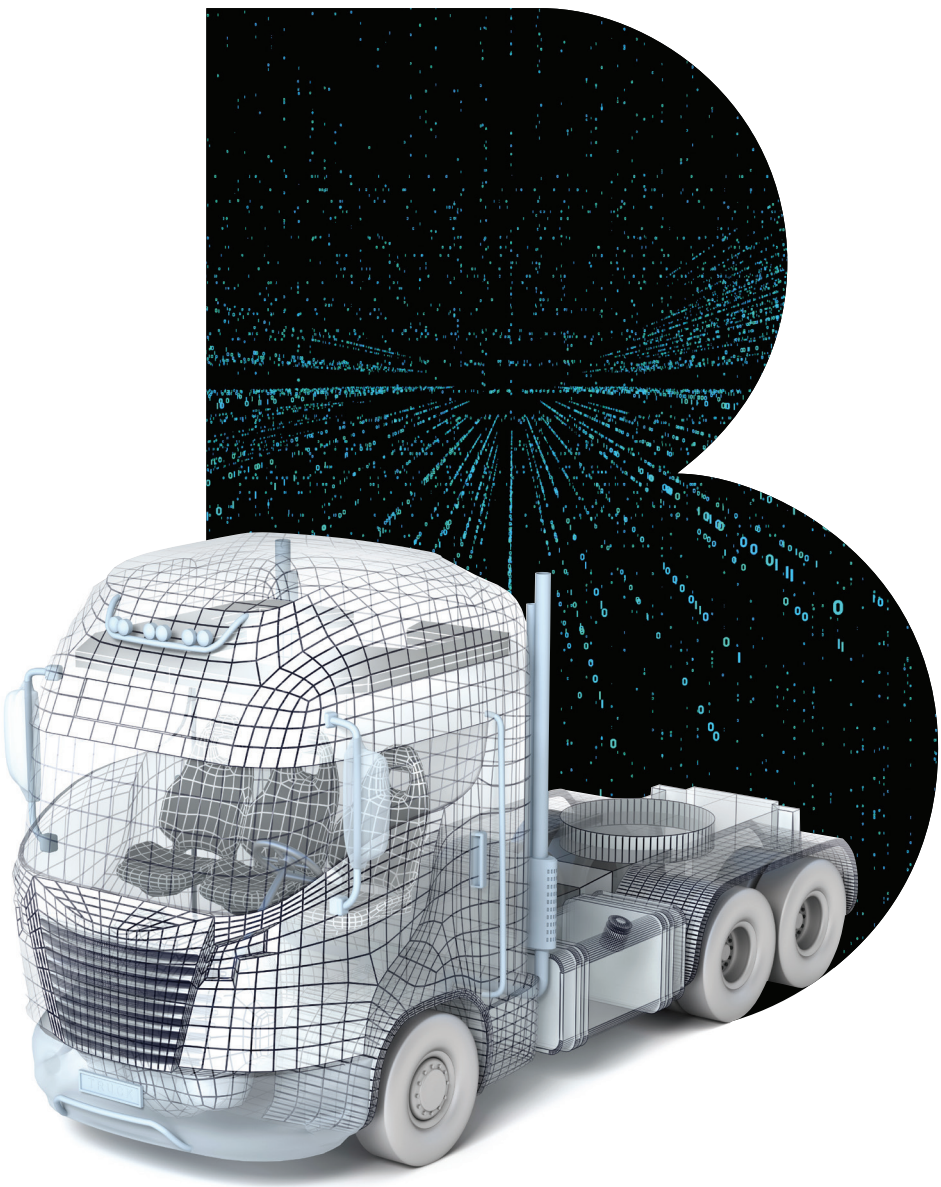
Roland Berger Focus

September 2018

Shifting up a gear

Automation, electrification and digitalization in the trucking industry



Roland Berger

Management summary

Trucking is the leading mode of freight transportation in many parts of the world, including the United States, Europe and China. But the industry is vexed by issues such as fragmentation, inefficiency, underutilization of trucks, difficulties recruiting new drivers and tightening regulations on emissions.

Fortunately, a number of trends that are currently visible in the industry offer solutions to these issues. Vehicle automation, electrification and digitalization will radically change the trucking industry over the next decades, allowing it to shift up a gear. New business models will emerge, such as the transfer hub model, combining driverless trucks on specific highway routes with conventional trucks for the first and last mile off the highway. The resulting operating cost savings will be significant, shaving 20 to 40 percent off today's costs.

In this paper, we examine the details of these technological changes and the impact they will have on the industry. As driverless trucks become a reality for highway-based line-haul routes, electric powertrains become viable for short-range applications and new digital solutions based on artificial intelligence (AI) improve utilization and increase transparency, the overall logistics ecosystem will gradually mutate. Trucking companies will face both positive and negative knock-on developments. Fleet sizes will change, the industry will consolidate, new tech players will enter the market and freight rates will come under pressure. At the same time, the development of legislation and public acceptance will be critical for the timing of the industry transformation.

Fleet operators need to start adapting to the coming changes in the industry. To help them master the challenges we suggest some key steps and possible questions that they can ask themselves. The answers to these questions will help them define their strategic direction and take the necessary steps to ensure that they stay ahead of the pack as the industry shifts up a gear.

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1. Key challenges for the trucking industry today

Demand is strong but the industry must address issues such as inefficiency, driver shortages and tighter regulation.

Trucking is the leading freight transportation mode in the United States, Europe and China today. Around 70 percent of all the freight tonnage moved in the United States and Europe goes by truck, and more than 75 percent in China. Truck fleets in United States and Europe are highly utilized and as a consequence freight rates are high. No let up in demand is foreseen in the coming years either, with economic growth continuing apace in these regions.

