the Industrial Revolution, but businesses are starting to realise the positive impact and, indeed, improvement it can have on the type of work humans do. "You still need lawyers to draft contracts, to advise on the legal implications, to reason about eventualities and the ramifications – that, a machine cannot do", says Peter Hunn, founder of Clause, a digital platform which takes contracts from their static natural-language form and turns them into pieces of IT infrastructure that can be integrated with existing enterprise systems, using blockchain in combination with associated technologies, especially IoT. This conviction is echoed by Bombardier's Lynn West, who says that harnessing the power of AI "will mean that we can really concentrate on the more complex legal things and not get too bogged down in some of the more administrative functions that are absolutely necessary in the role – we don't ideally want legal experts wasting their time on some of the more laborious work".

## Factors contributing to a reluctance to adopt AI technologies

### Planners and Commissioners



### Manufacturers and Service Providers



### Belief system

Bombardier's West summarises how enthusiasm can trump the over-hype in talking about how her attitude and those of her colleagues quickly changed through the course of their AI tools trials: "When we started the process I was a bit sceptical. I thought how on earth can you put all this information in a computer and it's

going to pull out the data that a human would – it's not possible. And then, having seen how quickly it's done and how accurate the information was that came out of the exercise, I was converted immediately. And then I realised the true value in that – that it's immediately taking you from a week of work to an hour of work, so you're immediately on the front foot to get on with what you really want to do".

## Liability: who is in the driving seat?

We predict a heavy global investment in AI in the near future, particularly in the Middle East region, with some reports predicting an investment of US\$100 million by 2021. The United Arab Emirates (UAE) is looking to gain a competitive advantage by becoming an early adopter of AI and, as a result, is expected to receive a US\$96 billion benefit by 2030 (13.6 per cent of GDP). In October 2017, the government launched its strategy for AI and appointed the first minister of state for AI. In order to achieve its vision

the UAE will have to adapt to deal expressly with the ethical and legal issues this technology creates. For example, if an autonomous vehicle crashes and a pedestrian is injured, who is at fault? Ultimately, the key choice for lawmakers will be whether to hold the owner of the vehicle or the manufacturer liable, or give the vehicle a legal personality combined with compulsory insurance that make it possible for the car itself to be held liable.

We think holding the manufacturer liable is unlikely, as it will only stunt growth of the

technology in the country. In the short term, where the driver is only assisted by AI, we expect liability to remain with the operator of the vehicle. As the technology advances, however, a more innovative approach will be necessary. Fortunately, with autonomous vehicles expected to reduce accidents by 90 per cent, whatever the approach, many lives will be saved.

**James Fox,**  
Partner, Middle East, DWF

# Big data, big opportunities

*The adoption of data analytics has grown exponentially, but concerns over security and privacy remain*







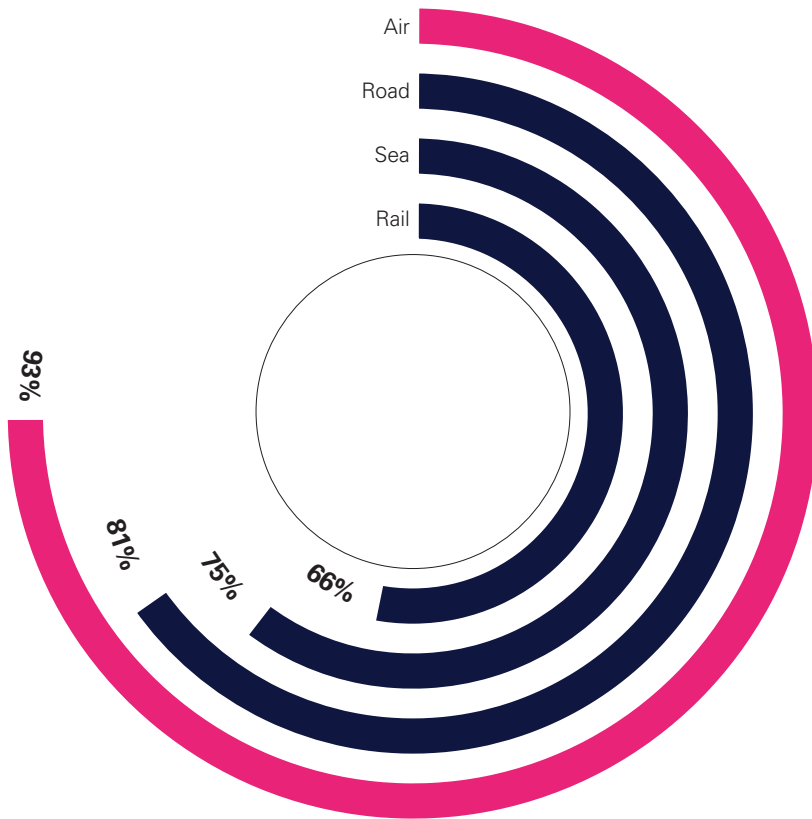
To cater for their customers' evolving needs and ever-changing market demands, transport companies need to take advantage of digital opportunities and adopt aspects of advanced vehicle-related IT systems and big data analytics to remain competitive.

