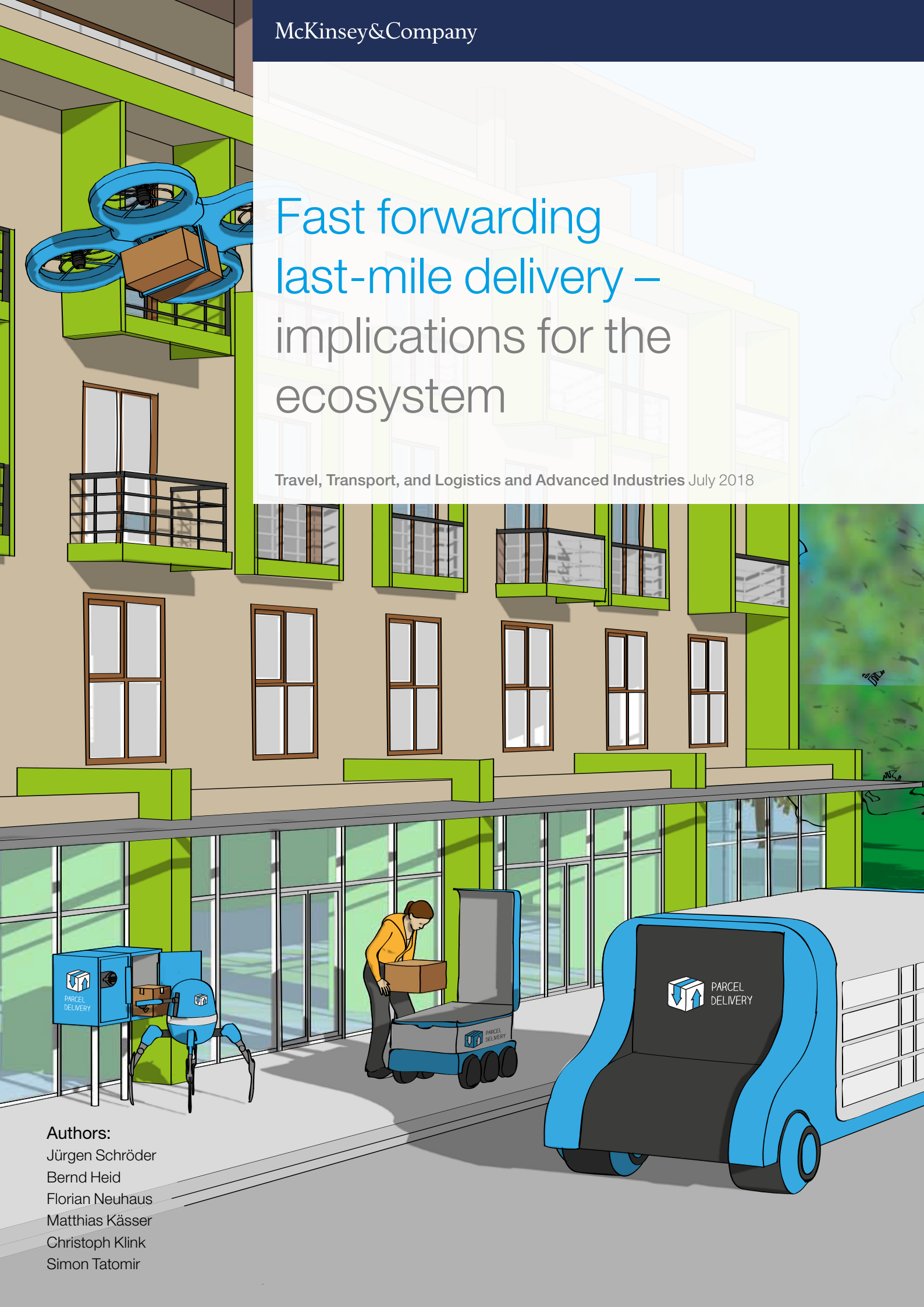


Fast forwarding last-mile delivery – implications for the ecosystem

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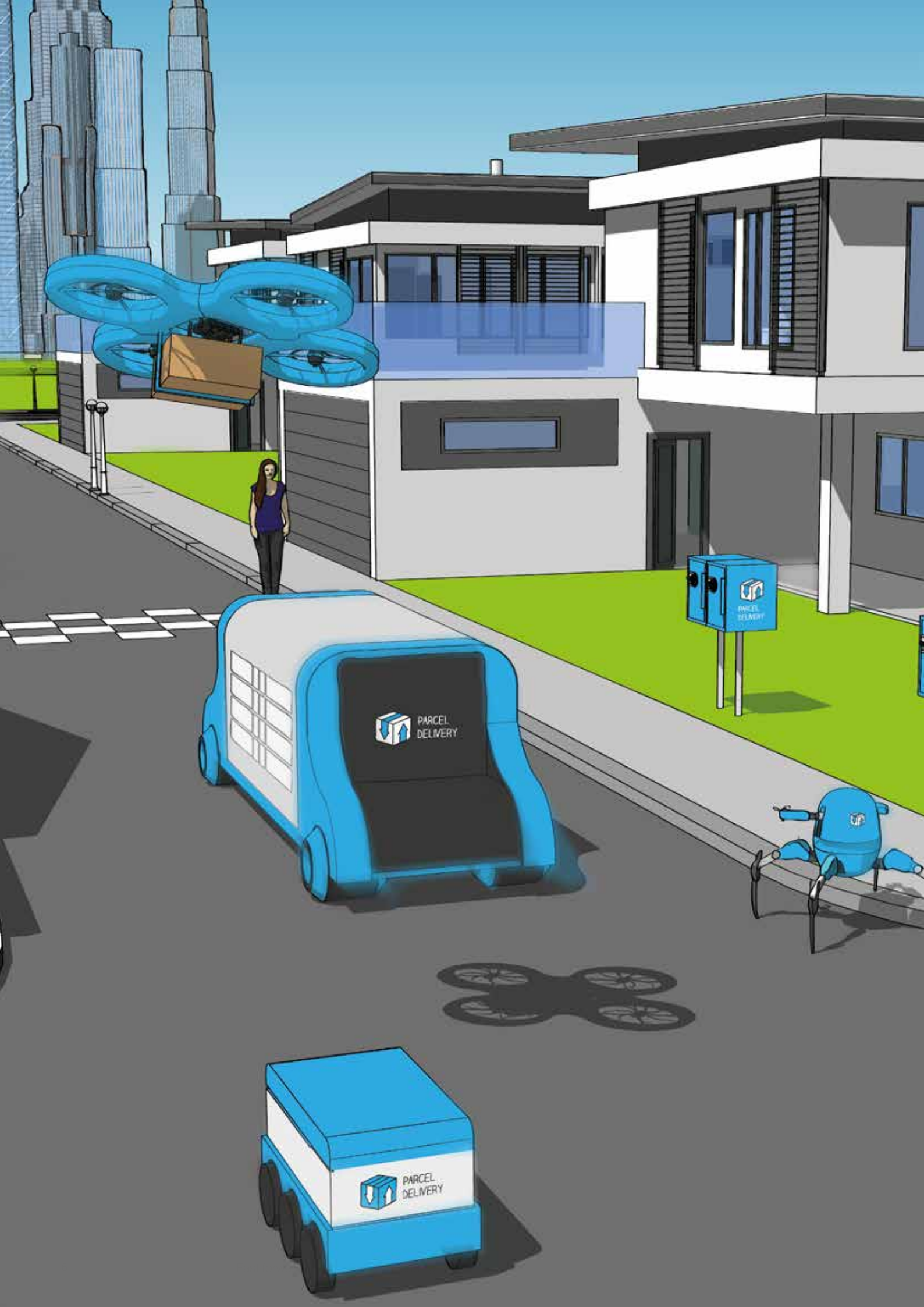
Introduction

Last-mile delivery is the final stage in the network of courier, express, and parcel companies (CEP). It is an entire ecosystem that brings a variety of goods to consumers' doorsteps (or very close). In 2016, we looked at the transport market – and in particular last-mile delivery – from two industry perspectives: commercial vehicles (advanced industries sector) and CEP (logistics sector). Our analyses revealed three main insights:

- **Consumer expectations are high and rising.** Consumers are becoming increasingly sophisticated in what they demand from last-mile delivery. Some 20 to 25 percent of consumers would pick same-day or instant delivery if it were available at low prices – which is a sizeable share compared to roughly 1 percent actual volumes today. Consumers are aware of what is possible, and they expect to be able to choose from many ways to get the products they want quickly and conveniently. Despite this expectation, their willingness to pay for this service is limited.
- **Automation potential is high.** Automation has significant potential to increase efficiency. Autonomous delivery vehicles (ADVs) are and will be the dominant technology in this regard, and they have the power to reshuffle the entire industry.
- **Competitive dynamics are changing.** The rapid evolution of technology in the sector is ushering in a potential rise in the number of new entrants. Both parcel delivery players and commercial vehicle players have to make sure they equip themselves with the necessary resources and skills if they want to make successful plays as competition increases.

We had expected that developments in the last-mile delivery ecosystem were going to happen quickly and that the future would require significant change from incumbents as new players are entering the field. However, the technological developments in the past 18 months have outpaced our expectations significantly. This recent acceleration is pressuring both incumbent and new market players to implement cost-effective technologies even more rapidly. It is clear that urgent action is required for players who want to prepare for the immediate adoption of new technologies in last-mile delivery.

