strategy&

The era of digitized trucking

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Charting your transformation to a new business model

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Executive summary

Within a few short years, trucking and logistics will be an ecosystem of autonomous vehicles directed by a digitized supply chain, combining driverless, cableless trucks and delivery hubs staffed by robots. We laid out our vision for this in a 2016 study.

But what about the numbers behind these changes? In particular, what do they mean for cost and efficiency in an industry that has long sought to improve both by fine-tuning its business model?

In this, our latest study, we have undertaken a deep dive into these two crucial elements with a focus on the trucking sector in the European Union (E.U.) and have developed the following estimates:

- Trucking logistics costs will fall by 47 percent by 2030, largely through reduction of labor.
- Delivery lead times will fall by 40 percent.
- Trucks will be in use on the road for 78 percent of the time, rather than the current industry average in Europe of 29 percent.

Significant stakeholders in the current system, such as long-distance truck drivers and freight-forwarding companies, will disappear; the process of matching the goods to be delivered and the available trucks will be fully automated. To stay competitive, original equipment manufacturers need to expand their product portfolios to include new powertrains and focus production on autonomous long-haul trucks. Large tech companies will become a bigger feature in the delivery market, with new technologies.

Automated freight matching's advantages

The key element behind these efficiency gains — beyond autonomous trucking, which will bestow many benefits — will be the adoption of automated freight matching (*see Exhibit 1, next page*). We think this is a big piece of the digital trucking puzzle that has yet to fully slot into place.

In a fully automated end-to-end supply chain, a product on a digitized assembly line would be built with the digital capability to send a signal and book transport for its delivery when it is close to being completed. It would already be coded with the address of the customer it is being shipped to. The freight-matching system would then look for available capacity on trucks going in the direction of the product's destination.

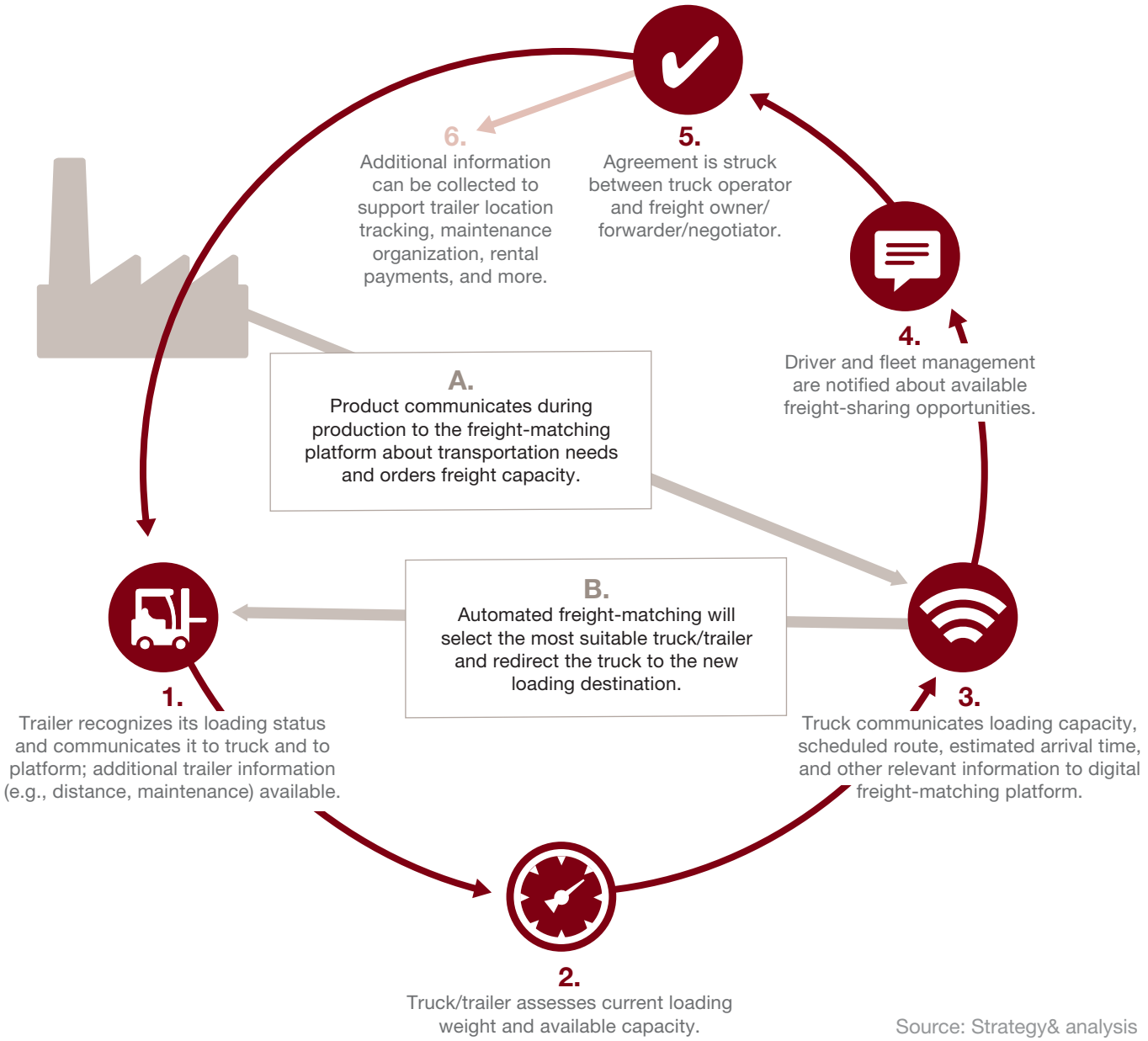
Still in the factory, the smart product would get back a list of available options and use its programmed algorithm to pick the best one. Once delivered to the loading bay of the factory, the product would be picked up by a robot and loaded onto the right truck, which would then drive itself to a distribution hub and use a global positioning system to find the right delivery bay. There, another robot would unload the product and take it to an electric vehicle that would carry it the short distance to the customer, to be delivered at an agreed-on time and location.