In our survey, 81 per cent of total respondents have already adopted big data analytics. This was most prevalent in air transport (93 per cent). Geographically, the greatest take-up is in North America, at 92 per cent – hardly surprising given the region's longstanding recognition of the power of data and its potential application in the business of moving goods. As far back as the 1950s, George Smith, the second CEO of UPS, famously said, "The ability to make decisions is the power to manage – without operations research, we could only analyse our problems intuitively." In today's parlance, we'd simply say that we need big data analytics.

These statistics are also mirrored by a compelling example of the use of data analytics in North American logistics companies: UPS, whose operations, in terms of vehicle deployment, focus heavily around road and air, teamed up with SAS to create an initiative called ORION (On Road Integrated Optimization & Navigation). A decade ago, UPS piloted a telematics initiative in its trucks to harvest data to identify where efficiencies can be improved. Using GPS tracking devices and vehicle sensors in conjunction with the driver's handheld mobile

## Have you currently adopted big data analytics?

Total respondents by transport mode



## Have you currently adopted big data analytics?

Total respondents by region



device, UPS captured data related to vehicle routes, idling times, and even whether drivers were wearing seatbelts. All of this culminated in the development of “a complex algorithm that could quickly solve complex routing problems”, based on around 1,000 pages of code, which “turns the captured data into instructions to optimise drivers’ routes”.

According to UPS, ORION saves them “about 100 million miles per year – a reduction of 10 million gallons of fuel consumed”, which also “reduces CO<sub>2</sub> emissions by around 100,000 metric tons”. The company says that “a reduction of just one mile per driver per day over one year could save UPS up to \$50 million”.

Striving for efficiencies is part and parcel of transportation’s “business as usual.” But big data analytics can be critically indispensable when unforeseeable incidents pose sudden and substantial threats. Earthquakes, terrorism, gas leaks, floods, cyber-attacks, blizzards or IT meltdowns – any one of these can cause far-reaching and disruptive shock-waves across the supply chain. Which brings us to digital disruption of a different sort – the flipside to the aspirational promises that technology can bring. In May 2017, hackers unleashed the “WannaCry” ransomware cryptoworm. In the UK, the NHS was one of many high-profile targets, but the attack was worldwide and directed at large organisations in 150 countries, including airlines, vehicle manufacturers, hospitals, universities – and logistics suppliers. Using big data, the transportation industry is fighting back.

That same month, DHL announced the launch of “Supply Watch”, which forms a part of its “Resilience360” supply chain risk-management platform, DHL’s early warning system which “uses machine learning and natural-language processing to detect disruptions in a company’s supply base before they cause financial losses or long-lasting reputational damage”. Supply Watch monitors supplier risks on a company level, including “financial indicators, M&As, environmental damages, supply shortages, quality issues and labour disputes”. How “big” is the “data”? According to DHL, its system

monitors “up to 30 million posts from more than 300,000 online and social media sources”. DHL said in a press statement that the WannaCry ransomware attack was another example of a situation in which the Resilience360 system “could help to identify which suppliers may have reportedly been affected, and therefore allow companies working with them to take appropriate precautions in their supply chain”.

### Data: a double-edged sword

The logistics sector is actively devising pre-emptive measures to counter abuse of data, but according to Andrea Amico, president of Jack Cooper Logistics, the scale and complexities of threats need to be tackled by the manufacturers of vehicles, not just their operators. He notes that the immense commercial potential of big data analytics is distracting the industry from some hard ethical and legal questions surrounding the personal data that connected vehicles are aggregating. “The pie is huge. McKinsey says that connected vehicle data is going to be worth US\$750 billion by 2030, and there’s a lot of excitement around collecting data from vehicles and building new business models to leverage it, but nobody really likes to talk about what it takes to do that in a responsible and ethical manner. I truly believe we’re vastly underestimating the time bomb that we have in our hands – vehicles haven’t been designed with enough security and privacy in mind.”

At a fleet logistics level, data is generating a cloud of legal obscurity: “The issue of who owns the data affects everybody. If you look at a commercial fleet like Jack Cooper’s I think it’s perfectly acceptable - if a driver is an employee - to let them know that the company will be monitoring certain performance parameters of the vehicle to make sure it’s operating in an efficient manner. I think it’s very different if you’re going to be collecting data from parties who may not be fully aware of data being collected, or of how it’s being used and shared with other parties.”