Nevertheless, the trucking fleet industry faces a series of challenges in all three markets. For one, the industry landscape is highly fragmented with a small number of large fleets and a long tail of small fleets and owner drivers. Inefficiency is a critical issue, although its level and causes vary by region. In China, for example, trucks run empty an estimated 40 percent of the time as finding cargo is a major issue for drivers, especially in the country's interior. In the United States and Europe, empty miles are caused by trucks traveling from one destination to the next pickup point without any payload due to inefficiencies in the dispatching process. The total empty miles here are lower than in China but still significant, accounting for an average of 20 percent of the total annual miles traveled.

Driver shortage is another pain point in both the United States and Europe. This affects mainly the long-haul segment, where it is both difficult to retain current drivers and challenging to attract new ones. Furthermore, there is a push towards increasing energy efficiency driven by both fuel prices and tightening of emission norms for trucks. Toxic emission regulations (NO_x, CO and particulate matter) are already extremely strict at ultralow levels in North America and the European Union, and the focus is now shifting towards carbon dioxide emissions. The United States and China have already introduced fuel-efficiency targets and the European Commission is working on a law for CO_2 emission standards.

A number of technological trends will address all of these issues and bring about fundamental change in the trucking industry. In the next section we examine advances in automation, electrification and digitalization. In so doing, we choose to focus mainly on the US market as it leads the way in terms of changes due to its geography and the resulting positive business cases – changes that will then spread to the rest of the world.

Trucking is the leading freight transportation mode in the United States, Europe and China today. The industry currently faces several challenges in all three markets.

2. New technologies

Automation, electrification and digitalization will shake up the trucking industry.

Three technological trends – automation, electrification and digitalization – are set to fundamentally change the trucking industry. Indeed, we can already observe the first fruit of these technological developments today. Several demonstrator projects for automated trucks are already ongoing. For example, the startup Embark has been operating automated trucks on the I-10 freeway between El Paso, Texas and Palm Springs, California since the end of 2017. Likewise, China-based autonomous truck technology startup TuSimple is testing a self-driving truck fleet at a deepwater port in a northern Chinese city. Established truck OEMs are also moving fast towards higher levels of automation, often in partnership with IT solution providers.

In the field of electrification there are multiple examples of technological advance taking hold, both from OEMs and startup companies. Telsa has announced a battery-electric semi-truck focused on short to mid-range applications, with 300 mi (480 km) and 500 mi (800 km) range options. The startup Nikola has announced a hydrogen fuel cell truck for long-haul applications. Established OEMs also unveiled full electric medium-duty trucks for urban pickup and delivery and refuse as well as heavy-duty tractors for short-haul applications.

In digitalization we can already observe innovation in the freight booking space. Several freight booking platforms have emerged in recent years, both from startups such as Convoy and Uber, and from established trucking companies such as the J.B. Hunt 360 platform, CHR Freightview and XPO Connect.

Below, we examine each of these three areas from a technical point of view and look at some of the figures behind them.

AUTOMATION – DRIVERLESS TRUCKS WILL BECOME A REALITY

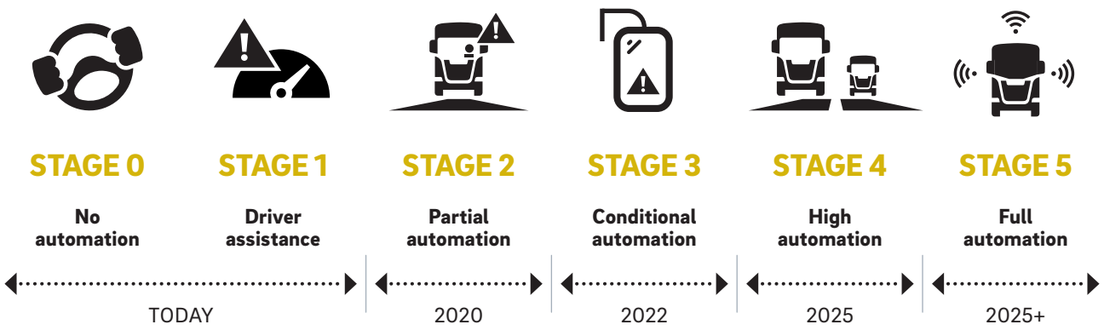
The technological roadmap for the development of automated trucks consists of a number of stages, with more and more responsibility handed over by the driver to the automation technology in each stage. At Stage 0 there is no automation and the driver is fully in control, the technology potentially providing him or her with warning signals. At Stage 1 individual functions are automated: The driver can be "feet off" thanks to cruise control or "hands off" thanks to lane keep assist. We are currently moving from Stage 1 to Stage 2, in which both systems run concurrently and the driver may be both feet off and hands off at the same time but must stay firmly focused on the road ahead. → A

Stage 3, which lies in the future, is a transition phase. At this stage the vehicle has the technology to drive independently but the driver needs to be able to take back control quickly if necessary or respond to a request to intervene. At Stage 4 the driver does not have to monitor the road at all during automated mode. In easier-to-navigate environments such as less crowded highway stretches, the truck could even operate without a driver. Stage 5 is that of full automation, where trucks can operate without a driver in all conditions, including on service roads and in inner-city traffic.

We expect to see a fast progression from Stage 2 to Stage 4. Stage 3 will likely be very short: Although the technology complexity increases as the vehicle has the capability to drive autonomously, this does not lead to any incremental savings in operating costs as a driver is still required at all times to be able to take back control of the vehicle quickly. Additional savings are only possible once Stage 4 is reached and the vehicle can function without a driver, at least in certain environments such as on highways.