In this article, we aim at providing an update that integrates our view on the commercial vehicle and logistics space, discusses the unlocking of new value potential and the substantial redistribution of value that is to be expected, and reveals further implications for the key players in the field.



Technology road map: The pace of tech development is faster than expected and is already transforming last-mile delivery

Last-mile technology will evolve across four horizons

Over the past 18 months, tech development in last-mile delivery has occurred at an even faster pace than we expected back in 2016. Today, we are observing not only various examples of technology piloting and testing across the globe, but we are also seeing the beginning of series productions and scaling of technology deployment by several companies (Exhibit 1). At every stage of development – from concept through testing to rollout – last-mile technology is making rapid gains. For example, autonomous vans were largely conceptual in 2016, and just two years later, we are expecting to see them road tested. While electric delivery vans (EV) were still in their pilot stages just a couple of years ago, today we are seeing their series production. Package-delivering “robotic dogs” have been tested, the large-scale deployment of droids has just been announced and an inter-hospital network of drones is already fully operational.

Exhibit 1:

Last-mile tech development recently accelerated – several key technologies being developed

Overview of technology maturity



Concepts

Autonomous delivery vehicle (ADV)
Drones
Robotics



Developing tech

Droid
Van/drone integrated system
Smart doorlock
Trunk delivery
Autonomous vans



Scaleable innovations

EV
Parcel box
Parcel locker

Technology maturity

SOURCE: McKinsey

A few key technologies underpin the examples listed above. In the years ahead, we expect their adoption to increase over a number of stages:

Horizon 1: we expect EVs and the increased presence of unattended delivery technology to form the first wave of technology that transforms last-mile delivery. This change is currently underway, as these technologies are already market-ready and scalable, with each of them contributing to cost effectiveness, customer convenience, or regulatory compliance. As cities tighten their emissions standards, it makes sense that the deployment of EVs in last-mile delivery will be among the first technologies to achieve significant adoption.

Research from 2016 tells us that 42 percent of Americans, 34 percent of Europeans, and 61 percent of Chinese are in favor of e-mobility regulation (versus 11 percent, 11 percent, and 1 percent who are against it, respectively). Fueled by their citizens' increasing taste for clean technology, several countries and cities have adopted regulation in favor of EVs. Recent examples are the ultra-low emission zone in London, which will kick off in 2019, and announcements from Paris, Madrid, Athens, and Mexico City that diesel-powered vehicles will be banned from their streets by 2025.

Horizon 2: in three to five years, large, semiautonomous delivery vehicles that follow parcel delivery staff are expected to be the next trend to be adopted by companies in the parcel delivery segment. This first step towards full automation will support delivery staff and increase productivity by cutting down the time needed to drive and park vans.

Horizon 3: in five to ten years, ADVs will very likely not need to be accompanied by human delivery staff at all and will represent the third wave of widespread tech-enabled parcel delivery. At a similar time, the use of drones will become more popular due to their ability to uniquely address particular delivery needs. For example, drones can be an effective solution in regions where road access is limited or in situations where roads (by condition or design) limit the fast delivery of emergency medicine. However, due to functional constraints (e.g., landing space, security, payload), regulatory restrictions, and costs, we do not expect that drones will be used at scale in dense urban areas. However, they may unlock higher service levels for rural and low-density suburban areas, which cannot currently be served with services such as same-day or instant delivery due to restrictions from available technology.

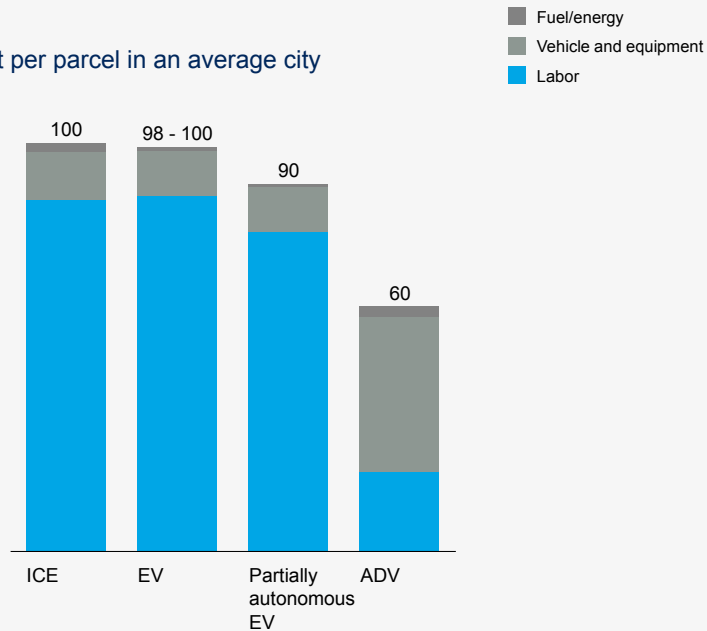
Horizon 4: in the relatively distant future, i.e., beyond 2030, it is expected that robots will take packages right to customers' front doors. This technology represents key added value – namely customer convenience – as robots will be able to address the “last ten yards” of delivery. The first robot-delivery pilots are already happening. The current high cost of this technology, however, means that these solutions are far from widespread deployment. Beyond the significant cost of further developing robot-delivery technology is a sizable structural matter. Enabling robots to deliver parcels to a customer's front door requires a high level of systems integration, which in its own right, is a significant technological undertaking whose development is ongoing.