Amico summarises the transport industry’s increasing reliance on data, providing both a reality check and an endorsement of our survey findings surrounding the sector’s high alignment to it, by emphasising that “without the data we wouldn’t be able to operate nearly as efficiently as we do. And as that data set gets richer we are able to do more things. We can reduce fuel usage, congestion, maintenance cycles, driver work hours, etc. This benefits everybody. The thing is: collecting data is relatively easy... the hard part is how we apply intelligence to the data.” He continues: “Fleets need big data because otherwise you can’t teach an algorithm how to efficiently operate your network, or recognise patterns and help humans make decisions. So having access to the right data is a prerequisite, but it doesn’t get you where you need to be by itself. It’s how you apply advanced analytics to the data that makes all the difference.”

“**Having access to the right data is a prerequisite, but it doesn’t get you where you need to be by itself. It’s how you apply advanced analytics that makes all the difference**

**Andrea Amico,**  
President, Jack  
Cooper Logistics

### Law to balance privacy concerns with encouraging innovation

The exponential growth in the production and storage of transport- and mobility-related data has been accompanied by rising concerns relating to the adequacy of regulations ensuring privacy. These concerns have been fuelled by the personally identifiable nature of certain data being collected and the fact that it’s often collected without full knowledge and informed consent.

Even arguably “anonymous” data can now be easily cross-referenced with other sources of contextual data to link back to specific individuals. This can be seen to compromise reasonable expectations of personal privacy. Big data analytics raises several issues relating to generic privacy threats that arise from the collection or discovery of personal data by economic agents as well as by governments.

Despite concerns over privacy, location-based data enhances

services available to individuals and may contribute to significant improvements in safety, traffic operations and transport planning.

There is a real tension between the value of large-scale flows, which may consist of non-anonymised data, and the contribution that this same data can make to individuals and society.

These challenges are acute and threaten an erosion of personal privacy rights. There is also a risk that regulatory backlash against big data, fuelled by attacks on personal privacy, may hamper innovation and curb the economic and social benefits that the use of such data promises. Evolving regulatory approaches will have to deliver simultaneously on the pro-privacy and pro-innovation expectations of citizens.

**Felice Cuzzilla,**  
Counsel, Italy, DWF

# The blockchain game-changer

*This nascent technology could change  
the face of commercial transport, but  
only once its full potential is unlocked*





**B**lockchain is perhaps the technology that elicits the most ambivalence and is the most opaque – a paradox, considering its *raison d'être* as an incorruptible yet transparent distributed ledger is to create trust. But that hasn't dampened our survey respondents' perception of its potential, nor dissuaded some of the biggest players in logistics from endorsing this disruptive technology.

For example, this January, Maersk and IBM announced their intentions to launch a JV to provide more efficient and secure methods for conducting global trade using blockchain across the entire global shipping ecosystem. By combining blockchain with AI and IoT, the new entity aims to "help companies move and track goods digitally across international borders". According to Maersk, 80 per cent of consumer goods travel by ocean at some point, but the cost of admin to process their shipping is estimated at 20 per cent of physical transport costs.

"By applying the technology to digitise global trade processes, a new form of command and consent can be introduced into the flow of information, empowering multiple trading partners to collaborate, and establishing a single shared view of a transaction without compromising details, privacy or confidentiality", the company says.

#### **The case for blockchain**

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In our survey, 80 per cent of total respondents "somewhat or strongly agree" that "blockchain technology will fundamentally change the face of commercial transport", with three-quarters predicting that blockchain will be implemented on a major scale in commercial transport in the next five years.

Our survey found that current adoption rates of blockchain technology were surprisingly prevalent in sea transport, at 69 per cent, compared to 37 per cent across all respondents (which in itself is higher than expected), highlighting that this mode is the most advanced in experimenting with, and implementing, this technology.

#### **Barriers to adoption – and new horizons**

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The principal barrier to adoption is a lack of understanding about the benefits of blockchain technology, highlighting that education is needed around this relatively new technology. Planners and commissioners were more deterred by the current market immaturity, whereas manufacturers and service providers saw financial investment as a barrier – indicating that they might be ready to experiment with the technology despite its immaturity, if it proves financially viable or rewarding.



**The principal barrier to blockchain adoption is a lack of understanding about the benefits of the technology**

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## Case study – Clause/Bosch

Blockchain has the potential to allay anxieties over the traceability of goods and payments passing through a chain of different entities. In the realm of “smart contracts”, by combining blockchain with IoT sensors and data APIs, a world of new possibilities opens up.

“We’ve had a couple of ‘proof of concepts’ in the supply chain space, which we see as particularly fertile ground for the use of smart contracts and blockchain”, says Peter Hunn, founder of Clause.

This February, at the Bosch Connected World conference, the Clause team demonstrated a “live smart logistics platoon legal contract”, which tracked and managed the logistics payments for a “platoon” of trucks. Bosch was testing its autonomous trucks on the Autobahn, and recognised that by driving closely together in a convoy – also known as a platoon – it could save around 30 per cent in fuel. That means the first truck in the platoon is essentially subsidising the aerodynamically advantaged followers. But who’s paying?

