FUTURE SUPPLY CHAIN TECHNOLOGIES FOR THE EUROPEAN DELIVERY INDUSTRY 2021

TRIANGLE

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Welcome to

Supply Chain Technology Trends in the European Delivery Industry

Technologies that will drive supply chains forward in the future

It is a pleasure to share the results from our study on *Supply Chain Technology Trends in the European Delivery Industry*. This White Paper explores insights provided by senior executives from major transport and logistics organisations across Europe. It looks at how the industry currently uses and is planning to adopt new technology to the challenges they currently face in the light of market pressures and industry realities. The Paper is supported by desk research conducted by Triangle Management Services to provide industry and market context.

Focussing on all stages of the delivery industry - first, middle and last mile - our respondents included postal operators, parcels/express carriers and 3PLs, which in turn encompass a variety of supply chain services (freight transport, fulfilment, logistics etc). Ranging from global to national players, from the most technologically advanced to quite early adopters, serving both B2B and B2C markets, they are all passionate about how technology can improve their businesses.

I'd like to thank all participants for sharing their opinions and observations, and helping Triangle present an objective view of current trends in supply chain technology usage in the delivery industry.

Neil Jackson
CHIEF EXECUTIVE | TRIANGLE MANAGEMENT SERVICES

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EXECUTIVE SUMMARY

The logistics industry is going through a transformation, with an 'anything, anywhere, anytime' delivery goal, supported by an ever increasingly sophisticated array of supply chain technologies available to drive efficiency up and costs down. With the unprecedented events of the last 18 months, supply chain solutions are more critical to business success than they have ever been. Operations need to be as resilient and as agile as possible.

Delivery companies are using technology to get smarter, reduce operational costs and improve their customer service. Environmental sustainability factors, plus the pandemic-driven need to support health and safety protocols to protect employees and customers, are also adding to pressures on the industry and influencing all aspects of supply chain technology decisions – from first to final mile.

Bottom Line Motivations

Our survey showed that obtaining better efficiencies and cutting costs is the main rationale for trying new supply chain technologies for most respondents. However, investment approaches by delivery companies are generally cautious, with proven technologies more easily justified to the board. Gaining a competitive edge is also important to many carriers, and as part of this, using the latest technologies is part of the corporate strategy and image.

> **" ABOVE ALL, RESPONDENTS ARE PRIMARILY THINKING ABOUT EFFICIENCY AND PRODUCTIVITY GAINS WHEN SELECTING NEW SUPPLY CHAIN SOLUTIONS "**

First Mile Deciding Factors

Above all, respondents are primarily thinking about efficiency and productivity gains when selecting new supply chain solutions. Customer satisfaction is the next most important priority. However, keeping operating costs under control is a perennial hurdle for the delivery industry. Although three-quarters of respondents said this was one of their top three challenges in first mile operations, dealing with sorting issues was just as much a challenge.

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Logistics companies have to handle a wide range of traffic sizes and weights, particularly in the first mile, where goods may be palletised prior to being broken down into individually addressed items or re-configured for delivery to business premises. Therefore, a wide variety of technologies are used to support sorting, picking, packing and despatch preparation in sorting hubs and distribution centres. However, newer technologies, such as robotics, drones, IoT (Internet of Things) and artificial intelligence-based solutions still have a way to go for most of the European delivery industry.

Meeting That Promise

In the final mile, the majority of respondents run their own delivery operations and for three-quarters of them simply keeping up with e-commerce-fuelled demand for deliveries has been the most significant challenge in the last 12 months. Staffing and cost containment have also posed serious concerns.

Amongst those technologies that support delivery and distribution activities in the final mile, mobile devices play a major part in increasing operator efficiency, providing real-time data collection, track & trace, and gradually replacing paper-based systems. Moreover, the capabilities of hand-held technology are constantly expanding, to incorporate, for instance, photographic, contactless ePOD, GPS and voice applications.

Newer types of supply chain management technologies have not yet been fully embraced by large sections of the delivery and distribution industry, such as network visibility platforms, autonomous delivery vehicles, and AI - and IoT-based solutions for improving transport efficiencies.

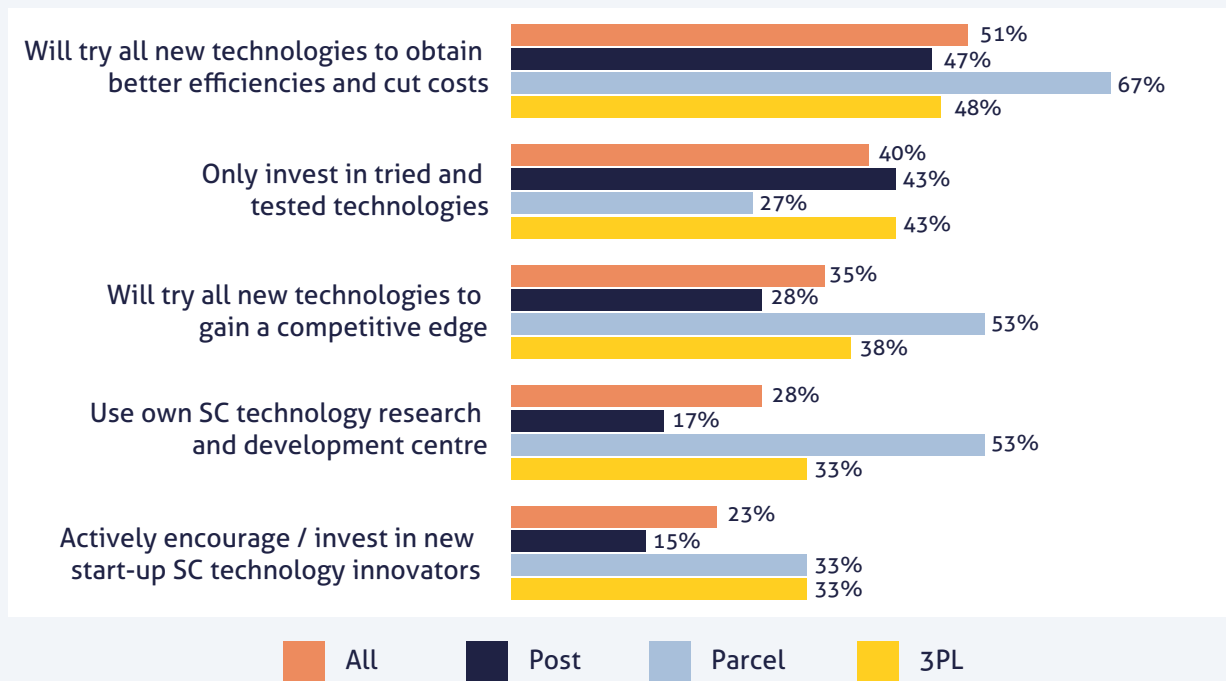"ADAPT OR PERISH"
H.G. WELLS

SUPPLY CHAIN TECHNOLOGY APPROACHES

*O*btaining better efficiencies and cutting costs is the main rationale for trying new supply chain technologies for just over half the respondents. However, investment approaches are generally cautious, with 40% only *investing in tried and tested technologies.*
The difference between the public and private sectors is markedly different. The private parcels operators were far more likely (67%) to *try all new technologies to obtain better efficiencies* and for nearly 53% of them *gaining a competitive edge* is part of their approach to trying all new technologies.

