



© paulbranding / fotolia.com

# FutureDRV Exploration Report

## Background Information on Research Activities and the 4 FutureDRV Scenarios

Prepared by: Sabine Schwenk, 3s research laboratory

With contributions from:  
FutureDRV consortium

IO: 1<sup>st</sup> Last update: August 2019

Contact: [schwenk@3s.co.at](mailto:schwenk@3s.co.at)

[www.project-futuredrv.eu](http://www.project-futuredrv.eu)

Co-funded by the  
Erasmus+ Programme  
of the European Union



**Project coordinator:**



DEKRA Akademie GmbH  
B2 Educational Research and  
Business Development International  
Handwerkstrasse 15, 70565 Stuttgart (DE)

Project coordinator:  
Claudia Ball ([claudia.ball@dekra.com](mailto:claudia.ball@dekra.com))

**Co-funded by:**



Co-funded by the  
Erasmus+ Programme  
of the European Union

ERASMUS+  
KA 2/ Strategic partnerships

ERASMUS+ grant agreement no:  
2016-1-DE02-KA02-003234

Project duration:  
September 2016 – August 2019

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

**Project partners:**



3s research laboratory  
Wiedner Hauptstr. 18,  
1040 Vienna (AT)  
[www.3s.co.at](http://www.3s.co.at)  
Contact: Sabine Schwenk  
([schwenk@3s.co.at](mailto:schwenk@3s.co.at))



Transformation  
Unit 11 Shaw Barn, Whitesmith,  
Lewes, East Sussex, BN8 6JD  
[www.transformation.co.uk](http://www.transformation.co.uk)  
Contact: James Tillyer  
([enquiries@transformation.co.uk](mailto:enquiries@transformation.co.uk))



AFT  
Avenue de Villiers 46,  
75017 Paris (FR)  
[www.aft-dev.com](http://www.aft-dev.com)  
Contact: Moncef Semichi  
([moncef.semichi@aft-dev.com](mailto:moncef.semichi@aft-dev.com))



DEKRA Akademie Kft.  
Vermező ut 4., Budapest  
[www.dekra-akademie.hu](http://www.dekra-akademie.hu)  
Contact: Zoltan Toth  
([zoltan.toth@dekra.com](mailto:zoltan.toth@dekra.com))



StageIT  
Korsgatan 10, 2 tr,  
41116 Goteburg (SE)  
[www.stageit.se](http://www.stageit.se)  
Contact: Andreas Silfverberg  
(Contact: [andreas@stageit.se](mailto:andreas@stageit.se))



DEKRA SE  
Service Division Training  
Handwerkstr. 15, 70565 Stuttgart  
[www.dekra.com](http://www.dekra.com)  
Contact: Claudia Ball  
([claudia.ball@dekra.com](mailto:claudia.ball@dekra.com))