Where is the industry today? Truck OEMs and technology providers are currently rapidly moving into the automated trucking space. OEMs are working on vehicles with Stage 3 and Stage 4 capabilities. Startups such as Embark in the United States and TuSimple in China have exhibited initial Stage 3 capabilities with

A: From no automation to full automation
A technological roadmap for self-driving trucks



Source: SAE, Roland Berger

aftermarket solutions in pilot applications. Partnerships of these startups or OEMs with IT solution providers will accelerate the development of Stage 4 and 5 capabilities. Specialized technology companies are also busy working on specific areas of automated vehicles, such as video safety technology, next-generation vision technologies, high-definition mapping, deep learning, artificial intelligence and computing and processing technology – Stages 4 and 5 will require large amounts of data to be processed in the truck and thus rely on advanced processing power.

Looking ahead, the development of automated trucks will go from confined environments such as harbors, terminals and mines, where automated trucks already operate today – Rio Tinto uses self-driving trucks in its open pit mines in Pilbara, Australia, for example – to unconfined environments, where conventional and automated vehicles will operate next to each other. This latter environment poses multiple technological challenges, and tech companies as well as OEMs are working on business models that allow operation of driverless trucks in semi-controlled environment with Stage 4 technology, before fully automated trucks become available.

The technology required for a Stage 4 driverless truck is expected to be ready by the middle of the next decade. This includes numerous hardware and software components. Thus, sensors monitor the surroundings of the vehicle – radar sensors keep track of traffic in front and to the sides while a front stereo camera adds redundancy and monitors the traffic in front. Multiple Lidar systems create high-resolution 3D environmental data. Data from these sensors is then processed on a computing platform. Spatial imaging occurs by means of aggregating the inputs from all sensors to develop 3D maps of surroundings, including information about shapes, sizes, distances and speeds. Algorithms for mapping and path planning/control use sensor data to plot, track and control appropriate routes to the vehicle's destination.

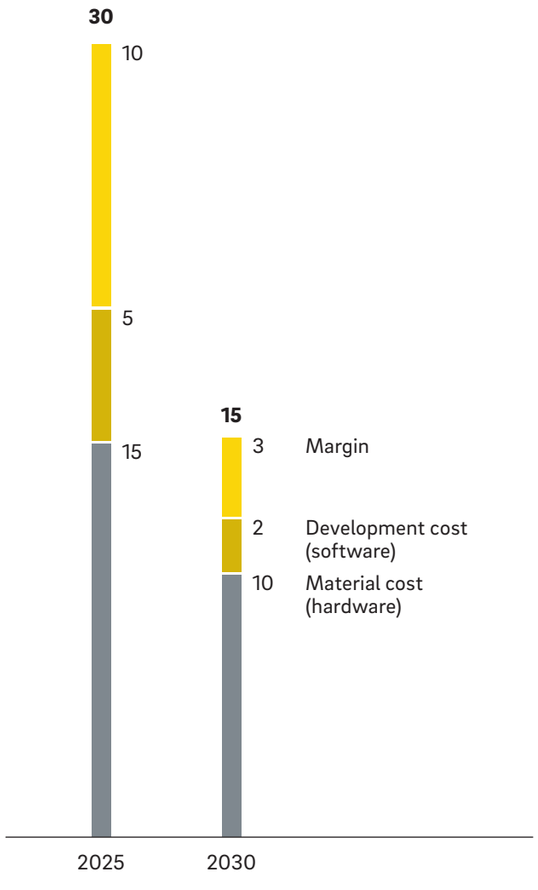
Illustrations: The Noun Project/Pham Duy Phuong Hung; Moose Icons, UA; Sascha Elmers; Ben Davis, RO

Stage 5 requires highly complex technology and software algorithms, which means significant R&D expenses. By contrast, Stage 4 driverless trucks can be considered a mid-term opportunity in financial terms. We estimate the additional hardware cost for a Stage 4 truck to be approximately USD 15,000 in 2025, with the computing platform and redundancy systems for braking, steering and energy supply being the largest items. The cost of sensors is expected to have come down significantly by this date, accounting for only about USD 1,000 per truck (Lidar systems today cost about USD 7-8,000, down from USD 75,000 a few years ago). The development cost for a Stage 4 truck, covering software development, prototypes and testing, is considerable, estimated around USD 1.1 billion. → B

Investments of this magnitude can likely only be carried out by large players such as global truck OEMs. The development cost share per truck depends strongly on the amortization model: We estimate it at about USD 5,000 per vehicle for those OEMs that can reach a minimum scale of 225,000 automated units. On top of the material and development cost, OEMs will charge a margin. We consider an initial margin level of up to 50 percent probable, as competition will be limited in the early years and OEMs target price their applications, allowing fleet customers to reach payback within the three years typically expected of such investments. In total, the incremental price of the technology in 2025 is an estimated USD 30,000 per truck, about 20-25 percent above the projected base vehicle price at that time. By around 2030, when sufficient scale effects have been achieved and initial development costs have been amortized, the price may go down to about USD 15,000.