All of these technologies have value potential as well as risks for customers and providers, but their value is delivered in different ways. Semiautonomous and autonomous vehicles, for example, reduce delivery costs in cities by approximately 10 to 40 percent (Exhibit 2). This amount is quite sizable in absolute terms also considering that last-mile delivery costs range from approximately EUR 1.50 to more than EUR 4.00 depending on network density, geography, and labor costs. EVs, on the other hand, do not yet yield significant cost savings. That is because total vehicle cost, incl. mileage, accounts for less than 15% of total last-mile delivery cost in dense networks and thus offers only a small basis for cost improvement. Therefore, at least in cities, even significant TCO improvements from electrification are not expected to substantially improve delivery cost. That said, the use of EVs will likely become necessary in order to comply with increasingly tight emissions-related regulations.

Exhibit 2:

AV technology holds the promise of increasingly reducing the per-parcel cost of last-mile delivery

Last-mile delivery cost per parcel in an average city Indexed¹



¹ Key assumptions include labor cost of EUR 20/h, average city network density, and energy consumption of 0.3 kWh/km for EVs and 12.0 l/km for ICEs
SOURCE: McKinsey

Technology will (re-)shape the last-mile landscape and unlock substantial new value potential

As described above, customers are demanding more from their delivery providers, and a highly competitive environment combined with customers' high cost sensitivity has pushed forward the development of technology that will help the industry deliver on these demands.

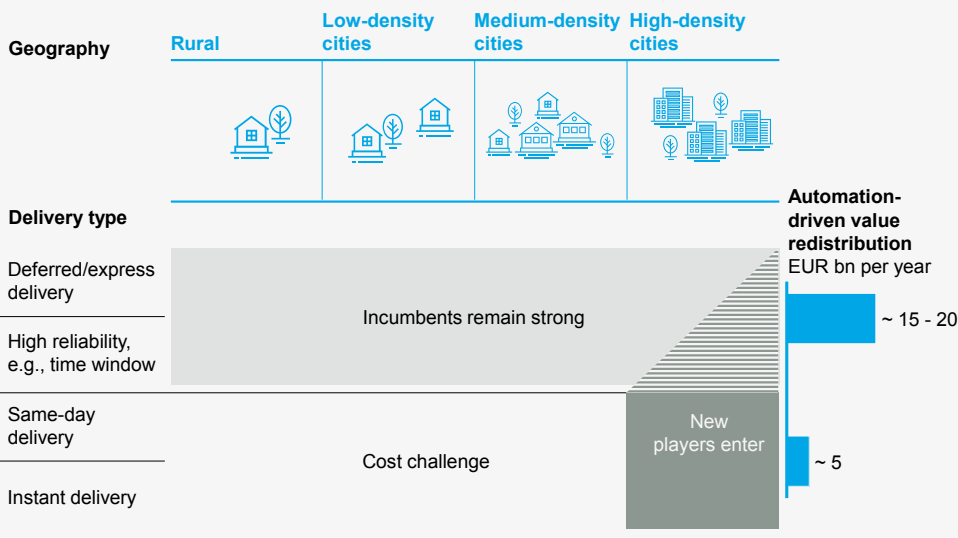
Combined, these trends mandate immediate adoption of these new technologies by last-mile players. The growing importance of technology in the last-mile industry will affect the overall ecosystem, including its competitive dynamics and the distribution of value across industry players (Exhibit 3). There are three main implications for the ecosystem:

CEP players will remain strong in the industry core. Despite the rather large technological leap that is required, incumbent CEP players are still very well positioned to control the bulk of parcel volumes (75 to 80 percent of the 2025 volume) in deferred, in B2B, and – to a lesser extent – in same-day delivery. The capital-intensive nature of sorting and full-scale logistics networks, the almost-mandatory nationwide service offer, significant economies of scale, and the required access to the customer (retailers and e-tailers) are immense barriers to entry for new players and will help traditional players hold on to dominance in the core. However, certain very large retailers may enter traditional last-mile delivery (i.e., deferred delivery) in selected high-density cities in order to gain control of the customer touchpoint and to create synergies with their same-day networks. While this is certainly a development that incumbents should watch closely, its impact on overall parcel volumes is likely to remain small – relative to the overall market – in the foreseeable future.