“You incentivise somebody to lead by them being paid by the other platoon members, but you have a problem of tracking all this in real-time”, says Hunn. “You could have Eurologistics, DHL, Maersk joining this platoon, and it’s an administrative nightmare. Managing all the payments between them in the current way completely undermines the cost savings of running something like this – it’s a huge overhead.”

“They wanted a way of automating that. You could have a series of contracts that exist between Maersk and Eurologistics, who may be paying one rate for leading and one rate for joining the platoon. And you may have a different relationship between DHL and Maersk, for example.” In the background, blockchain, IoT sensors and APIs work symbiotically to make this all possible.

Clause has also carried out “proof of concepts” with freight

## Top barriers to adopting blockchain technology

Most frequently ranked as a top-three barrier

### Manufacturers and Service Providers

**42%**

Financial implications

**42%**

Lack of understanding about how this technology can be beneficial

**38%**

Insufficient skills or expertise

### Planners and Commissioners

**56%**

Lack of understanding about how this technology can be beneficial

**52%**

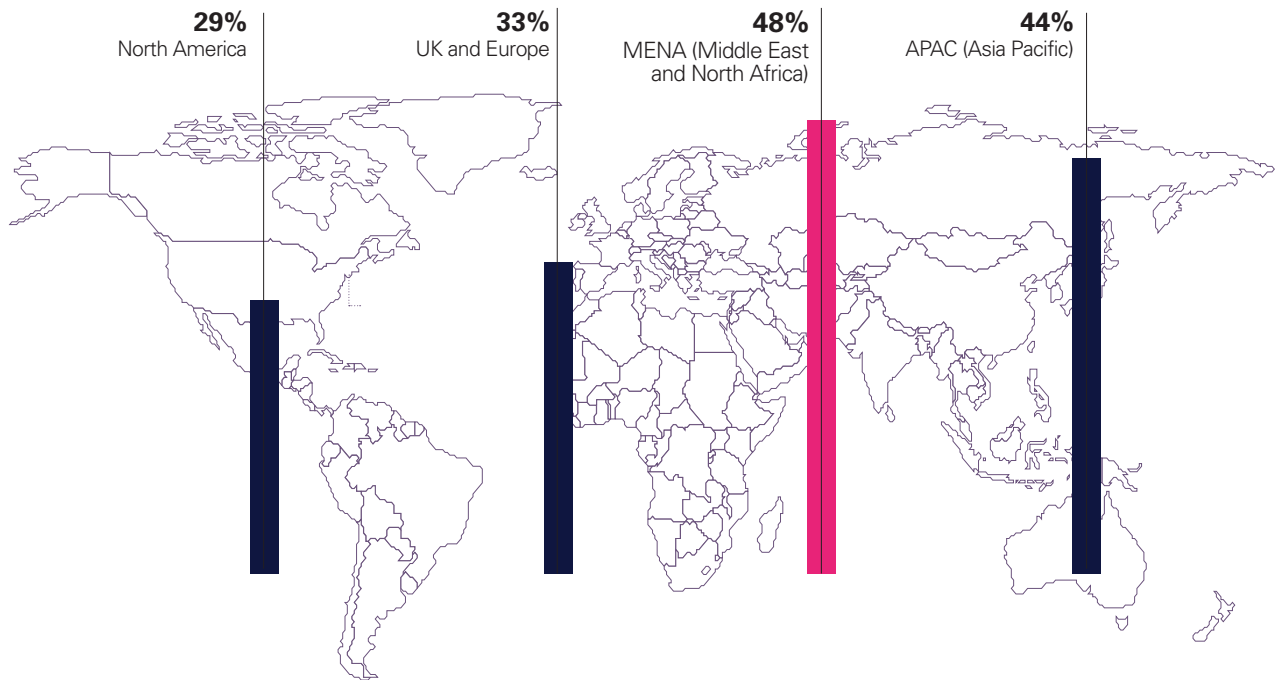
Market immaturity

**40%**

Insufficient skills or expertise

## To what extent are you beginning to test the use of blockchain technology in your business?

Percentage beginning to test blockchain by region



forwarders, where they've automated the issuance of credit or the automation of dynamic pricing clauses – common in supply contracts – so that, if delivery is delayed by a given period of time, there may be a credit issued, or it may result in a price decrease. In another scenario you can track temperature and humidity within a shipping container so that if the temperature is too high, as measured by IT sensors, “you could automate the rejection of goods if they're perishable commodities, or you could reduce the price again or increase a warranty period. When you bring in blockchain you can share all that across parties in a verifiable way”, says Hunn.