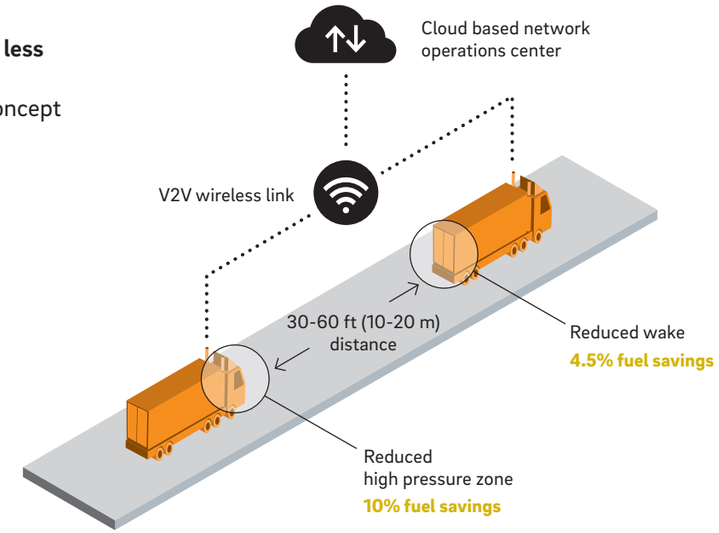
The actual timing of when driverless trucks will appear on our roads will not depend so much on the availability of the technology, but rather on legislation. Some

B: Stage 4 driverless trucks: a mid-term opportunity
Incremental pricing of Stage 4 trucks vs. today's trucks [USD '000]



Source: Roland Berger

C: Less air drag means less fuel consumption
The truck platooning concept



Source: Peloton, expert interviews, Roland Berger

states in the US, like Arizona and Florida, are already advanced when it comes to driverless truck legislation. For large-scale adoption, however, driverless trucking needs to be allowed in multiple adjacent states, allowing for automated truck corridors along major interstates. Several states in the South and Southwest have already laid out a path towards commercial operation of driverless trucks. At the federal level, the DOT and NHTSA have already announced that their future policy guidance will also include trucks.

A more immediate technology connected to automation is "truck platooning". In a platoon, trucks drive at a smaller distance from each other, typically between 10 and 20 meters apart. This reduces the wake at the rear of the leading truck and also the high-pressure zone in front of the following truck. The lower air drag cuts fuel consumption, typically by four to five percent for the first truck and ten percent for the second truck, meaning combined average savings per truck of 7.5 percent. A vehicle-to-vehicle wireless link between the trucks enables connected braking and cuts braking time. Platooning is possible with all levels of automation, even at Stage 1, where the driver is responsible for the lateral control of the vehicle in a "driver-assisted truck platoon". → C

Regulation of platooning is already advanced in the United States and in Europe, with multiple states and countries having enabled platooning via changes to the following distance regulation. Longer platoons consisting of more than two trucks are also under discussion. However, the length of the platoon creates potential problems: A three-truck platoon would be about 90 meters long, which could cause difficulties for a passenger vehicle that wanted to take an exit that was effectively blocked by a truck platoon.

Concepts are also being developed for platoons with a driver in the lead truck only, followed by a driverless second truck. Technically, in such a scenario the second truck would need to be equipped with Stage 4 technology as it has to be able to drive independently should the platoon break up. However, if Stage 4 technology is required, then the entire platoon might as well operate with no drivers (if not otherwise mandated by regulation). Platoons with a driver in the lead truck may therefore be an interim phenomenon only, building acceptance for fully driverless platoons later on.

ELECTRIFICATION – ELECTRIC POWERTRAINS WILL BECOME VIABLE FOR SHORT-RANGE APPLICATIONS

Over the past two years, many incumbents and startup truck manufacturers have increased their focus on electric powertrains. Various factors drive truck electrification, including fuel efficiency and CO_2 emissions regulation, corporate sustainability targets and a "green image", city restrictions on diesel vehicles and total cost of ownership (TCO) benefits. Some factors are more relevant for particular markets than others. For example, the Chinese market is mainly driven by the need to resolve the local emissions problem. The Chinese government also supports the development of electric vehicle technology in the hope of leapfrogging Western OEMs, as local manufacturers are struggling to compete on combustion engine technology. By contrast, the main aspects driving developments in Europe are both TCO and planned inner-city restrictions on diesel vehicles.

In the United States, the key driver for truck electrification is the TCO benefits that derive from fuel cost savings. The fuel cost per mile for a diesel truck is around USD 0.34 at today's fuel-efficiency level and diesel price. An electric truck can operate at around USD 0.2 per mile at the current electricity price, so 30 percent less than a diesel truck. This cost benefit could grow to 40 percent

Electric trucks with an operating range of up to 250 miles (400 kilometers) provide a TCO benefit and payback that is short enough for fleet operators.

based on diesel and electricity price projections from the US Energy Information Administration. Batteries are the major cost contributor for electric trucks, and we expect battery prices for commercial vehicles to come down from around 300 USD/kWh to 100 - 140 USD/kWh by 2025. The required battery capacity depends on the application and operating range of the vehicle.

Electrification of long-haul trucks will not be economical, even at the lower battery cost expected for 2025. Some simple calculations show why. A long-haul truck with a range of 750 miles (1,200 kilometers) would need a battery capacity of 1,500 kWh. Given current technology developments, such a battery would still cost in excess of USD 150,000 in 2025, while the annual operating cost savings would amount to USD 18,750. Payback on the incremental investment would therefore be longer than the average first-owner usage time of five years. In addition, a battery of this size would weigh about ten tons and bring a significant payload penalty.

The picture is different for short-range applications such as drayage trucks. Less battery capacity is required

to support the lower operating range, making electrification a viable option. Trucks with an operating range of up to 250 miles (400 kilometers) provide a TCO benefit and investment payback that is less than five years, in other words, short enough for fleet operators.

One additional complication needs to be considered, however. Used trucks make up a significant share of drayage trucks. While fleets typically replace their long-haul tractors every three to five years, a sizeable proportion of the drayage truck fleet is over ten years old. The economics of an electric truck only work when compared to a new diesel truck. The operating cost of a used dray truck is significantly lower as the equipment is largely depreciated. The electric truck would provide a lower fuel cost than the used, less fuel-efficient truck, but the investment does not typically achieve payback within the remaining lifetime of the truck. This further limits the potential of electric trucks. We estimate that sales volumes for battery electric Class 8 trucks will reach 10-11,000 in the United States by 2025. Larger numbers are expected for medium and light-duty trucks with urban applications, such as delivery trucks and refuse haulers. These vehicles require smaller battery capacities and their return-to-base, commercial-hours only driving pattern makes them suitable for depot charging. The low annual mileage of urban truck applications, however, can be a challenge when fleet operators aim for fast payback. Inner city restrictions planned in many cities, especially in Europe, might well turn out to be the real driver behind electrification of these applications.