This fully automated model would mean shorter waiting times for delivery — hence our estimated 40 percent fall in lead times by 2030 — and less inventory stored in warehouses. There will also be fewer loading and other types of errors.

Such integrated supply chain models are already being developed by RIO, a cloud-based platform owned by Volkswagen; FR8Star, a U.S. platform co-owned by Volkswagen; Velocity Vehicle Group, a large trucking dealership in the U.S.; Sandhills Publishing, which runs equipment auctions and owns a number of trucking publications; and Uber Freight, an app owned by Uber Technologies that matches carriers with shippers.

In this report, we examine the changes to the supply chain that will result from these innovations, and how they will save companies and customers time and money. We look at the switch to autonomous vehicles and, finally, at how all these elements will affect the business models of today's stakeholders.

Exhibit 1
How automated freight matching works



Source: Strategy& analysis

Cost reduction potential throughout the supply chain

Add up the various incremental technological changes throughout all the steps of delivery from the first mile to the last, and the logistics business will be fundamentally altered. The far higher degree of automation will in turn drive logistics costs down by 47 percent by 2030. Notably, about 80 percent of those cost savings will come from a reduction in the labor required. We break this down into five segments (*see Exhibit 2, next page*):

1. **End-to-end supply chain:** In the scenario we foresee, an automated freight-matching system will cut administrative costs by reducing or even entirely eliminating the human — that is, the manual — element in the process of matching goods to be shipped with the truck that will deliver them. Algorithms can be used to make the required decisions, using key data such as the delivery address; the weight, dimensions, and condition of goods to be delivered; and knowledge of which trucks are on the road and their location. Warehouses will need less inventory, and there will be less "shrinkage" and less risk of error, which will lead to reduced insurance costs. Taking all this together, we see such end-to-end costs falling by as much as 41 percent by 2030.

2. **First mile:** The process of taking goods from a factory in an urban area — a furniture factory, for example — and delivering them to an out-of-town hub where they can be picked up for long-distance transportation will be made more efficient by automating the process of assigning goods to trucks. The vehicles will be filled more efficiently, and manual administrative roles would largely fall away. Vehicles will be equipped with alternative powertrain technologies, such as electric. Costs in this segment will be 45 percent lower by 2030.