A high proportion (53%) of parcels operators also said they had their *own supply chain technology R&D facilities* and, similar to the 3PLs, 33% have *new technology incubation laboratories.*

The 3PL/Logistics sector appears to sit partway between the posts and parcel sectors in their approach; as cautious as postal operators, but keen to try new technologies to *gain a competitive edge.*

Company Approach to Supply Chain Technology

Will try all new technologies to obtain better efficiencies and cut costs
- All: 51%
- Post: 47%
- Parcel: 67%
- 3PL: 48%

Only invest in tried and tested technologies
- All: 40%
- Post: 43%
- Parcel: 27%
- 3PL: 43%

Will try all new technologies to gain a competitive edge
- All: 35%
- Post: 28%
- Parcel: 53%
- 3PL: 38%

Use own SC technology research and development centre
- All: 28%
- Post: 17%
- Parcel: 53%
- 3PL: 33%

Actively encourage / invest in new start-up SC technology innovators
- All: 23%
- Post: 15%
- Parcel: 33%
- 3PL: 33%

Legend: All | Post | Parcel | 3PL

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Importance of Supply Chain Technology Innovation for the Delivery Industry

Many R&D initiatives regarding inner city logistics and carbon neutral transport, for instance, are government-funded in Europe, but equally many of the larger post, parcel and logistics companies invest in new supply chain technologies because they have a vested interest. It provides early access to new developments that could bring improved efficiencies, competitive advantage or play to their 'innovative image'.

Thus, there are innovation labs, or funding initiatives to support start-up enterprises involved across a wide range of technologies, from harnessing new power sources for vehicles, to robotics, blockchain, artificial intelligence, robotics, IoT applications and new picking solutions.

Looking more tactically, there is also a growing trend for logistics operators to partner with external trusted advisors, such as Panasonic and Zetes, to show them innovative approaches.

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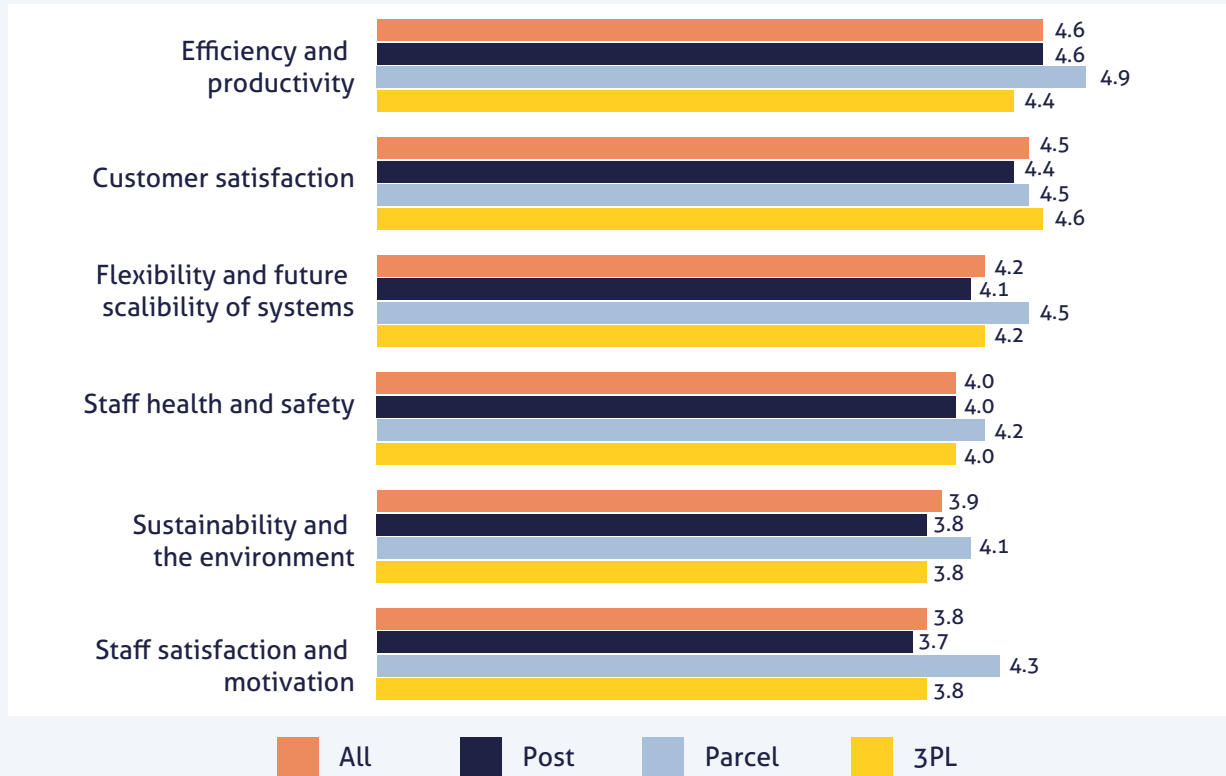
KEY INFLUENCES ON SUPPLY CHAIN TECHNOLOGY DECISIONS

E*fficiency and productivity* is the most important consideration for respondents overall when assessing new supply chain management technologies. This is closely followed by *Customer satisfaction*.

Parcel operators stand out as rating *Efficiency and productivity* as the most important influence on approaches to new supply chain management technologies for them, whereas *Customer satisfaction* is of the highest importance for 3PLs as well as for postal operators.

GREATER EFFICIENCY AND PRODUCTIVITY OF NEW TECHNOLOGIES SCORES THE HIGHEST - 4.6 OUT OF 5.0

New Supply Chain Technology Influencing Factors

Average importance score from 1 to 5

Factor	All	Post	Parcel	3PL
Efficiency and productivity	4.6	4.6	4.9	4.4
Customer satisfaction	4.5	4.4	4.5	4.6
Flexibility and future scalibility of systems	4.2	4.1	4.5	4.2
Staff health and safety	4.0	4.0	4.2	4.0
Sustainability and the environment	3.9	3.8	4.1	3.8
Staff satisfaction and motivation	3.8	3.7	4.3	3.8

Legend: All · Post · Parcel · 3PL

To what extent would you say that your company's approach to new supply chain technology is influenced by the following factors? Please rate in importance 1-5, where 5 is influenced greatly and 1 is of no consideration at all.