DIGITALIZATION – NEW DIGITAL SOLUTIONS WILL IMPROVE UTILIZATION AND INCREASE TRANSPARENCY

Around 20 percent of trucks in the West currently travel empty. Sub-optimal route planning, driven by complexity, leads to empty runs. For instance, a truck might have various options to pick up loads on a given day. At the destination of each trip, several options may exist to pick up a new load. However, this could involve waiting times or empty trips to the next pickup point, the number of possibilities increasing with every day. Truck dispatchers need to decide on routes taking into consideration the length and pricing of the trips, the number of empty miles to the next shipment and expected waiting time for that shipment. This is a highly complex task that involves many uncertainties and requires coordination of a large number of moving elements.

Artificial intelligence (AI) is the key to solving the "dispatcher's problem". Digitalization is set to automate today's largely manual, telephone-based freight capacity and demand matching process using data analytics and AI algorithms. We expect to see freight booking and optimization platforms emerging and disrupting the industry in the same way that booking platforms have disrupted the travel industry. This development will initially apply primarily to standardized freight, which accounts for approximately 25-30% of today's freight volumes.

Many firms, both large trucking companies and startups, have launched online platforms in recent years. Convoy or J.B. Hunt 360 in the US and Sennder or InstaFreight in Europe are such examples. However, integration with transportation management systems (TMS) will be critical for large-scale adoption. Ultimately, booking platforms will replace intermediaries, such as third-party logistics (3PL) companies and brokers, and eliminate their margins, today at 15-20 percent. Full truckload business with standardized freight (dry van business) will be most suitable for booking platforms, while less than truckload business and specialized freight will likely be less impacted. We expect that those booking platforms that reach critical mass in terms of the number of freight forwarders and coverage will attract the most customers, eventually pushing other platforms out of the market in a "winner takes all" scenario.

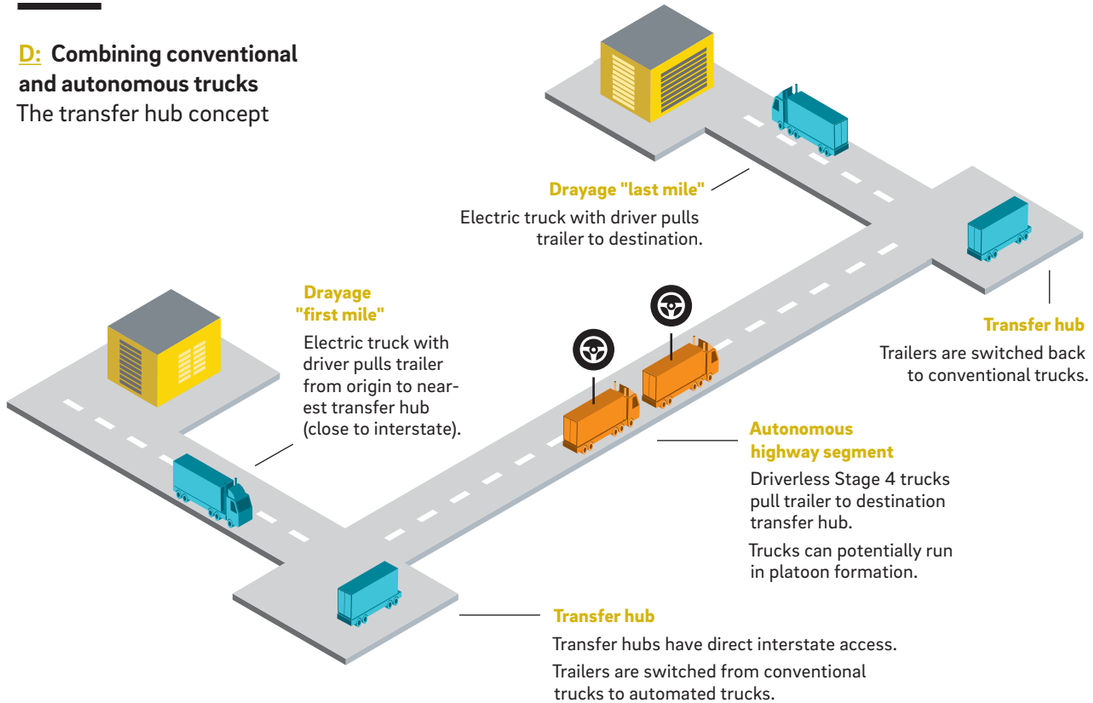
3. The business model

Transfer hubs and platooning combine to deliver substantial end-to-end savings for operators.

The technological changes outlined in the previous chapter have the potential to reshape the trucking industry's business model. Specifically, for the second half of the next decade, we foresee a scenario that combines electric drayage trucks and automated long-haul truck platoons, both optimized through booking platforms. This will lead to significant overall savings in operating costs.

Automated driving on highways is less complex than driving on service roads or in inner-city traffic. The business model that will likely emerge therefore combines conventional trucking for the first and last mile with automated driverless trucking for the middle mile on the interstate. The change between the two modes will take place in "transfer hubs" that are located next to the interstates with direct access to them. These hubs will require little infrastructure and basically consist of dedicated areas where trailers can be switched from one truck to the other. The trip between two transfer hubs can be done in a platoon. Once the automated truck has pulled the trailer to the destination hub, an electric truck with a driver will take over and pull the trailer to its final destination. → D

D: Combining conventional and autonomous trucks
The transfer hub concept



Source: Roland Berger

In the transfer hub model total operating cost savings range from 22 percent to 40 percent.