3. **Hub organization:** The out-of-town hub, or warehouse — where goods would be delivered in order to be transported long distances by fully automated trucks — would use fully automated docking and unloading of the "first mile"' deliveries. These hubs would also use fully automated systems for storage, retrieval, and reloading onto larger trucks. Amazon and other large retailers already use robots in

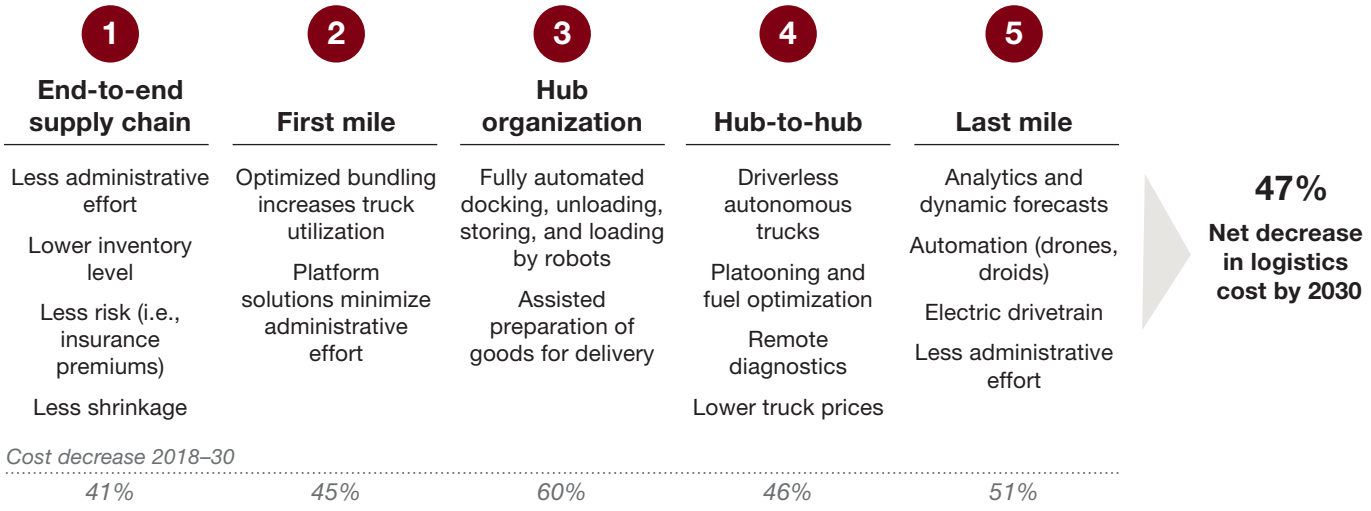
their warehouses, and this trend will continue. Costs in this segment will be 60 percent lower by 2030.

4. **Hub-to-hub:** Delivery is carried out by a fully automated, driverless, cableless truck. The trucks will be linked together in convoys in a concept known as "platooning," and remote diagnostics will identify and address problems before they become serious and costly. The biggest savings will be in labor. We estimate costs will be 46 percent lower for this segment.

5. **Last mile:** Analytics and dynamic forecasting will make delivering to homes more efficient. Drones and droids will deliver some goods, and administrative work in this segment will also be reduced by the automated freight-matching system. In cities and towns, this stage will look most similar to today's logistics process, because large autonomous trucks will not be suitable for crowded urban environments, and automating smaller trucks doesn't make sense because a driver/operator is needed to make the final delivery. Costs in this segment will be 51 percent lower by 2030.

Exhibit 2

Automation will reduce logistics costs thoughout the supply chain by 47% by 2030



Source: Strategy& analysis

Knock-on effects: "Trucking 4.0"

The future logistics model will generate savings beyond the five supply chain segments. We see three other areas where costs will be reduced.

First, the future model will require more engine types, including electric, hybrid, and those powered by compressed natural gas (CNG), liquid natural gas (LNG), or fuel cells. These will coexist with the internal combustion engine that accounts for 97 percent of the market today. With these new engine types, fuel costs for trucking companies will come down significantly.

After fuel, the next biggest cost center is the driver. A fully automated truck obviously does not need a driver, which results in significant savings. Such a truck also eliminates the need for a cab, which will reduce the cost of a truck by about a third, given that the cab is one of the most expensive parts of a truck. The remaining vehicle will be a much more commoditized affair, with the only meaningful differentiating factor being the type of powertrain.