Exhibit 3:

Incumbents will continue to dominate the industry core, where the bulk of value redistribution from automation will occur, but new entrants will emerge in the same-day and instant delivery segments

Competitive dynamics in different geographies and product segments

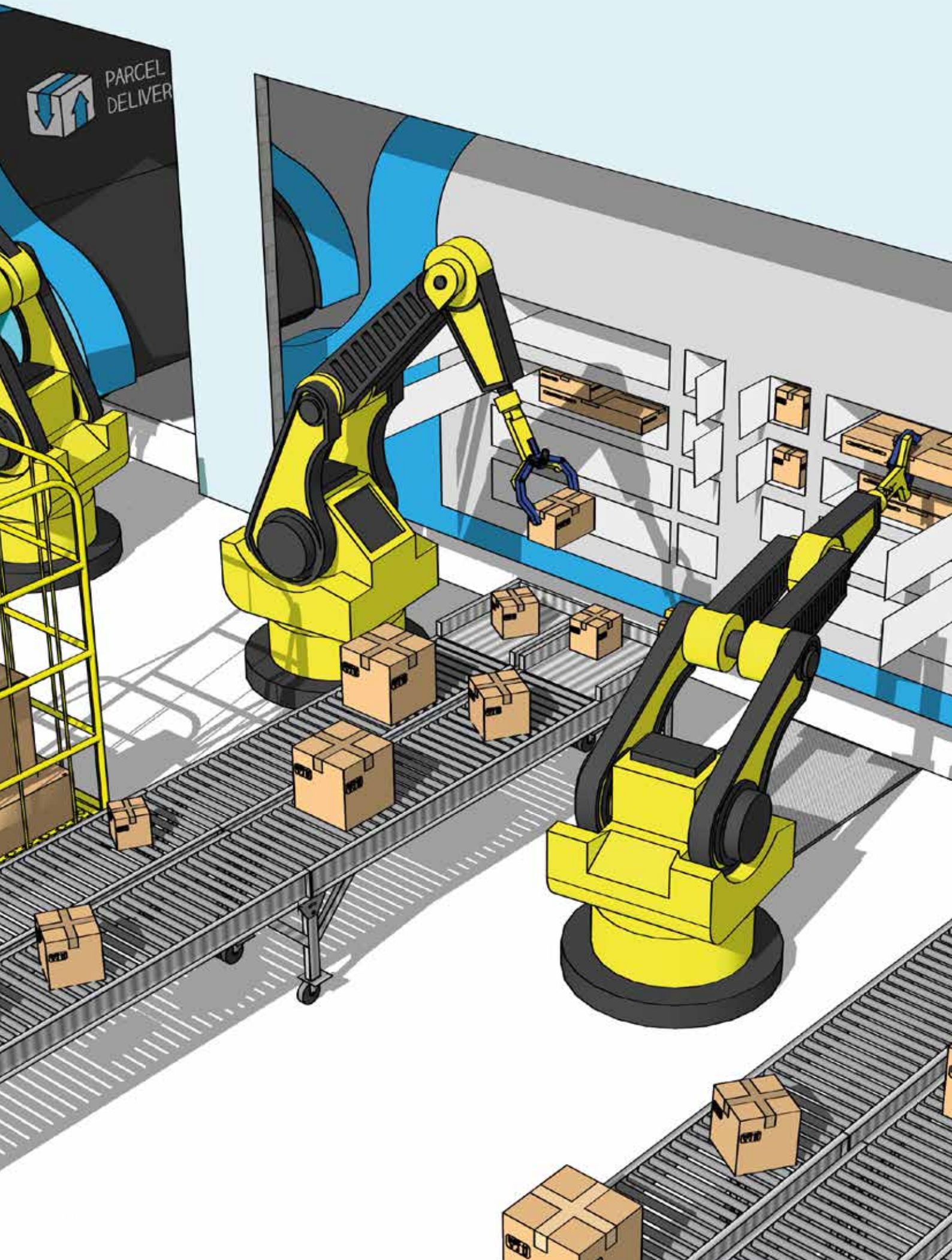


SOURCE: McKinsey

New players can enter in new segments. For other new entrants, however, emerging niches in last-mile delivery such as same-day and instant delivery are opportunities for which they – for several reasons – are well positioned to move in and compete. A dense logistics network used to be what was required to offset the high cost of operations in the industry. ADVs, however, will dramatically drive down operations costs, making dense networks less essential and opening the door to smaller, newer players. To this end, technology and commercial vehicles (CV) players may be gaining importance in the field and could unlock additional value-creation potential by entering last-mile delivery. The most realistic options identified would be deploying and operating autonomous delivery fleets or offering white-label solutions to very large retailers.