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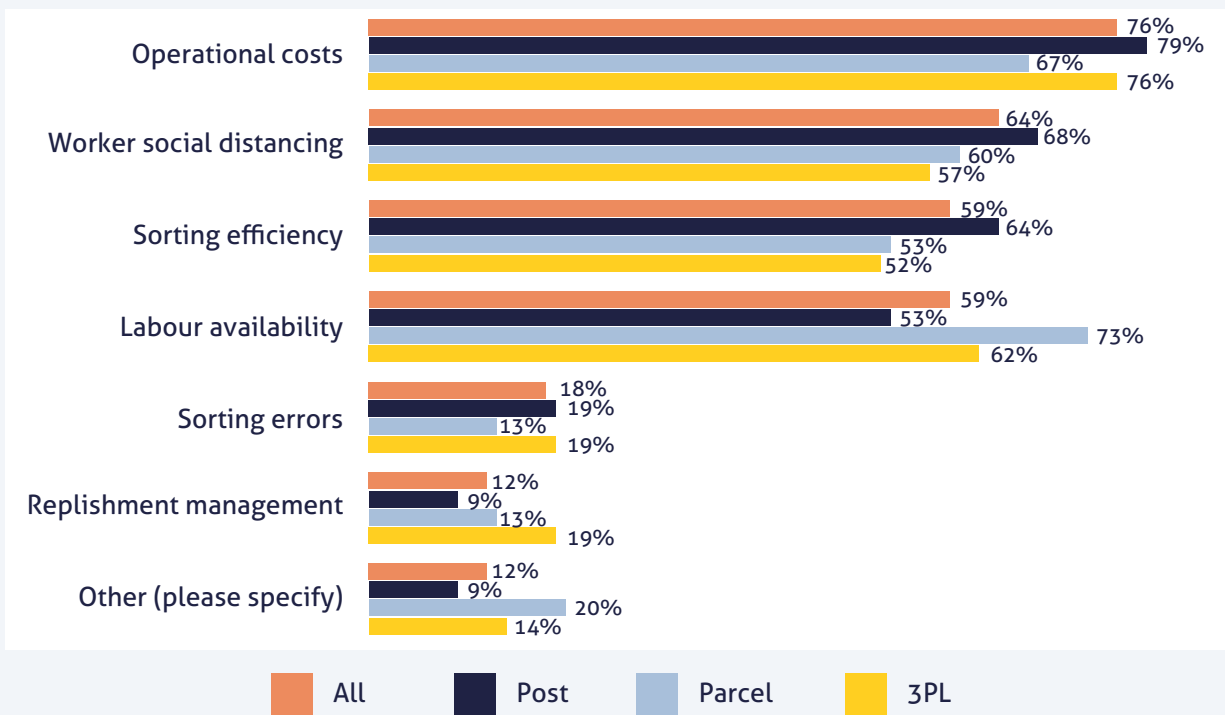
FIRST MILE CHALLENGES

Keeping *operating costs* under control is a perennial hurdle for the delivery industry. Three-quarters of respondents cited this as one of their top three challenges in first mile storage, sorting and fulfilment operations. However, dealing with *sorting issues*, whether just improving sorting efficiency or resolving sorting errors/sorting machine breakdowns was just as much a challenge as managing *operational costs* (77% of respondents overall).

The next most prevalent hurdle (64% of respondents) stemmed from handling *Covid-related issues*, such as worker social distancing. *Labour availability* was an issue for 59% of companies answering our survey.

Sorting issues, operational costs and worker social distancing were most problematic in the postal sector, whereas labour availability challenges appeared to be most pronounced amongst parcels operators.

59% OF RESPONDENTS SAID THAT LABOUR AVAILABILITY WAS A CHALLENGE

Main Challenges in First Mile Storage, Sorting and Fulfilment Operations

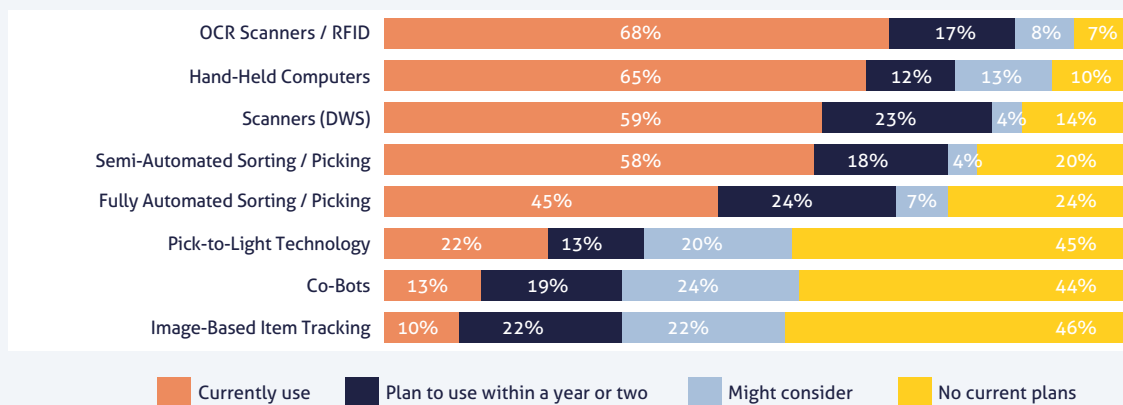| Challenge	All	Post	Parcel	3PL
Operational costs	76%	79%	67%	76%
Worker social distancing	64%	68%	60%	57%
Sorting efficiency	59%	64%	53%	52%
Labour availability	59%	53%	73%	62%
Sorting errors	18%	19%	13%	19%
Replishment management	12%	9%	13%	19%
Other (please specify)	12%	9%	20%	14%

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TECHNOLOGIES SUPPORTING THE FIRST MILE

Automating logistics is more complex than in a manufacturing environment, where the same process is repeated across a limited number of product types. Logistics companies have to handle a wide range of traffic sizes and weights, particularly in the first mile, where goods may be palletised prior to being broken down into individually addressed items or re-configured for delivery to business premises.

In sorting hubs and distribution centres across respondents overall, certain technologies are widely used for sorting, picking, packing and despatch preparation; *OCR barcode label scanners / RFID visual tags* (67%), *Hand-held computers* (65%), *Scanners for dimensioning and weighing/DWS* (59%) and *Semi-automated sorting and/or picking* (58%).