Self-driving trucks (ideally traveling in platoons) have much lower operating costs on the long-haul than conventional trucks. Today the average cost per mile for a Class 8 truck is around USD 1.55 (or USD 0.96 per km), excluding the cost of empty miles, compared to an estimated USD 0.83 (USD 0.52 per km) for a driverless truck traveling in a platoon between transfer hubs. In the conventional model, the human driver is the single largest cost item, accounting for almost half of the cost, followed by fuel at almost a quarter, then equipment and maintenance. Insurance and infrastructure costs (tolls) are less significant.

Platooning reduces the fuel cost due to the lower air drag, while equipment cost goes up slightly due to the depreciation of the additional technology required for platooning. On an annual basis, fuel savings from platooning can add up to USD 2,400 per truck. With Stage 4 automation, where the vehicle functions without a driver on the long-haul section between transfer hubs, the cost of the driver is fully eliminated. Maintenance cost is reduced due to less wear and tear (the result of better driving) and less unplanned downtime (the result of fewer accidents). The insurance cost is expected to fall in line with the lower probability of accidents. On the other hand, equipment cost will increase as the additional technology means greater annual depreciation. Also, the trucks using the transfer hubs have to bear the expense of the hubs – largely real-estate expenses and personnel costs.

If the long-haul savings amount to 72 cents per mile (45 cents per km), what, then, are the ultimate end-to-end savings for fleet operators? The figures vary by lane and depend on how long the drays and the long-haul section are. Our cost model is based on a scenario in which electric drayage trucks pull the trailer from and to the transfer hubs. We model three different lanes and calculate the total cost per load for the entire trip from origin to destination. For each lane we define potential locations of transfer hubs, assuming that they would be located in areas with sufficient industrial production or metropolitan areas. → E

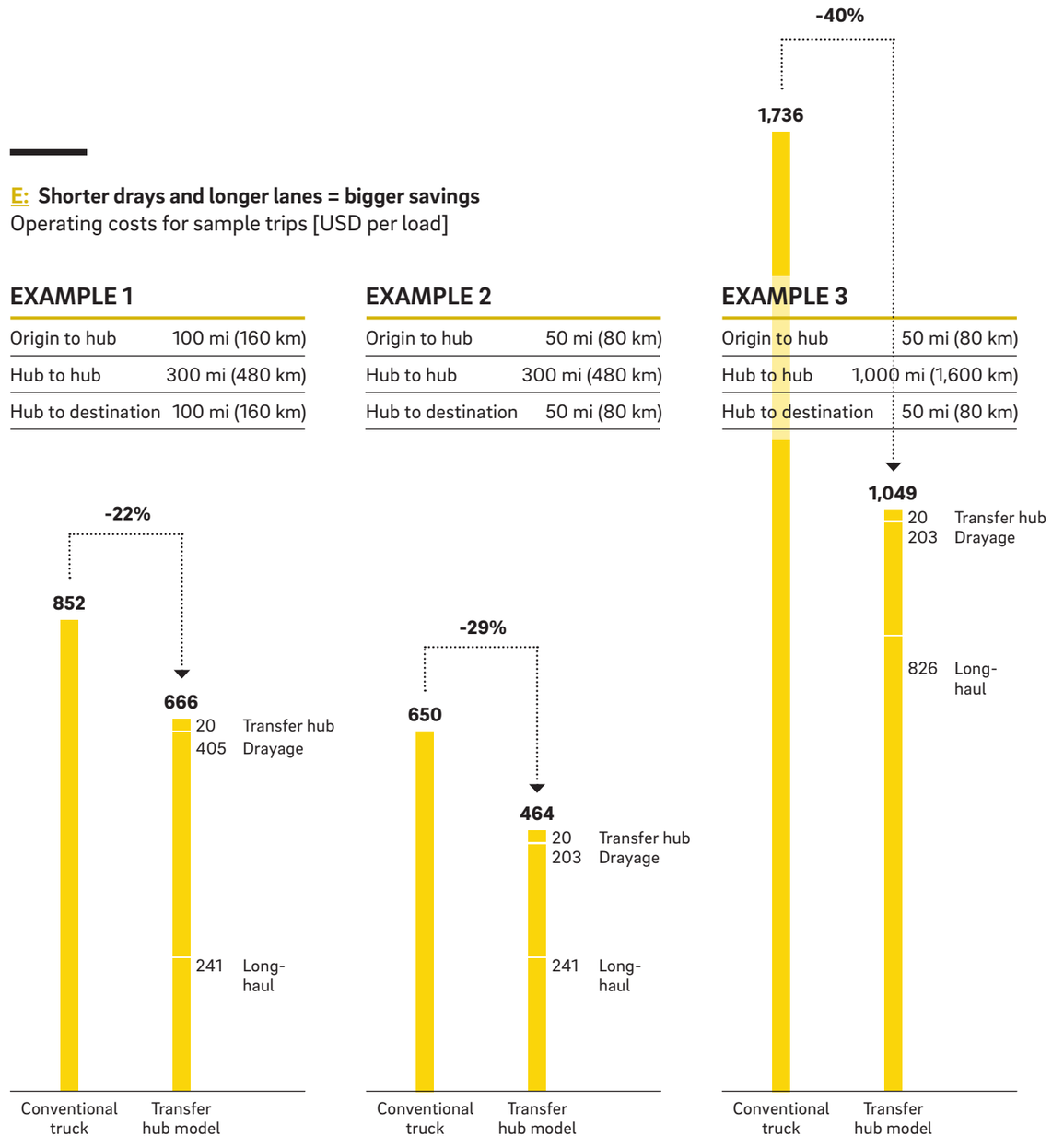
The majority of the cost-out effect comes from the elimination of the driver on the section between the hubs. Fuel cost savings from platooning and electrification are small in comparison to the driver cost savings on the long-haul section. Total savings range from 22 percent for a short lane with long drays to 40 percent for a long lane with short drays. As the implementation of transfer hubs will happen gradually and the number of hubs will be limited at the beginning, longer drays will be required to reach the next hub. Savings will therefore be closer to the 22 percent level initially or even lower, increasing over time as the transfer hub network grows.