### Blockchain needs careful nurturing from legal frameworks

With the advent of blockchain-enabled business processes, the message is clear: this technology is here to stay. International trade means complex business transactions with contractual obligations between various parties, involving different modes of transport and spanning multiple countries. Blockchain uses smart-contract-based systems that self-execute transactions in multipart trade processes, ideally triggered by IoT applications that connect all stakeholders and guarantee the integrity of data shared between them.

A predictable and stable legal environment will be key for the long-term establishment of blockchain technology in transport. Current legal frameworks are being put to the test by digitalising traditionally paper-based instruments, such as letters

of credit and bills of lading, ensuring a binding effect of smart contract execution, transfer of claims and effective dispute resolution. Data protection and the transfer of data in a blockchain context are under scrutiny, notably since the EU's GDPR came into force. As blockchain technology is distributed, additional questions arise regarding applicable law and jurisdiction. Legislators on a national, supranational and international level will need to address these concerns. As blockchain is a nascent technology, premature and uncoordinated regulation would be detrimental. Once the technology is consolidated and core applications are established, the need to change existing laws will have to be re-examined.

**Susi Förschler,**  
Associate, Germany, DWF

# Power shift

*With the advancement of electric vehicle fleets and the development of electric roads, is this the end for fossil fuels?*







Fossil-fuelled vehicles are entering their twilight years. Legislation in the UK and in France will prohibit the sale of new petrol and diesel vehicles by 2040, while Norway aims to achieve this by 2025. According to Frost and Sullivan's *Global Electric Vehicle Market Outlook 2018*, logistics companies such as DHL, DPD and TNT "are switching to a 100 per cent electric fleet by replacing conventional vehicles with electric vehicles that are equally competent and a perfect fit for the business model".

Electric vans could rapidly gain traction in urban environments, according to Dr Wolfgang Schrempp, MD at automotive consultants CC Consulting, due to the exponential rise of online retail and the growing propensity for home delivery of groceries: "Electric vans will be a forerunner in the future for this battery activity. People are no longer shopping in the cities, they're ordering nearly everything online today", says Schrempp, citing the stressful realities that "there's no parking space or if you do have parking it's very expensive" – not to mention the political and environmental imperatives of reducing emissions. "I think for electric vans driving in the city less than 250 kilometres a day it's easy to handle the workload as they can be recharged overnight, ready for deployment at 7 o'clock in the morning."

That's exactly what's happened in Amsterdam, where twelve eCanter, all-electric light-duty trucks by FUSO, a part of Daimler Trucks, are poised to enter service with a group of operators including PostNL, Albert Heijn B.V., Cornelissen Groep B.V. and Technische Unie B.V., as well as Holland's biggest online foodservice marketplace, Bidfood B.V.

Our survey indicated that 44 per cent of UK and Europe think electric vehicles have the potential to revolutionise transport businesses, while 76 per cent of total respondents believe that electric road vehicles will become ubiquitous in commercial transport within ten years.

From both fuel-cost and environmental perspectives, electricity is potentially more cost-efficient and greener than diesel – it costs

half (according to Tesla) and can be produced in a number of green ways, such as solar power. However, can some of the issues associated with electric vehicles – range anxiety, battery longevity and a dearth of charging points – be overcome? Could electric vans and trucks really deliver in terms of speed, endurance and freight-pulling power?

### Technological maturity

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The immaturity of electric road vehicle technology was ranked as the greatest barrier to its adoption (51 per cent), and this was echoed by manufacturers and service providers. Planners and commissioners, however, think adoption will more likely be slowed in the industry due to a lack of vehicle variety. This is somewhat unsurprising considering the fragmented range of technologies.

One solution would be to increase battery power. Tesla envisages a new breed of truck – the "Semi" – which, it says, "does 0–60 mph in 20 seconds with a full 80,000-pound load, a task that takes a diesel truck about a minute". These will be powered using new high-speed DC charging devices called "Megachargers", which will "add around 400 miles in 30 minutes and can be installed at origin or destination points and along heavily trafficked routes, enabling recharging during loading, unloading and driver breaks". The Semi will be equipped with surround cameras and

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The immaturity of electric road vehicle technology was ranked the greatest barrier to its adoption

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onboard sensors, helping to “aid object detection while also enabling Enhanced Autopilot for automatic emergency braking, lane keeping, and lane departure warning”. This March, Fedex placed “a reservation for 20 Tesla Semi trucks”.

Another operator in North America is keeping a watchful eye on the evolution of electric trucks, but is circumspect regarding the balance of trade-offs: “There are some supposed clear advantages in terms of maintenance”, says Andrea Amico, president of Jack Cooper Logistics. He notes “clear drawbacks in terms of the weight of the truck, given the way the regulation works in the US”, where the total weight of the rig plus the freight is fixed, so every pound added to an electric truck’s battery means one less pound of revenue-generating freight.

“Finding that balance is not immediate; the other thing is infrastructure – how easy will it be to find a charging station and how much time will it take to charge?”, asks Amico. In terms of adoption, he believes “it’s too early for us to say if we’re going to be committing to electric-only mode. I think you’ll see things move faster in Europe

mainly due to a sensitivity to carbon emissions that frankly we don’t have, unfortunately, in the United States.”