Current usage is still low for *Image-based item tracking*, including *Augmented Reality goggles* (10%), *Co-Bots – to work alongside staff, e.g. Autonomous Mobile Robots* (13%) and *Pick-to-light technology* (22%). Moreover, less than half of all respondents have these technologies in their roadmap.

Technologies used for Sorting, Picking and Despatching - All

Technology	Currently use	Plan to use within a year or two	Might consider	No current plans
OCR Scanners / RFID	68%	17%	8%	7%
Hand-Held Computers	65%	12%	13%	10%
Scanners (DWS)	59%	23%	4%	14%
Semi-Automated Sorting / Picking	58%	18%	4%	20%
Fully Automated Sorting / Picking	45%	24%	7%	24%
Pick-to-Light Technology	22%	13%	20%	45%
Co-Bots	13%	19%	24%	44%
Image-Based Item Tracking	10%	22%	22%	46%

[1] Respondents may be using both Semi- and Fully-automated sorting solutions in different hubs, due to transitional upgrade plans or different sorting needs. Also, chart bars may not total 100% due to rounding of percentage numbers.

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The differences by company activity across the group of respondents is quite clear, with Postal operators demonstrating a higher usage level for *OCR scanners/RFID, DWS scanners* and both *Semi- and Fully-automated sorting* both currently and for near-term plans. However, *Image-based item tracking, Co-Bots* and *Pick-to-light* technology do not feature highly for them. This is probably because the mainstream business model of the Postal operator is focussed on sorting and delivery, rather than e-commerce picking., Possibly, the benefits of these technologies are not well understood by many companies yet.

COMPARED WITH THE LOGISTICS INDUSTRY AVERAGE, PARCEL CARRIERS SHOW A MUCH HIGHER CURRENT AND PLANNED USAGE LEVEL FOR HAND-HELD COMPUTERS

Postal operators have a long history and vested interest in fixed sorting issues, which have been enhanced over the years to improve speed and capacity handling. One of the main drivers for recent sorting upgrades has been the need to adapt letter-mail sorting systems to small package handling due to the increase in e-commerce traffic and the decline in letters. Secondly, since the start of 2021, the requirement to read parcel labels correctly and process inbound and outbound EU traffic liable for taxes and customs duties efficiently has become critical. Hence, many European postal operators have been investing in multi-format sorters, as well as label readers combined with software that calculates monies owed and determines how the parcel is processed.

Compared with the logistics industry average, Parcel carriers, on the other hand, show a much higher current and planned usage level for Scanners for dimensioning and weighing (100%), Hand-held computers (87%), and OCR scanners (86%).

Because of the Varied Needs of 3PLs, our survey displayed a similar current and planned usage level as Parcel Carrier Interests for Hand-held computers (86%) and mirrored Postal Operators with regards to Scanners for dimensioning and weighing (67%). Usage and interest levels in some of the automated sorting and picking technologies were low, but almost a quarter of 3PLs displayed potential interest ('Might consider') in Image-based item tracking.

Our survey showed the highest usage level of Automated Picking functions is amongst Parcels Carriers, followed by 3PLs; both groups are often involved in contract logistics and e-fulfilment. There are a number of such companies investing in pick-to-light technology. Users mention improving speed, accuracy and working conditions, as well as meeting innovation strategy goals.

Given the wide array of emerging logistics technologies, operators are creatively using or trialling Mix and Match Usage technologies to solve their technical challenges and meet their needs for economy, speed, accuracy and competitiveness. For instance, one leading postal operator has been using voice-assisted sorting of non-sortable items, which provides the operative with information such as route, sequence number and QR code all at once.

PARCEL CARRIERS HAVE
THE HIGHEST USAGE LEVEL
OF AUTOMATED PICKING
FUNCTIONS

Although robotics is lagging amongst the most adopted technologies, there are recent examples of companies using 'Goods-to-man' type technology for picking, where co-bots assess the distance between objects to be picked and are being piloted to automate complex picking processes needed for small-scale orders across a wide number of product categories, or are used in picking work stations equipped with vision technology.

Other types of order preparation automation include 'wearable technology', such as Augmented Reality Glasses, intelligent scanning gloves and 'passive'/'active' back supports. A number of logistics companies have been using these types of devices to maximise picking productivity and reduce error rates. 'Passive' back supports ('exoskeletons') are being used to improve the health and safety of warehouse workers, but 'active' technology is also being tested, to pre-empt any strenuous lifting work.

EXOSKELETONS ARE BEING USED TO IMPROVE THE HEALTH AND SAFETY OF WAREHOUSE WORKERS

KEEPING SAFE

As a result of the pandemic, the majority of respondents (61%) said they were already using various technologies and products to support health and safety protocols such as physical distancing, contact tracing, face mask usage monitoring, equipment sanitisation, etc. A further 7% had plans/or might consider (8%) implementing such solutions. However, just under a quarter had no current plans.

There is wearable technology, such as distance warning devices, which sound an alarm if two people get too close. Some carriers provide these to staff at parcel sorting centres, but they are reportedly costly. Proximity sensors and cameras are being installed in fulfilment centres to monitor employee compliance with face mask wearing and social distancing rules. There are even in-house developed track and trace systems in use, which require staff and visitors to use their smartphones to scan a QR code which links directly to a contact tracing type survey. Temperatures are then monitored before access is granted.

In the final mile, in order to protect customers and staff alike, signature proof-of-delivery capture on the doorstep is largely being replaced by barcode scanner apps. Alternatively, the addressee can be sent a 6-digit confidential code and a QR code to show the courier upon delivery.

Other types of contactless delivery include to an unattended Smart Parcel Locker or to a Car boot (mentioned later in this report). 'Smart lock' technology, which enables delivery to unattended locations or safe places such as vehicles, private garages, drop boxes, or hallways, is another alternative contactless delivery solution being tested in Europe.
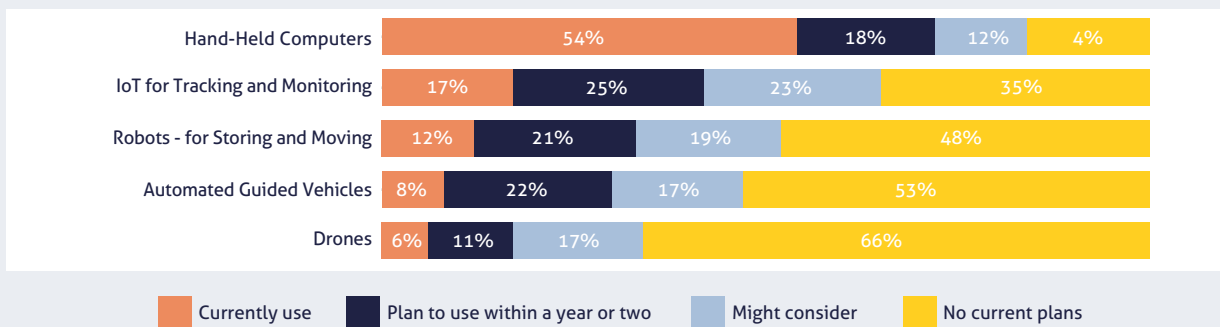
INVENTORY CONTROL AND GOODS MOVEMENT

Usage of *Hand-held computers* for goods-in, item look up, inventory checking, and put-away is quite well established; 54% of respondents currently use them and a further 18% plan to introduce them within a year or two.