E: Shorter drays and longer lanes = bigger savings
Operating costs for sample trips [USD per load]

EXAMPLE 1	
Origin to hub	100 mi (160 km)
Hub to hub	300 mi (480 km)
Hub to destination	100 mi (160 km)

EXAMPLE 2	
Origin to hub	50 mi (80 km)
Hub to hub	300 mi (480 km)
Hub to destination	50 mi (80 km)

EXAMPLE 3	
Origin to hub	50 mi (80 km)
Hub to hub	1,000 mi (1,600 km)
Hub to destination	50 mi (80 km)



Source: Roland Berger

The endgame scenario

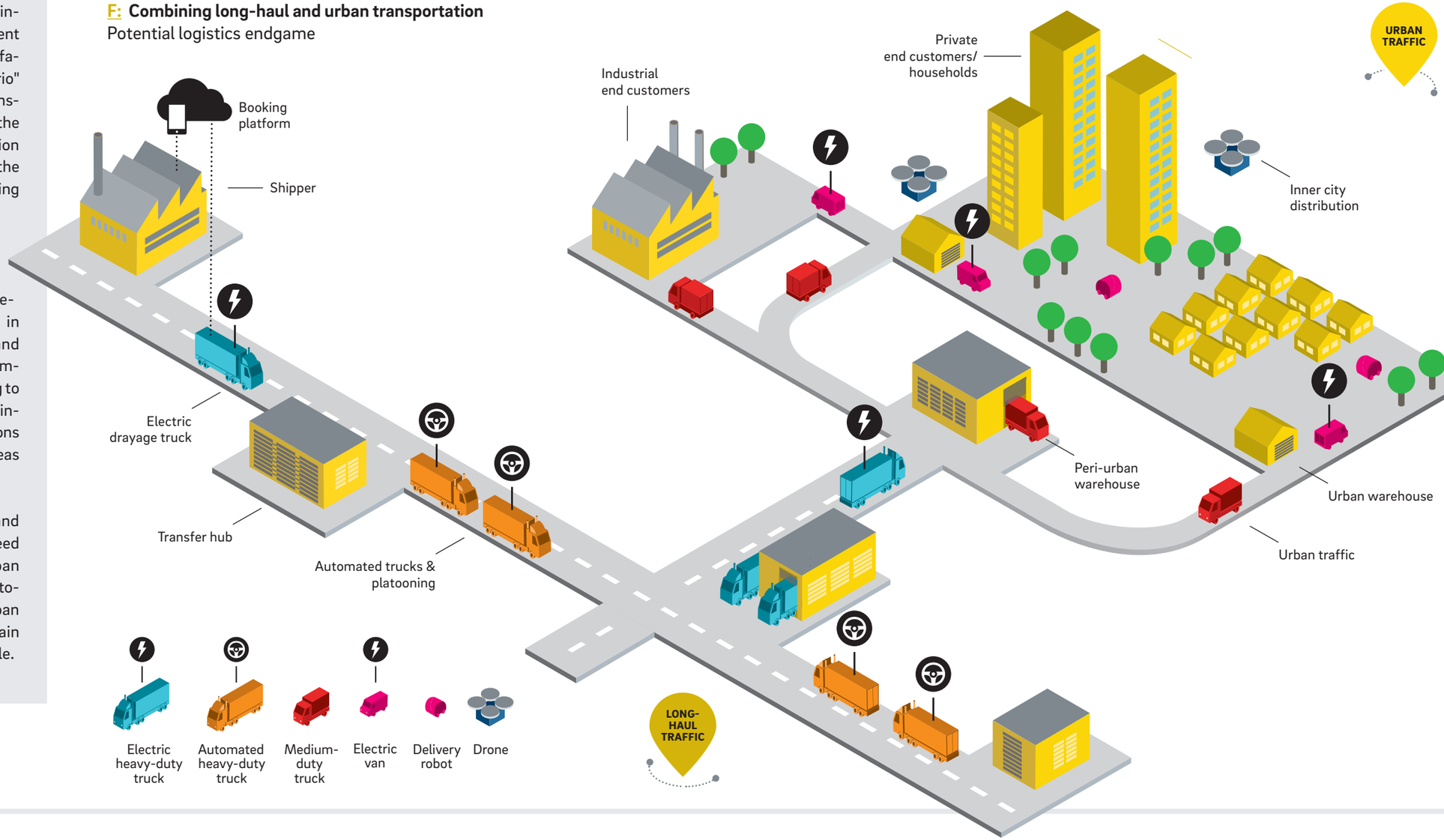
A new logistics ecosystem.

The changes taking place in the logistics industry will ultimately create a very different logistics ecosystem to that which we are familiar with today. This "endgame scenario" covers two distinct spheres: long-haul transportation and urban distribution. While the overall trends of automation, electrification and digitalization apply to both spheres, the drivers behind these trends and the resulting solutions differ.

In long-haul transportation, the focus will be on reducing operating costs, while in urban logistics, the main levers are higher customer expectations in terms of delivery speed, information and flexibility. The standards set in the e-commerce space are progressively transferring to other areas such as food retail. Retailers intend to meet growing customer expectations by increasing delivery speed in urban areas and setting up innovative delivery modes.