### Electric roads

An alternative to batteries and a charging network is to electrify the road itself. Two basic technologies are involved: “Induction”, whereby electricity is transferred wirelessly from the road to the vehicle – a process which, for now, appears prohibitively expensive and requires special roads; then there’s “Conductive”, where there’s a physical electrical link between the vehicle and the road.

Two different conductive systems have already been trialled in Sweden. In June 2016, a two-kilometre strip on the E16 motorway near Gävle was opened, wherein Scania electrified trucks were driven in open traffic, using conductive technology developed by Siemens. It’s the culmination of a cooperation between the Swedish government and the private sector, enabling trucks to operate as electric vehicles when on the electrified road and as regular hybrid vehicles at other times, running on biofuel.

A consortium of Swedish companies, eRoadArlanda (70 per cent state-financed), has built and tested a two-kilometre stretch of electrified road between Arlanda cargo terminal and Rosersberg’s logistics centre. The advantage of this is that any road vehicle type – trucks, coaches, vans, taxis and private vehicles – can use the system, as energy is transferred from the rail embedded in the road to the vehicle using a movable arm. CEO Hans Säll says: “We’re testing to see if it is possible to do these kinds of electric roads in the framework of our existing legislation and regulations. It’s a bit bureaucratic sometimes but it’s possible to do this.”

With haulage companies already invested in fleets of diesel trucks, could there be a viable path for them to modify their fleets to run on electricity? Säll says that it will differ from case to case: “It’s definitely possible, that’s exactly what we’ve done in our project; we bought a brand new diesel truck and converted it to 100 per cent electric and it didn’t cost a fortune, but in the long run it will be more cost effective if vehicle producers have big volumes – but it’s definitely possible.” Säll was referencing Apeldoorn-based

## The number of years before the transportation of goods by electric vehicles becomes ubiquitous

● 1–5 (Years) ● 5–10 ● 10–20 ● 20–30 ● 35+ ● It won’t

North America



MENA (Middle east and Africa)



UK and Europe



APAC (Asian Pacific)



Total



company e-Traction (acquired in 2016 by China's Tanhas Group), which carried out the conversion for eRoadArlanda. Therefore, there's a budding ecosystem poised to capture an upgrade path to electrification for pre-existing haulage vehicles.

### Barriers to adoption

Our survey showed that the UK and Europe are particularly concerned that the technology associated with electric roads is not yet sufficiently advanced, whereas in APAC, 52 per cent of respondents feel a lack of variety in available electric vehicles is a top-three barrier. According to Säll, the obstacles are mainly commercial rather than technical, and he thinks that even car manufacturers – perhaps with a vested interest in recouping their investment in fossil fuel technologies – are receptive to change.

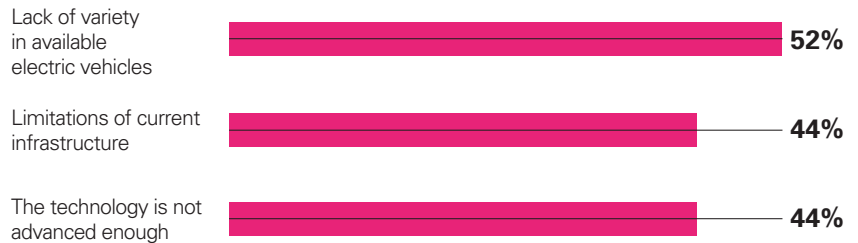
What's key, he says, is finding the right business model for electric roads: "Is it the energy producers or is it someone else who will finance this? I think the state will have to because it will, of course, cost money to implement."

“  
**We're testing to see if it is possible to do these kinds of electric roads in the framework of our existing legislation and regulations**

**Hans Säll,**  
 CEO, eRoadArlanda

### The top three barriers to adopting electric road vehicles varies between business types

#### Planners and Commissioners



#### Manufacturers and Service Providers



### Regulate to accumulate on electrification

The electrification of road transport is still in the early stages of development. This means the commercial adoption of electric technology is largely driven by regulation, such as prohibiting the future sale of petrol and diesel cars in France and Norway, or incentives such as grants or loans to fund car fleets in Scotland.

The need for state involvement to encourage uptake is likely to continue, with the first fully "electric roads" being funded and procured by regional or national governments. Similarly, the success of electric or other low-carbon vehicles is dependent on their ability to be produced affordably on a commercial scale, which will require appropriate government support. The real game-changer

for electric technologies will be when they become affordable enough to allow revenues generated from electricity sales to fund the design, construction, maintenance and operation of new infrastructure. Instead of tolls, operators would receive income from the electricity generated by road users.