IoT (Internet of Things) with sensors for tracking and monitoring is currently used by 17%, whilst a quarter have plans to introduce such technology.

Technologies used for Inventory Control and Moving Goods - All

Technology	Currently use	Plan to use within a year or two	Might consider	No current plans
Hand-Held Computers	54%	18%	12%	4%
IoT for Tracking and Monitoring	17%	25%	23%	35%
Robots - for Storing and Moving	12%	21%	19%	48%
Automated Guided Vehicles	8%	22%	17%	53%
Drones	6%	11%	17%	66%

Legend: ■ Currently use   ■ Plan to use within a year or two   ■ Might consider   ■ No current plans

Current usage of robotic technology is low, whether *Robots - for storing and moving* (12%), *Autonomous forklift truck solutions* (8%) and *Drones - for automated inventory checks, surveillance and inspection etc.* (6%). Planned usage, however, shows promising potential interest with *Autonomous forklift truck solutions* (22%) and *Robots* (20%).

Postal operators show a lower usage and need level for inventory control and goods movement technologies than the other logistics sectors. However, nearly 60% expressed interest in *Robots for storing and moving*, whereas for Parcel Carriers it was 40% and 48% of 3PLs using, planning or considering introduction.

At 67%, Parcels carriers have the highest current usage levels of *Hand-held computers* for tracking item movements. A third of those participating in the survey already use *IoT with sensors for tracking and monitoring*, and 27% have plans to introduce *AGVs*.

> NEARLY 60% OF POSTAL OPERATORS EXPRESS INTEREST IN ROBOTS FOR STORING AND MOVING

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AMRs versus AGVs

An AMR (Autonomous Mobile Robot) is a robot that operates without direct driver input or pre-configured programs to move and put away goods. An AGV (Automated Guided Vehicle) is an unmanned electric vehicle that is controlled by pre-programmed software to move materials around a facility.

3PLs also show a high current usage level of *Hand-held computers* in distribution centres (67%), but for the newer technologies the 3PLs show serious intentions to implement *IoT with sensors for tracking and monitoring* (29%) and *AGVs* (29%).

Robots for storing and moving goods show increasing potential for multi-tasking, i.e., moving, picking and packing. Their flexibility and scalability also mean that they can be deployed in smaller areas to move heavy mail bags, for instance, where conveyors cannot be installed, and forklift trucks cannot be manoeuvred.

There are interesting advances in the technology for *Automated Guided Vehicles* (AGVs also known as automated forklift trucks), expanding their flexibility and potential, including remote operation. One leading parcels carrier has been testing a combination of conveyors (with scanners and barcode readers for parcel sequencing) and AGVs to automate the process of loading parcels into delivery vans, which is usually a manual job.

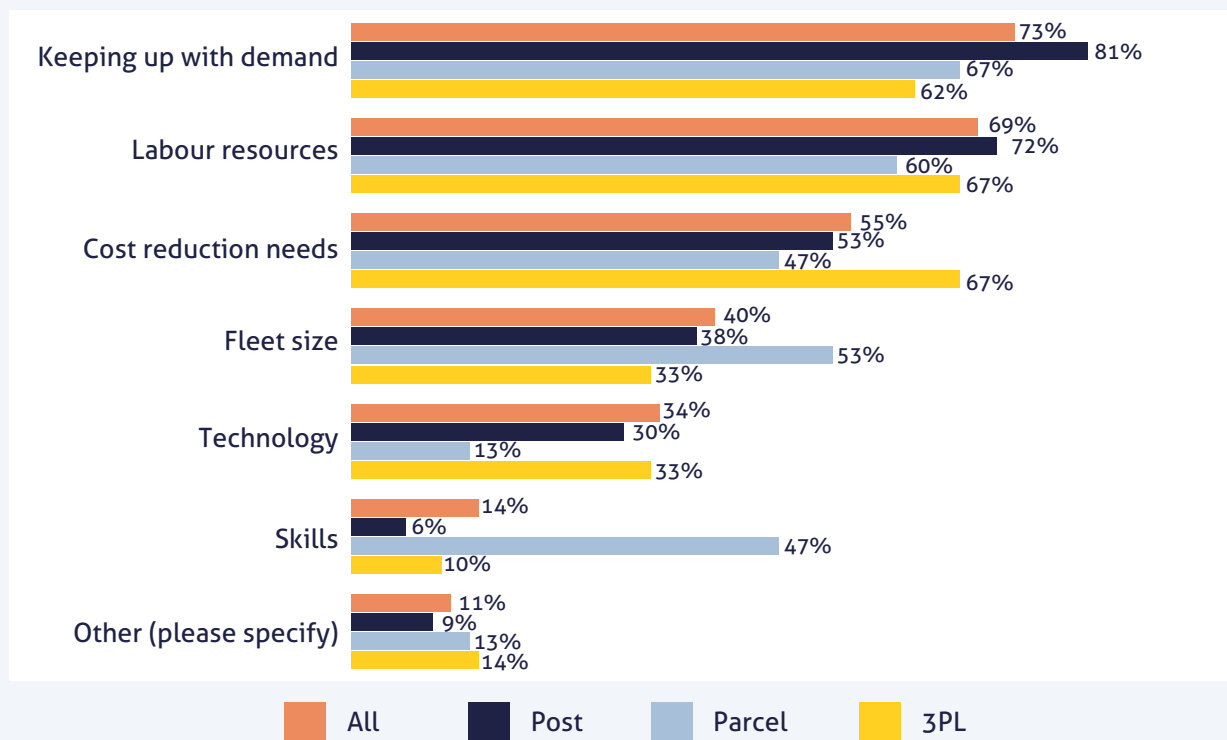In general, 3PLs are currently the most likely to be using innovative technologies for managing inventory.