In both areas – i.e., the industry core and new segments – significant cost savings will trigger a multi-billion-euro redistribution of value. In developed economies, EUR 20 to 25 billion per year in savings from cost-effective autonomous technology are up for grabs. The magnitude of the value redistribution is significant, exceeding the overall profit pool of CEP players in developed countries today by quite some margin. Moreover, the lion's share of value redistribution (EUR 15 to 20 billion) in the last-mile ecosystem is expected to occur in today's core market rather than in the emerging same-day and instant markets. The value will be redistributed across CEP players, autonomous vehicles manufacturers, IT operators, and customers. We believe that three control points will determine the shape of this shift. Specifically, the players that master delivery tour planning, routing,

and management of autonomous fleets will be the ones that capture the largest chunk of the new value pool. Even though full deployment of fully autonomous fleets is not expected until well into the 2020s, rapid tech development means that its future winners will likely be determined in just the next two to three years. Besides automation, advances in analytics and artificial intelligence are very likely to drive services that meet customers' growing demand for convenience through, for instance, improved prediction of recipients' availability and utilization of their delivery preferences. However, given the much lower cost of labor in developing markets, technology is expected to play a less pronounced role in these markets for the foreseeable future – with the exception of China, where the large e-commerce players are driving the adoption of new technologies and are potentially even outpacing several western markets.



Strong business partnerships can help CEP and CV players unlock the full automation value potential and ensure competitiveness

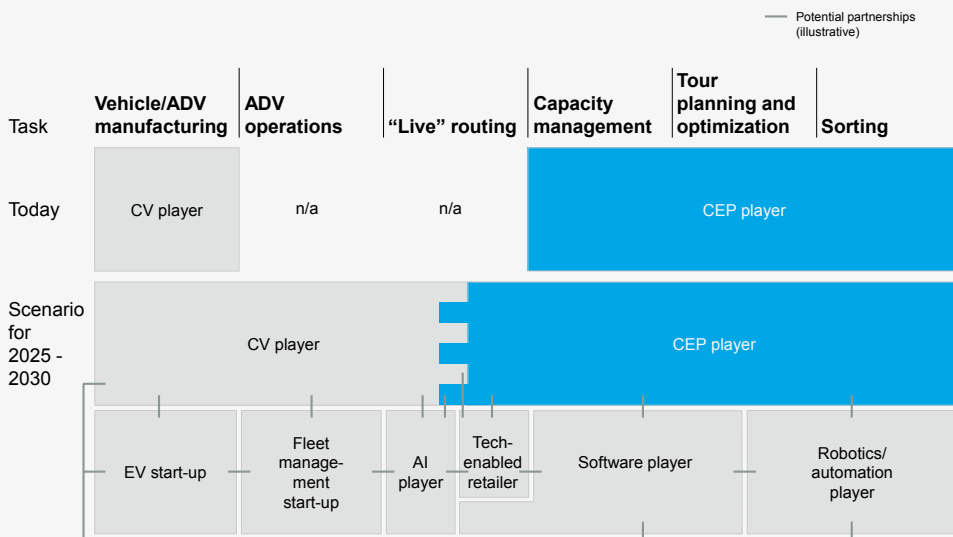
Information (and other) technology capabilities – especially in delivery tour planning and routing as well as in the management of autonomous fleets – will be the decisive capabilities determining how the bulk of the last-mile value pool will be allocated. Through collaboration and forging strong business partnerships across the entire last mile ecosystem, CEP and CV players can build on their current positions to develop these core capabilities and capture a number of advantages – which are further discussed in the following.

Before turning to these details, though, it is important to stress that while CEP-CV partnerships are the central and highest-impact partnerships in this ecosystem, there are other valuable partnership options, too. For instance, a number of innovative players will emerge in the ecosystem, and both incumbents and new players alike will benefit from partnerships with innovative adjacent players (see Exhibit 4 for an illustration). For instance, further optimization potential lies within the creation of an integrated information flow through the entire value chain which would enable, e.g., more efficient long-hauls, tour planning and capacity management. Moreover, the cooperation with robotics and automation firms is beneficial for both CV and CEP players in order to unlock the value potential in the loading processes and to create smooth handover processes for customers.

Exhibit 4:

The new value chain brings CEP and CV players closer together, making partnerships essential to effective routing