This model could work for public and private sector operators, with transport infrastructure not only providing connectivity but also generating income. While this may be some way off, governments need to be exploring how they can facilitate the adoption and development of electrified transport now.

**Martin Gallaher**  
 Partner, Projects: Road, Rail and Aviation, UK, DWF

# Conclusion



**A** technological revolution is presenting transportation's stakeholders with powerful and disruptive new tools that can bring unprecedented levels of operational efficiencies and business advantages.

When setting out to produce this report, we decided to segregate the technologies, putting each one in turn under the microscope in order to probe their specific benefits. What emerged in the wake of the research findings and interviews was one overarching and irrefutable consensus that these technologies are potent business tools in themselves, but when fused together often create the catalyst for bigger disruptive leaps forward.

Are blockchain, AI, electric roads and big data really overhyped? The statistics said maybe. Our interviewees said hardly. They were

unanimous in their endorsement of the new technologies, to the extent that detractors confessed to having become evangelists as soon as productivity benefits became apparent.

Bombardier's Lynn West distilled this point in her comments on AI and big data:

"When we started the process I was a bit sceptical ... And then having seen how quickly it's done and how accurate the information was ... I was converted immediately, ... you're immediately on the front foot to get on with what you really want to do."

The instantaneous business benefits of these new technologies were similarly identified during discussions about blockchain. Blockchain is the secret sauce that everyone in logistics has been waiting for, thanks to its ability to bring real-time tracking

“  
**Technologies are potent business tools in themselves, but when fused together, create the catalyst for bigger disruptive leaps forward**



## Law must keep pace with the speed of technological change

Technological developments are revolutionising transportation. Big data analytics allows vast amounts of data to be interpreted using AI technology. Blockchain will connect the supply chain, securely sharing information between parties, creating a permanent digital public ledger of transactions. Electrification and the rise of the electric vehicle will enhance the sustainability of our road transportation, reducing emissions and fossil-fuel dependence.

As technology progresses rapidly, the law needs to adapt and keep pace. Laws and ethical practices have developed slowly. Changes that evolved over centuries now happen over a period of years. There is an increasing requirement for the law to

react and determine what is acceptable and what is unacceptable. How will the courts assess liability if a crewless ship, owing to defective software, powers into a jetty wall leading to property damage, death and injury? How will the courts decide whether a collision caused by an autonomous vehicle is the fault of the owner or down to a defective product? As the law, together with the regulatory framework, continues to align itself with new advances in transport technology in this era of unprecedented discovery, DWF's expert team of transport lawyers are well placed to provide advice and support.

**Jonathan Moss,**  
Partner, Head of Transport, DWF

of goods in transit throughout their entire journey and across multiple handovers from one entity to another, even across national borders.

As for the physical vehicular landscape as we enter the early 2020s, batteries are included in tomorrow's transportation. But there's likely to be a stark polarisation between urban and intercity adoption of "electric roads". Consumer propensity for online shopping, combined with corporate environmental sensibilities, is making electric vans an attractive solution for matching delivery of consumer goods and food supplies, while promoting eco-friendly credentials. But electrifying the highways with charging capability for the considerable energy requirements of large electric trucks requires power infrastructure on a phenomenal scale. And without

such infrastructure, manufacturers of conventional large trucks aren't in a hurry to invest heavily in electric counterparts – a classic chicken-and-egg scenario. Electrification of the actual roads is still at the experimental stage, and without cross-border standards and a viable business model adoption will be slow. Hence, the future of electric roads is still embryonic, as battery-powered vans start to populate the urban landscape.

What interviewees told us time and time again was that there is no single technology that gives us all the answers for tomorrow's transportation – it's all about smartly integrating combinations of technologies in appropriate ways for the task in hand. Blockchain promises to resolve the ever-growing threat of cyber-hacking and criminality; AI, when applied to business processes,

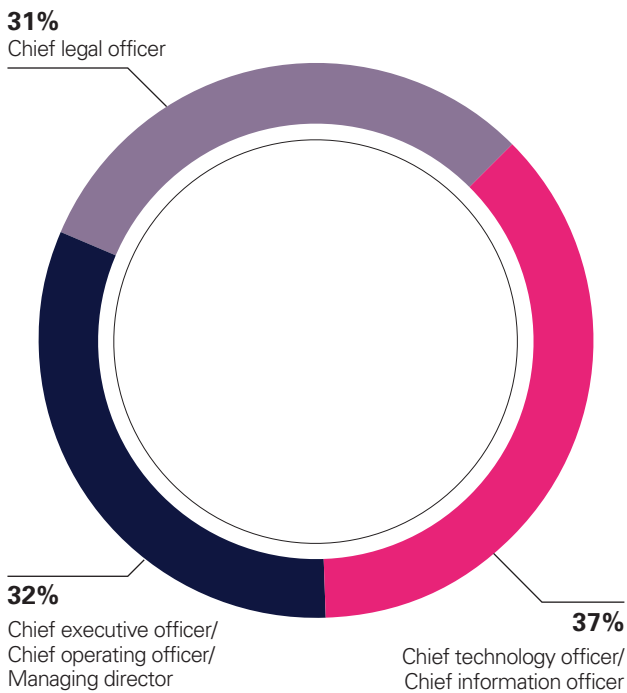
is increasingly proving its ability to bring efficiencies and free up human resources. Big data provides intelligence and context to AI and blockchain, and is already enabling optimised routing.