1 IN 5 RESPONDENTS PLAN TO INTRODUCE AMRs OR SIMILAR SOLUTIONS IN THE NEAR FUTURE

3PLS ARE THE MOST LIKELY TO BE USING INNOVATIVE TECHNOLOGIES FOR MANAGING INVENTORIES

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FINAL MILE DELIVERY CHALLENGES

The majority of respondents run their own last mile delivery operations and for three-quarters of them simply keeping up with e-commerce-fuelled demand for deliveries has been the most significant challenge in the last 12 months. Having sufficient staff involved in last mile operations has been an issue for almost 70% of them, whilst 55% have found the continuous need to control or reduce costs a serious concern.

Main Challenges within Final Mile Delivery

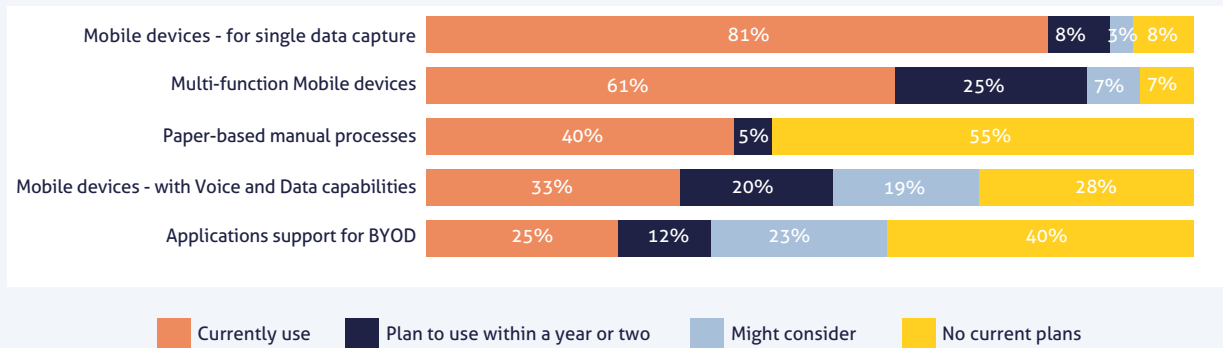| Challenge	All	Post	Parcel	3PL
Keeping up with demand	73%	81%	67%	62%
Labour resources	69%	72%	60%	67%
Cost reduction needs	55%	53%	47%	67%
Fleet size	40%	38%	53%	33%
Technology	34%	30%	13%	33%
Skills	14%	6%	47%	10%
Other (please specify)	11%	9%	13%	14%

Legend: All, Post, Parcel, 3PL

Postal operators would appear to have an above average challenge *Keeping up with demand* (81%) and building adequate *Labour resources* (72%). Parcel carriers said that maintaining an optimum *Fleet size* (53%) and recruiting the right *Skills* (47%) were the most challenging aspects of final mile delivery. This compares with 3PLs, who are most taxed by keeping *Costs* down (67%) and getting the right *Technology* (33%).

MOBILE DATA CAPTURE IN THE FINAL MILE

Our survey asked about a variety of technologies that support delivery and distribution activities in the final mile. Mobile devices play a major part in increasing operator efficiency, supplying in-transit data collection updates, real time track & trace notifications, and eventually replacing paper-based systems. A high proportion (81%) of respondents currently use *Mobile devices – for single data capture applications* (e.g., track & trace with ePOD), and a further 8% have plans to implement them.

Multi-function Mobile devices are the second most prevalent devices - 60% of respondents currently deploy them and a further 25% are planning to use them. *Mobile devices with Voice and Data capabilities* are far less common – a third of respondents use them today and 20% plan to use them.

Data Capture Technologies for Delivery and Distribution - All

Technology	Currently use	Plan to use within a year or two	Might consider	No current plans
Mobile devices - for single data capture	81%	8%	3%	8%
Multi-function Mobile devices	61%	25%	7%	7%
Paper-based manual processes	40%	5%		55%
Mobile devices - with Voice and Data capabilities	33%	20%	19%	28%
Applications support for BYOD	25%	12%	23%	40%

■ Currently use   ■ Plan to use within a year or two   ■ Might consider   ■ No current plans

Postal operators and Parcels carriers have a high usage level of *Mobile devices for single data capture* (85%-87%).

Across the three groups, Parcel carriers show the highest usage of *Multi-function mobile devices* (87%) and *Mobile devices with Voice and Data capabilities* (47%) and a further 27% have plans to add such devices within the next two years.

Paper-based *manual processes* are still used by 40% of respondents, Although current usage may be a little higher amongst Postal operators and Parcel carriers, *Paper-based systems* are of no future interest for most delivery companies (55%).

Multi-Usage of Mobile Devices

Due to the ever-expanding capabilities of Hand-held technology, its usage is widespread in the logistics industry. Some respondents (14%) that answered this question use four different mobile technologies, whilst 35% use two types.

The recent trend in mobile technology has been towards the incorporation of high performance scanning and network communications to improve efficiency, accuracy and real time information. This supports other applications, so as to scan multiple parcels at once, use GPS tracking or add an augmented reality view that will make vehicle loading more efficient.

Various carriers opt for handheld devices to meet their individual needs. Some are using imaging software so that delivery staff are able to read and decode linear and 2D barcodes quickly and capture photographs for proof of delivery and parcel condition. Hand-held terminals offer some postal operators the ability to provide simple post office transactions on the doorstep, such as bill payments, cash withdrawals and mail despatches.

14% OF RESPONDENTS USE FOUR DIFFERENT MOBILE TECHNOLOGIES IN THE FINAL MILE

HAND-HELD TECHNOLOGIES ARE WIDELY USED IN THE LOGISTICS INDUSTRY DUE TO THEIR EVER-EXPANDING CAPABILITIES
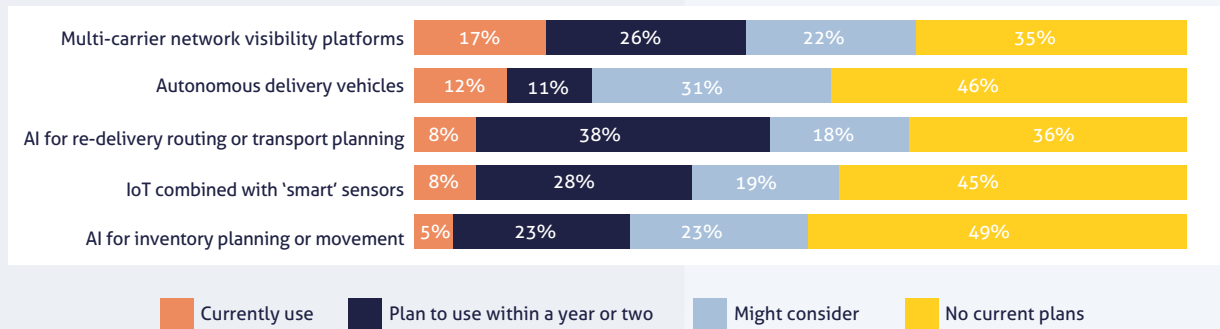
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EMERGING TECHNOLOGIES FOR DELIVERY AND DISTRIBUTION

Other types of supply chain technologies have not yet been fully embraced by large sections of the delivery and distribution transport industry, such as *Network visibility platforms, Autonomous delivery vehicles, AI and IoT-based solutions* for improving transport efficiencies, reducing costs and smarter asset management.