CV and CEP players' current and expected future roles



SOURCE: McKinsey

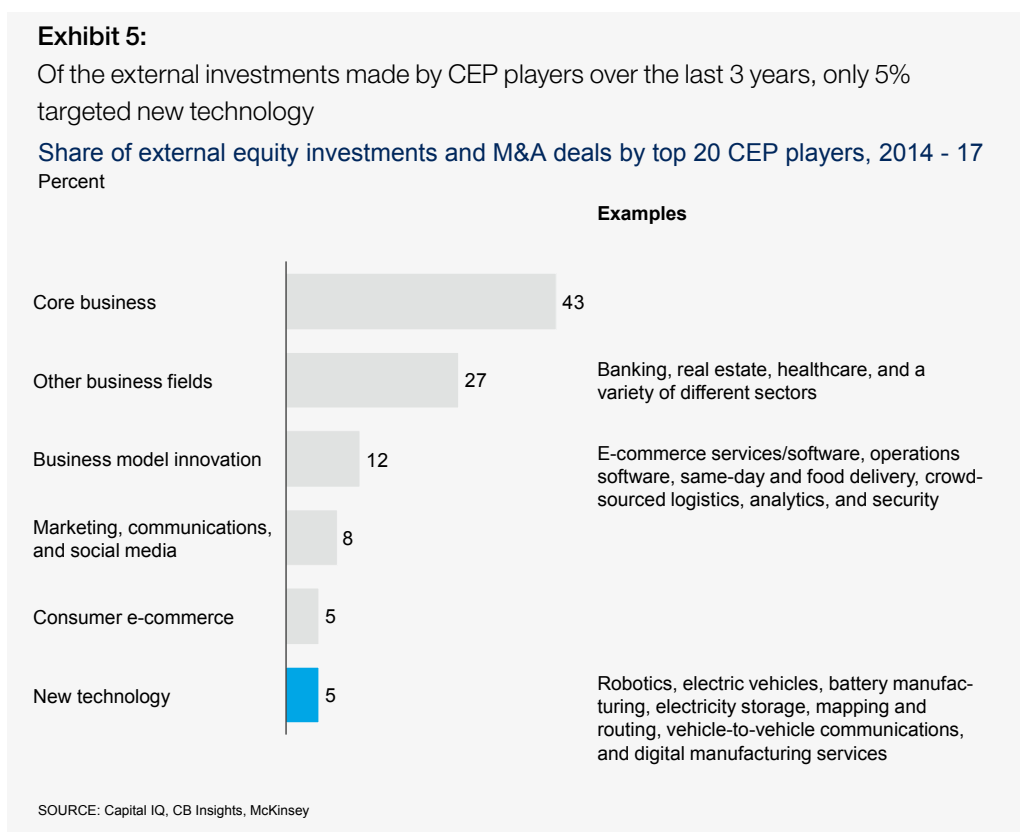
In the future, CV players are likely to play a more important role in last-mile delivery, since they not only are well positioned to operate the autonomous delivery fleets (fleet management), but can also leverage their routing expertise. CEP players are well positioned to control the core steps – capacity management, tour optimization and planning, and sorting – as they will continue to play from a position of strength in the core business. Physical control of the parcels also gives CEP players possession of and control over the associated data, which is a vital input for process excellence.

These shifts will bring CV and CEP players closer together (Exhibit 4). In order to capture the full efficiency potential, both sides need to collaborate closely in the routing of autonomous vehicles and together tackle capabilities challenges, such as “suggesting” possible parking spots and instant rerouting based on traffic information. A close partnership also facilitates the integration and alignment of the routing software with the player’s related IT backbone (e.g., tour planning and optimization IT).

Beyond the technology advances that benefit CEP and CV players collectively, strong business partnerships can result in a number of competitive advantages to individual players depending on the role(s) they play in the last-mile ecosystem.

Advantages to CEP players

Better access to technology and, ultimately, a chance to obtain technology leadership. While CEP players stand to benefit significantly from better access to transportation and delivery technologies, most of them so far have yet to realize these benefits. Not only has the majority of CEP players shied away from tech M&As in the past (Exhibit 5), they also have merely limited experience with transportation technology. This relative inexperience is evidenced by the fact that only 8 percent of their patenting activities are related to this field (Exhibit 6). Moreover, their overall patenting activity has also been stagnating during the past years, which, although it is an imperfect measure for innovation, underscores the notion that CEP players need to do more to prepare themselves for the technological step change ahead.



Improved requirements management. CEP players can ensure specific requirements are reflected accurately in product development. Meeting these requirements is already extremely important to CEPs today, as custom-built vehicles are essential ingredients to the business of many of these players. With the growing importance of technology and the adoption of autonomous driving technology, requirements management will become even more critical and challenging.

Advantages to CV players

Better core market access. CEP-CV partnerships can help CVs secure access to an important market and defend them against potential new entrants. For example, a strong partnership between a tech giant and an automotive supplier has the potential to bolster a CV's ability to withstand competitive threats.