The journey into tomorrow's logistics landscape is already underway, and the technologies we've probed in this report have brought us to an inescapable conclusion: transport technology will deliver beyond the hype – it's already started to deliver the future.

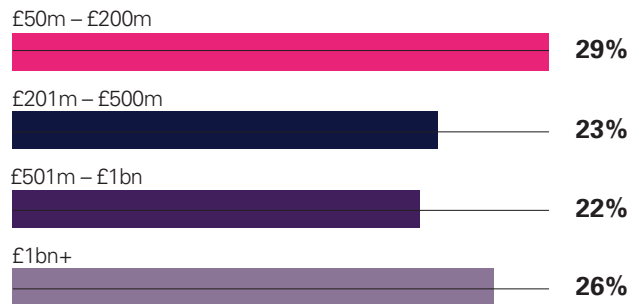
# Demographics

We surveyed 250 senior executives from transport businesses across 4 regions of the world

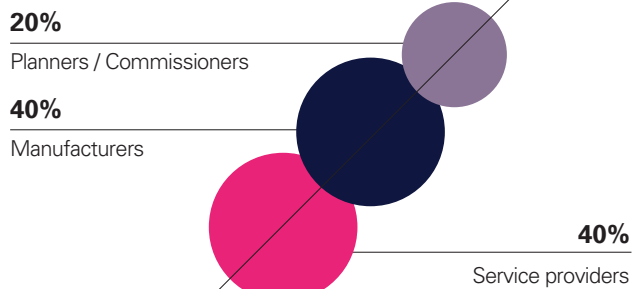
## Job roles of manufacturers and service providers across sea, road, air and rail transport



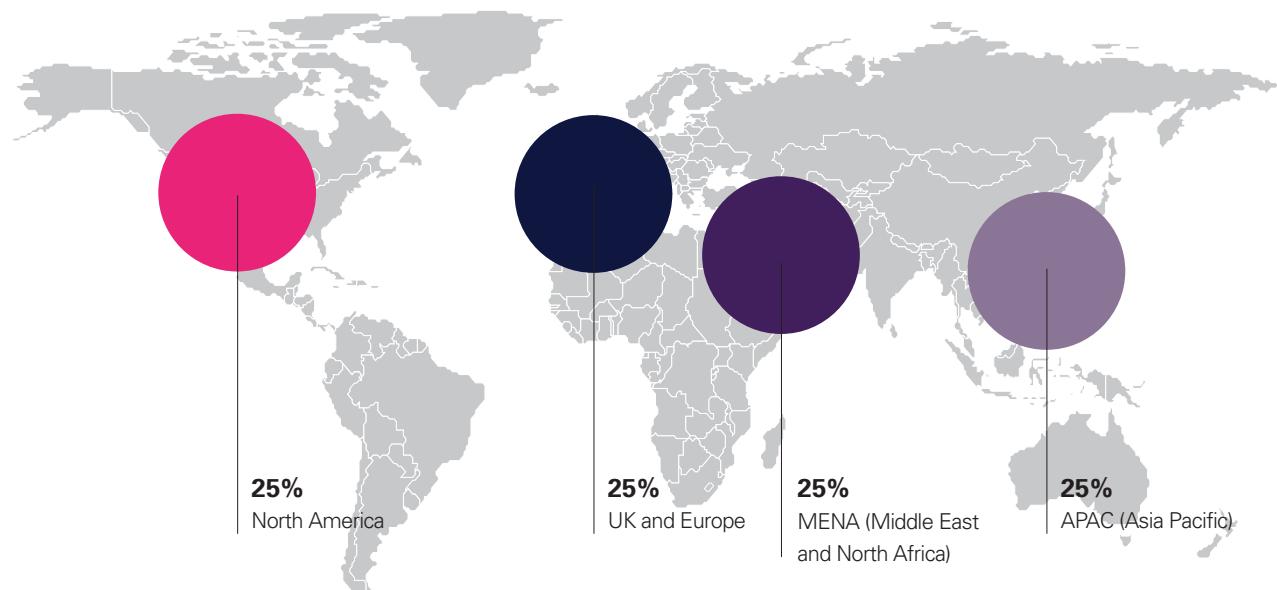
## Company turnover of manufacturers and service providers across sea, road, air and rail transport



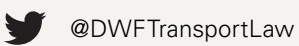
## Business type



## Primary location of operation







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