Other Delivery and Distribution Transport Technologies - All

	Currently use	Plan to use within a year or two	Might consider	No current plans
Multi-carrier network visibility platforms	17%	26%	22%	35%
Autonomous delivery vehicles	12%	11%	31%	46%
AI for re-delivery routing or transport planning	8%	38%	18%	36%
IoT combined with 'smart' sensors	8%	28%	19%	45%
AI for inventory planning or movement	5%	23%	23%	49%

Overall, *Multi-carrier network visibility platforms* were currently used by 17% of respondents, with a further 27% planning to introduce this technology and 22% who might consider it. Delivery companies still remain unconvinced of the merits of *Autonomous delivery vehicles.* Although 12% of respondents currently use them, only 11% have plans to introduce them, but just under half have no plans at all for them. Unlike *AI for re-delivery routing or transport planning*, where current take-up is low (8%), but 37% have plans to introduce this type of technology within the next year or two. The pattern is similar for *IoT combined with 'smart' sensors and the use of AI for inventory planning or movement*; very low current usage (5%-8%) but future implementation by 23%-28%.

46% OF RESPONDENTS HAVE NO CURRENT PLANS FOR AUTONOMOUS DELIVERY VEHICLES

The picture is different for the various logistics sectors, according to their needs. Postal operators, for example, show a higher than average current usage of *Autonomous delivery vehicles* (13%), but although usage of *AI for re-delivery routing or transport planning* is low now (6%), future usage is high, with 40% looking to introduce this smart software.

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With intense competitive pressures in their sector, Parcel carriers display the highest level of usage and interest in all of these technologies. *Multi-carrier network visibility platforms* are of highest interest; 60% either use or plan to introduce this software. *AI for re-delivery routing or transport planning* is also attractive, with 54% likely to be using it in the medium term. This sector's attitude to *Autonomous delivery vehicles* is the most receptive, with only 20% saying they have no plans for this form of delivery vehicle.

The 3PL segment would appear to be the slowest to adopt these technologies, but this may be due to the wide range of services offered by the companies in our survey. *Multi-carrier network visibility platforms* are currently used by nearly a quarter of them and a further 43% have definite plans or might consider this type of software in the future. However, the majority are at the early implementation stages or have no current plans to introduce most of the other technologies Usage of *Autonomous delivery vehicles* by the post and parcel sectors is still largely experimental in Europe, where out-of-sight drone flights is of greater importance than ground-based delivery robots, which appear to be more of interest by retailers for hyperlocal deliveries. Notable examples include medicine deliveries to remote areas.

THERE ARE A WIDE RANGE OF AI AND IoT APPLICATIONS USED BY THE DELIVERY INDUSTRY RANGING FROM ROUTE OPTIMISATION TO ASSET TRACKING

In the area of *AI for re-delivery and transport planning*, there are a wide range of AI applications used by the delivery industry from route optimisation to address verification. Artificial intelligence-based machine-learning tools can determine the likelihood of delivery delays, plan postal routes and send delivery ETAs, thereby providing better visibility to consumers.
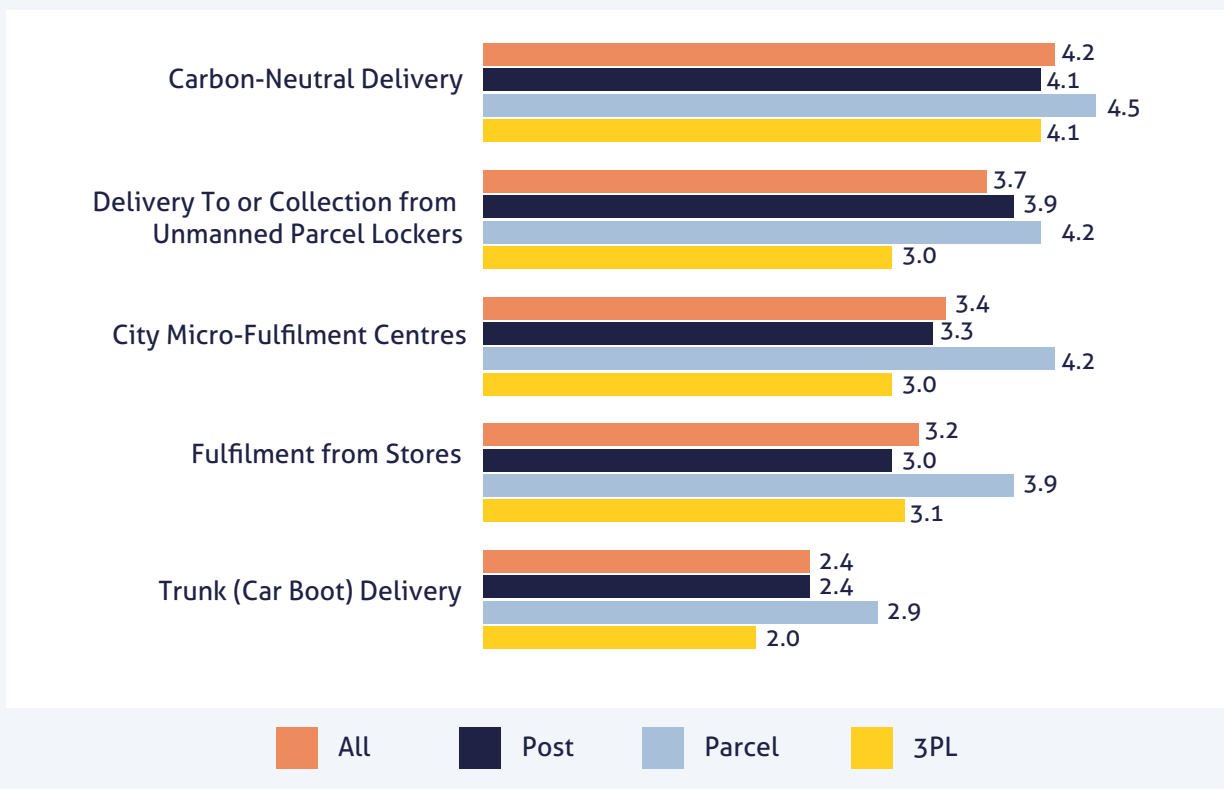
IoT combined with smart sensors enables real-time supply chain visibility for smart shipments, asset tracking and improving facilities. This technology is already being used by one delivery company to detect whether mailboxes are empty in order to optimise collections during the last-mile delivery round, and by another carrier to monitor the location of their equipment and vehicles nationwide, even outside their own supply chain.