**Associated partners:**



# INDEX

---

SUMMARY .....	3
1. INTRODUCTION .....	4
2. OBJECTIVES OF INTELLECTUAL OUTPUT 1.....	4
3. DESCRIPTION OF ACTIVITIES FOR TASK 1.1 –EXPLORATION PHASE.....	5
3.1 INITIAL RESEARCH .....	5
3.2 THE DELPHI METHOD.....	6
3.3 DELPHI SURVEY – ROUND 1- USING THE SCENARIO TECHNIQUE .....	6
3.4 RESULTS OF THE DELPHI SURVEY – ROUND 1.....	8
3.5 DELPHI SURVEY – ROUND 2.....	9
4. FUTUREDRV SCENARIOS OF PROFESSIONAL DRIVING (FREIGHT TRANSPORT).....	11
4.1 SCENARIO 1 - HIGHLY-SKILLED PROFESSIONAL TRUCK DRIVER – LONG DISTANCE GENERAL SCENARIO DESCRIPTION – SCENARIO 1 .....	11
4.2 SCENARIO 2 - HIGHLY-SKILLED PROFESSIONAL TRUCK DRIVER – SHORT DISTANCE .....	14
4.3 SUMMARY OF SCENARIO 3 – LOW-SKILLED PROFESSIONAL TRUCK DRIVER – LONG DISTANCE .....	18
4.4 SUMMARY OF SCENARIO 4 - LOW-SKILLED PROFESSIONAL TRUCK DRIVER – SHORT DISTANCE .....	21
5. FUTUREDRV SCENARIOS OF PROFESSIONAL DRIVING (PASSENGER TRANSPORT) .....	25
5.1 ADDITIONAL INTERVIEWS ON THE FUTURE OF PROFESSIONAL BUS/COACH DRIVING .....	25
5.2 SCENARIO A – LONG-DISTANCE BUS/COACH DRIVER – HIGHLY SKILLED.....	25
5.3 SCENARIO B - SHORT-DISTANCE BUS/COACH DRIVER – HIGHLY SKILLED .....	26
5.4 SCENARIO C – LONG-DISTANCE BUS/COACH DRIVER – LOW-SKILLED .....	26
5.5 SCENARIO D – SHORT-DISTANCE BUS/COACH DRIVER – LOW-SKILLED .....	26
REFERENCES .....	28
ANNEX 1: INTERVIEWQUESTIONS – INTERVIEW SERIES 1.....	30
ANNEX 2: INTERVIEW QUESTIONS – INTERVIEW SERIES 2.....	34
ANNEX 3: QUESTIONNAIRE DELPHI ONLINE SURVEY – ROUND 1 .....	36
ANNEX 4: QUESTIONNAIRE DELPHI ONLINE SURVEY – ROUND 2A.....	44
ANNEX 5: QUESTIONNAIRE DELPHI ONLINE SURVEY – ROUND 2B.....	56
ANNEX 6: INTERVIEW QUESTIONS ‘PROFESSIONAL BUS DRIVER’ .....	67

## Summary

The following report gives an overview on the ‘Exploration Phase’ of Task 1.1 of Intellectual Output 1 of the Erasmus+ project FutureDRV (<https://www.project-futuredrv.eu/>). It was coordinated by the Austrian project partner 3sresearch laboratory (3srl) with the support of all members of the FutureDRV project consortium and contains information on the research activities and research methodologies applied during the exploration phase of the FutureDRV project. The research activities and research results of Task 1.1 led to the “4 FutureDRV Scenarios” that are the focus of this report and that were one of the key prerequisites for developing the “FutureDRV Profile for Professional Drivers (Truck and Bus)”.

Chapter 2 gives a very short summary of the objectives of Intellectual Output 1, starting with Task 1.1, the exploration phase described in this report, and finishing with Task 1.6, the publication of the “FutureDRV Profile”.

Chapter 3 presents a detailed description of the research activities of the project consortium’s activities during the Exploration Phase with the applied research activities and research methods.

Finally, chapter 4 and 5 present an overview of the “FutureDRV Scenarios” and describes the process of how these Scenarios were evaluated by conducting a Delphi Online Survey and by additional interviews.

## 1. Introduction

The three-year Erasmus+ project FutureDRV (09/2016-08/2019) investigated the future of professional driving by taking a look into the tasks and role of professional drivers and their qualification requirements in 2035 and beyond. Throughout the project, the six project partners (from AT, DE, FR, HU, SE, UK) investigated different dimensions of professional drivers' future skill requirements in order to develop a comprehensive set of tools and recommendations supporting social partners, education providers, policy makers and other stakeholders to ensure a well-skilled workforce of professional drivers capable of handling the changes and innovations that are to come.

The FutureDRV project was divided into three project phases: "Exploration", "Development" and "Exploitation" that built on each other. This report concentrates on the activities during the exploration phase.