New warehouse concepts (peri-urban and urban) are emerging to face space and speed constraints of urban logistics. Peri-urban warehouses (25,000 m^2) will be highly automated to deliver huge volumes while urban warehouses (below 5,000 m^2) will remain manual to keep them as flexible as possible.

F: Combining long-haul and urban transportation
Potential logistics endgame



Source: Roland Berger

4. Implications for the trucking industry

Larger freight volumes, industry consolidation and pressure on freight rates lie ahead.

What do these trends and developments mean for the trucking industry? We identify a number of effects, from changes in truck fleet size and composition, to industry consolidation, the emergence of new tech players and increased pressure on freight rates. Legislation and public acceptance of autonomous vehicles will also have a fundamental impact on the speed of adoption.

TRUCK FLEET SIZES AND COMPOSITION WILL CHANGE

While freight volumes are projected to continue growing, the size of the truck fleet required to handle these volumes depends on the adoption of the transfer hub model. As automated trucks can, at least theoretically, operate 24/7, their utilization is almost twice as high as that of trucks with drivers, who need to rest once they hit the legal driving limit. Fewer automated trucks are required to carry the same freight. The number of conventional sleeper cab tractors will go down with increasing penetration of the transfer hub concept. At the same time the number of automated trucks will go up, and the number of drayage trucks will increase. We estimate that by 2035, 20-25% of the freight volume in the US could be handled through transfer hubs, reducing the overall truck fleet by 6%. By then, automated trucks will account for 10-15% of the trucks on the road.

INDUSTRY CONSOLIDATION IS INEVITABLE

Investing in automated trucks is expensive. They cost around 20-25 percent more than conventional trucks and require large control centers and investments in IT infrastructure. For this reason, only large fleet operators are expected to adopt driverless technology. Smaller players, especially the owner-driver segment, will face price pressure from booking platforms without having the cost-saving potential of automated trucks available, leading to consolidation in the industry in all regions.

NEW TECH PLAYERS WILL ENTER THE MARKET

New tech players will continue to enter the industry, driving the development of automated truck technology. While these players are not seeking to become integrated trucking operators themselves, they are likely to operate individual lanes of automated trucks as sub-contractors to large trucking companies that continue to own the customer interface. Traditional players will probably lose revenues to these new players as a consequence, unless they build up their own capabilities around the operation of automated truck fleets.

FREIGHT RATES WILL COME UNDER PRESSURE

The elimination of the driver will eventually allow operating costs to come down significantly. However, the cost-out effect will not fully hit the bottom line of trucking companies. Once digitalization increases transparency over available freight capacity and rates, and booking platforms become integrated with transportation management systems (TMS), freight rates will increasingly come under pressure. The operating cost savings from truck automation will at least partially be passed on to end customers.

LEGISLATION AND PUBLIC ACCEPTANCE WILL BE CRITICAL

The actual timing of when driverless trucks appear on our roads will depend not so much on the availability of technology as on legislation and public acceptance. In the United States, while some states are relatively advanced when it comes to driverless truck legislation, others have not yet decided which direction to take. Various stakeholder groups are trying to make their voices heard: Tech companies, OEMs and large shippers are in favor of automated truck technology and are lobbying for this, while labor unions (Teamsters) are trying to slow down adoption.

5. Our recommendations

Fleet operators must prepare for the challenges ahead.

While automated trucks won't become reality before the middle of the next decade, fleet operators should already be preparing for the industry to shift up a gear. Players should be asking themselves a number of questions, the answers to which will help them master the changes that lie ahead.

Choose your direction: The first task for fleet operators is to decide what fundamental direction they want to take their business in. Should your focus remain on owning and operating trucks, or shift to asset-light services and supply-chain expertise? In the future, we will see a much clearer separation of asset-heavy and asset-light players. If you are an asset-heavy player and you want to extend your offering into digital services, for example, you might consider setting up a freight booking platform.

Define your competitive position: Fleets that want to become significant players in the automated and digitalized logistics world need to define their future competitive positioning and differentiation potential. While truck automation is still a few years off, other forms of automation, such as warehouse automation, are more immediate. Could this be your first step towards becoming an automated, digitalized player?

Transform your customer interaction: Transforming your customer interaction in line with today's digital world will ensure continued customer loyalty. Should you be looking at integrating your services with a booking platform or developing your own platform, perhaps?

Develop an operating model: In the long term, fleet operators need to develop an operating model for an automated truck fleet. Do you want to own the automated truck fleet or sub-contract individual lanes to a technology player?

Build the infrastructure: Players that wish to run their own fleets of automated trucks need to adapt their existing infrastructure for automation. Is now the time to consider setting up your own transfer hubs? Is your existing warehousing network sufficiently robust when viewed against the expected upcoming changes?

Prepare for disruption: Finally, organizations need to prepare themselves for the coming disruption. It is vital to ensure that you manage the transition properly, for example through workforce transition plans. You must also ensure that you have the necessary financing for the required investments. Do you have a robust execution plan in place for taking the organization with you through the transformation?

As we have seen, automation, electrification and digitalization are set to cause major disruption in the trucking industry. The precise timing of this technology-driven transformation is as yet unclear, as it depends on how legislation develops and whether the public can be convinced that autonomous trucks are a safe addition to our roads. What is clear, however, is that the shifts will have far-reaching implications for fleet operators, changing operating practices and rewriting the underlying economics. To stay ahead of the pack, trucking companies need to be proactive and start preparing now for the road ahead.

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WE WELCOME YOUR QUESTIONS, COMMENTS AND SUGGESTIONS

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Publisher

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RB_PUB_18_041