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ENVIRONMENTAL AND SOCIAL RESPONSIBILITY

Carbon-neutral delivery in general was of the greatest importance to all respondents. Delivery to or collection from *Unmanned parcel lockers* was seen as the next most important way forward for sustainable and environmental delivery. *Fulfilment from alternative locations*, such as stores and city micro-fulfilment centres was felt to be of moderate importance for the future. However, possibly because it is still in its infancy and the practicalities still not resolved, *Delivery to a car boot*, was ranked as of least importance to future logistics strategies.

Key Options for Environmentally Friendly Delivery

Average importance score from 1 to 5

Option	All	Post	Parcel	3PL
Carbon-Neutral Delivery	4.2	4.1	4.5	4.1
Delivery To or Collection from Unmanned Parcel Lockers	3.7	3.9	4.2	3.0
City Micro-Fulfilment Centres	3.4	3.3	4.2	3.0
Fulfilment from Stores	3.2	3.0	3.9	3.1
Trunk (Car Boot) Delivery	2.4	2.4	2.9	2.0

Legend: All · Post · Parcel · 3PL

Compared with the other two logistics sectors, Parcel carriers saw most types of environmentally friendly delivery options as very important. Unmanned parcel lockers were quite an important part of Postal operator future distribution strategies, but 3PLs said that general carbon neutral delivery was the only serious option for them.

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Fleet wise, most operators have well established plans for reducing emissions through use of various *Carbon-neutral last mile delivery* vehicles (electric vans, cargo bikes and pedal-powered bicycles). For the first mile, hydrogen gas powered trunking vehicles are one of the transport options with interesting potential.

Partly in response to the pandemic, there has been greater interest in contactless delivery. Most last mile delivery operators already run their own or have access to *Unattended smart parcel lockers.* In continental Europe, particularly in Scandinavia, these constitute the default e-commerce delivery option. The latest generation of parcel lockers offer a touch free solution, whereby the consumer can send or take delivery of a parcel using a QR code on a smartphone. Other types of contactless delivery include to a Car boot, where a number of trials between parcels carriers and car manufacturers are currently running.

Fulfilment from inner city micro-depots is an attractive solution for shortening the last mile delivery distance to city dwellers. As postal and parcel carriers have hyperlocal delivery expertise, a range of city micro-depot initiatives have sprung up. Mobile micro-hubs are being trialled, whereby, delivery vans act as dynamic delivery hubs that collect orders from a depot and then briefly stop at strategic locations identified as the most efficient for each batch of orders. Foot couriers – and potentially bicycle couriers, drones and autonomous robots – then fulfil the last leg of each delivery.

Fulfilment from Stores is also on the rise, particularly in the grocery sectors where there is a need to either shrink the delivery time (due to short life span of the product) or to minimise real estate costs while meeting the needs of on-demand ordering. It is an area that 3PLs are best able to support, with their retail distribution expertise, though they often have to partner with local couriers for final mile delivery.

PARTLY IN RESPONSE TO THE PANDEMIC, THERE HAS BEEN GREATER INTEREST IN CONTACTLESS DELIVERY

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FINAL THOUGHTS

Our research presents a snapshot in time

It shows an industry in a perpetual state of development, to improve efficiencies, minimise operational costs meet the promise of delivering the goods to the right place, in perfect condition and on time. And the pressures are coming from all directions – customers, competitors, investors and government.

Technology, deployed carefully, can support these goals, but it does require an implementation plan, so that the right skills, timetable and economic justifications are factored in. And one technology does not suit all, as each sector of the logistics industry has different needs, because of the types of traffic handled, customers served, and services provided. That is why we see a variety of solutions being used and piloted.

With so many technologies now available it is essential for businesses to identify the right partner to work with, so as to deploy the best technology for improving operational efficiencies.

The delivery industry stresses the importance of efficiency and productivity, plus scalability of systems, because of the rising volumes of e-commerce items to process and the need to handle peak periods. Older sorting systems have traditionally been less flexible in terms of capacities and changing needs. However, new technologies (e.g., high performance scanners, sensors etc) are able to extend the life or change the use of some of these systems.

Meanwhile, a wide array of more flexible supply chain technologies is available – from autonomous vehicles to AI- and IoT-enabled solutions – to help overcome some of the industry's challenges today and tomorrow. And just like the delivery industry, the technologies are developing too.

"The research shows that innovative technologies are a key part of the corporate strategy for many organisations. We strongly believe that intelligent technology solutions can be a game changer in driving operational efficiency for the entire supply chain. The journey to a complete digital logistics future has started and we are ready to collaborate with and support logistics organisations utilising all our knowhow and capabilities to make this road smart and deliverable."

SHUSUKE AOKI | CHIEF TRANSFORMATION OFFICER | PANASONIC BUSINESS EUROPE

RESEARCH METHODOLOGY

Panasonic and Zetes commissioned Triangle Management Services to conduct this study into the supply chain management technologies being used and of future interest to European logistics companies. From early March to the end of April 2021,

Triangle ran an online survey across postal operators, parcels carriers, freight, logistics and 3PLs, and received views from 83 respondents at 59 different organisations across 32 countries (including Crown Dependencies).

Where they had sorting hubs, warehouse facilities etc, 68% of respondents had over 5 distribution centres. Where they operated their own delivery fleets, 83% had over 100 vehicles.

The online survey was supported by desk research into various supply chain management technology developments, supplier innovations and logistics industry usage cases, so as to inform the report further.

The respondent base segmented as follows:

Company Type	Count
Postal Operators	47
Parcel Carriers	15
3PLs	21

The majority of respondents (58%) came from large organisations with over 5,000 employees

Employee Size Bands	Percentage
5,000+	58%
1,001 - 5,000	10%
251 - 1,000	17%
1 - 250	16%

FUTURE SUPPLY CHAIN TECHNOLOGIES FOR THE EUROPEAN DELIVERY INDUSTRY 2021

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