The main target groups for the exploration phase were transport experts (truck or bus), employers, social partners (e.g. chambers of commerce/labour), transport scientists, truck or bus drivers, truck/bus unions, training providers (e.g. driving schools) and national, European and international transport associations (e.g. IRU).

## 2. Objectives of Intellectual Output 1

In total, IO1 consisted of 6 tasks that are briefly summarised in the following because they all built on each other to create the final FutureDRV profile:

\_Task 1.1: Exploration of the future of professional driving

Task 1 contained desk research and complementing interviews and consultations with stakeholders related to trends and innovations ahead, creating potential scenarios on the professional driver profession with regard to qualification requirements and an exploration of existing and evolving VET solutions in the field. This exploration laid the foundation for the development of the FutureDRV profile.

\_Task 1.2: Identification and description of work processes/tasks

\_Task 1.3: Definition of Learning Outcomes

\_Task 1.4: Structuring (segmenting and sequencing) the profile

\_Task 1.5: Final consultation with stakeholders on the FutureDRV profile

\_Task 1.6: Publication of the FutureDRV profile

## 3. Description of Activities for Task 1.1 – Exploration Phase

### 3.1 Initial Research

The FutureDRV project started with an intense exploration phase to collect necessary information. In addition to the desk research activities by the project members and the creation of a comprehensive online literature database, a first series of interviews was planned. The objective was to identify trends, innovations, future work requirements and their impact on professional driving but also innovative learning solutions within the professional driving sector. Under the leadership of the task coordinator 3srl and the support of all partners, a questionnaire for a first series of interviews with transport experts (truck) was created and 25 interviews were conducted between March and June 2017 (see Annex 1).

The first interview series resulted in some valuable input but at the same time it revealed a certain lack of interest and knowledge of some target groups<sup>1</sup> about the future of professional driving. It seemed that some employers, training providers and even some professional drivers themselves were not able to give any kind of opinion on the future of professional driving. Predictions on the future of the profession were extremely scarce, instead, most of the interviewees were mostly focused on the current situation within the transport sector (e.g. lack of drivers, bad image of the profession, bad working conditions). Few transport professionals or training providers seemed to be actively interested in the actual future of professional driving and could therefore say little about future competence requirements.

The results of the Interview Series 1 suggested to start a second interview series with “Complementary questions from the perspective of innovation”. Here, the aim was to try to ascertain more information on the speed of implementation of innovations and on new technological developments within the professional driving sector. It was necessary to gather more information about new task requirements for the drivers and to find out more about new production processes and/or organisational changes within transport companies. Furthermore, questions on the future needs within initial and continuous vocational training still had to be answered. This second interview phase was prepared in September 2017 under the leadership of AFT and carried out between December 2017 and May 2018. This time, the additional interviews were targeted at four groups: professional drivers, transport managers, truck/trailer manufacturers and software developers (see Annex 2).

Right from the start of the FutureDRV project, the IO1 leader 3srl also worked on creating a FutureDRV “core profile”. This first rough basic professional profile was created with the help of the outcomes of the desk research activities, literature research and the use of the

---

<sup>1</sup>The target groups for the first interview series were experts in the field of transport looking at transport from different angles (e.g. from telematics, transport infrastructure and/or education), VET providers (incl. schools and colleges), manufacturers/ service providers (not only for trucks but also for other transport related products and services as well), publishers/ learning material / technology developers, employers, sector organisations/ associations, drivers and their representatives (e.g. unions), driver agencies, chambers of labour/ commerce, city clusters, policy makers.

professional driver profile of a predecessor of the FutureDRV project, the Erasmus+ project "ProfDRV" (<https://www.project-profdrv.eu/>) that took place between 2010 and 2013.

Due to the complexity of describing future requirements for professional drivers in 2035 and the multitude of key factors that influence this future, the FutureDRV project consortium decided to apply two additional research methods often used for researching and sketching future developments: the Delphi Methodology and the Scenario Technique.