The third knock-on effect will be an extension of the amount of time in a vehicle's daily life that it is actually in use — the so-called utilization rate. We estimate this will increase from 29 percent in 2018 to 78 percent by 2030, based on current E.U. regulations and industry practice. Put another way, of the 168 hours in a calendar week, trucks in the E.U. are currently on the road for only 48 hours of actual driving. Of the remainder, 98 hours are taken up with drivers' rest time, loading, and traffic congestion, while 22 hours are accounted for by a Sunday lorry ban, when no driving is allowed. By 2030, we estimate driving time will increase to 131 hours and the idle time will fall to 15 hours. (This assumes no change to the Sunday lorry ban).

Implications for stakeholders

Truck makers (original equipment manufacturers, or OEMs) and their suppliers face as much disruption and transformation as the delivery — or trucking — companies that buy their products. The changes coming in trucking and logistics fall into two categories: technology and business model.

Technological changes will mainly affect truck makers and their suppliers. To stay competitive, OEMs need to expand their product portfolios to include new powertrains and focus production on autonomous long-haul trucks, which will greatly increase the importance of software. The design mandate will change from making trucks a home on wheels to creating a self-driving container.

One business model option is for OEMs to transform themselves into "mobility-as-a-service" (MaaS) providers, with fleets of trucks positioned throughout major global regions. In this scenario, an autonomous truck can be summoned with a signal that starts the vehicle and sends it to the right warehouse to collect a parcel or a trailer. Alternatively, the truck is already on the road and gets redirected to a new loading address in order to pick up additional goods.

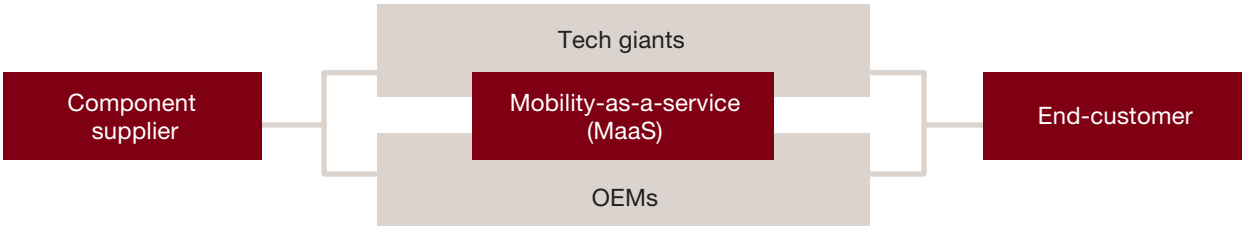
An automated supply chain will result in fundamental business model change for freight forwarders, truck operators, and long-distance truck drivers. These roles will cease to exist in their traditional form, eliminating parts of the industry entirely. As MaaS providers, OEMs will compete with trucking and leasing companies that operate fleets of autonomous trucks and, most significantly, with large tech companies. Waymo, an autonomous vehicle business owned by Alphabet; Uber; and graphics chipmaker Nvidia have all entered the delivery market, showing how important technological capability will be (*see Exhibit 3, next page*).

If OEMs choose not to compete with tech companies for the MaaS role, they risk falling down the value chain, selling commoditized trucks to tech companies, which will automate the roles now performed by leasing, trucking, and logistics operators.

Exhibit 3

OEMs and tech giants will compete for mobility-as-a-service hegemony

Logistics stakeholder chain 2030



Source: Strategy& analysis

Road map

OEMs may be aware of these imminent changes but likely find it very challenging to publicly embrace them, because they threaten not only the business model of the truck manufacturers themselves, but also their customers, the leasing and logistics companies. The whole ecosystem is under threat (*see Exhibit 4*). Yet it is essential that the industry acknowledges and works to keep pace with the incremental disruptive changes in technology and automation over the coming years — a transformation that will create a new and more cost-efficient supply chain by 2030.

Exhibit 4

New technologies will create a more cost-efficient logistics supply chain by 2030

Current technology	By 2020	By 2025	By 2030
	–5%	–20%	–47%
Virtual platforms	Logistics mobility-as-a-service (MaaS) introduced	Nearly all hub-to-hub logistics done by MaaS	All hub-to-hub logistics done by MaaS
Warehouse robots	Drone-automated inventory taking	Processes (except commissioning) automated	Processes for standard delivery 100% automated
Partially automated trucking	Platooning begins	Partially autonomous trucks, requiring driver	Fully autonomous trucks without driver
Electric vans	Significant share of electric vans	Commercial delivery drones	Synchronized, heterogenous delivery fleet

Source: Strategy& analysis

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