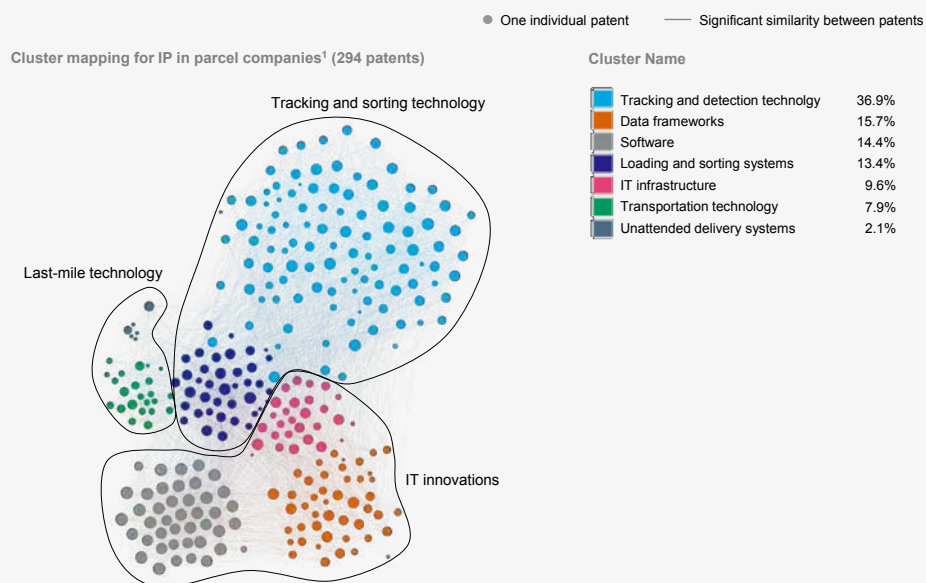
Access to additional value pools. Close collaboration can also help CVs gain access to additional value pools such as ADV operations and routing (see Exhibit 4 on page 13) and thereby capture part of the EUR 20 to 25 billion efficiency gain p.a.

Data insights and IT-related learnings. As CEP players collect vast amounts of data, insights distilled from this data could become valuable to CV players beyond the immediate scope of their collaboration – for example, in that these insights help improve the routing software beyond ADV-related purposes. Collaboration with CEPs can provide CVs access to these valuable learnings. What's more, CEP players dedicate most of their innovation efforts to IT (Exhibit 6). Thus, while the success of these efforts varies, CV players may also benefit from the cooperation by better understanding CEP players' IT approaches regarding, for example, data management.

Exhibit 6:

CEP players' in-house innovation focuses on IT and tracking technology but tends to neglect last-mile technology

Patent cluster analysis reveals that CEP players mainly patent IT innovations



¹ Based on a semantic analysis of patents filed after 2014 for top 20 parcel companies
SOURCE: IP Analytics

Collective benefits of CEP-CV partnerships

The benefits of collaboration can certainly accrue to CEP and CV partners in ways that serve the competitive interests of individual players. What's more, collaboration also has the potential to give CEP and CV players an unprecedented level of collective influence in two key ways:

Establishment of an ecosystem. Highly successful collaborations can open the door for CEP and CV players to establish a last-mile delivery ecosystem. As “founders” of a new landscape, they have the opportunity to make their routing and delivery planning the industry standard and build a platform on which other ADV manufacturers run and different applications and services are built.

Additional data-driven business models. Jointly creating an integrated routing/delivery planning software can give both players access to an immense amount of data. Insights derived from data gathered from various sources, e.g., from traffic, parking spots, or consumers themselves, can shape new joint business models.

However, if CV and CEP players fail to accelerate their development through more in-house innovation, they risk losing ground to other players in the emerging last-mile ecosystem. Software and tech players, in particular, are well positioned to own the core optimization and routing process steps. The current pace of innovation of CEP players does not reflect the step change that would be required given the trajectory of technology development. At the same time, already-available advanced traffic data combined with the shipment data of a few, very large retailers could also serve as a starting point for such an advanced integrated routing and tour optimization software. Furthermore, routing software is already one of the pillars of start-up activity in this sector, and so new players are also likely to emerge here.

Therefore, if CEP and CV players want to be in the driver's seat and master the core capabilities of autonomous delivery, they should act fast and look for opportunities to partner with each other. For CV players, it seems advantageous to partner with one or more large CEP players who are leading in their respective home countries, because they possess the best data and typically the greatest innovative power. For CEP players, size matters and smaller CEPs risk falling behind the innovation curve. The current gap between smaller and innovative, large CEPs is already substantial – the top 3 most innovative CEP players hold 2,700 active patents, and the remaining 17 only have 800 – and likely to widen. For smaller CEP players, building a consortium with other CEPs might be a wise first step that helps them identify and attract prospective CV partners and become more competitive.

□ □ □

Overall, the unprecedentedly fast technology development expected for the coming years is likely to put pressure on both CEP and CV players to act immediately in order to defend their industry positions and capture new value opportunities. Furthermore, in the future, successful strategies will need to be based on a set of specific capabilities and require leveraging a complex and resource-intensive technology infrastructure. As fulfilling these demands seems overly ambitious for any single CV or CEP player, we expect players to set up strong business partnerships in response to these challenges.

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