### 3.2 The DELPHI Method

The Delphi method is a structured group survey that usually consists of several rounds. After each round, there is an exchange of information so that the participating experts can correct their opinions if they want to. The experts are asked for a written assessment/feedback on a specific topic - usually in the context of time estimates. The result is then reported back to the experts until, ideally, a consensus is reached. The aim is to obtain a stable group opinion. The number of survey rounds can vary, the experts remain anonymous and have no contact with each other. The following diagram illustrates the principles of a Delphi survey:

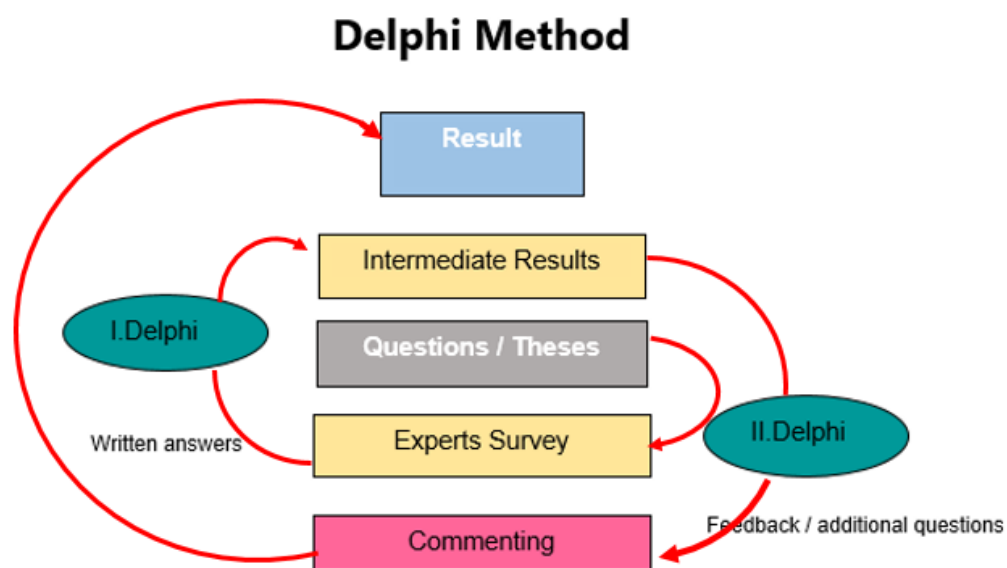


FIGURE 1: TRANSLATED FROM ZUKUNFTSINSTITUT (2019), P. 1

### 3.3 DELPHI Survey – Round 1- using the Scenario Technique

For the next research step of the FutureDRV project, the project consortium decided to prepare and carry out two rounds of Delphi Surveys. For this purpose, 3srl together with the project partners developed an interview guideline combined with an online questionnaire that underwent several feedback and evaluation loops. In order to be able to sketch possible future



work conditions and work requirements for professional drivers, the consortium decided to rely on yet another research method, the “Scenario Technique”<sup>2</sup>.

The Scenario Technique is designed to enable improved decision-making by allowing the consideration of outcomes and their implications. It is a process of analysing possible future events by considering alternative possible outcomes. At the same time, it does not try to show one exact picture of the future but it presents several alternative future developments instead: *“A scenario can be defined as a description of a possible future situation, including the path of development leading to that situation. Scenarios are not intended to represent a full description of the future, but rather to highlight central elements of a possible future and to draw attention to the key factors that will drive future developments.”*<sup>3</sup>

Many scenarios are designed in the form of a “scenario funnel” where the starting point is a trend scenario that is positioned on a time axis. This trend scenario presents the future developments where stable developments are assumed although unstable conditions must be assumed as a rule. Therefore, both positive and negative development opportunities are taken into account. Because of the increasing distance from the present and the expected possible deviations from the trend scenario, the range increases over time. The extreme scenario that shows the best possible development (“best case scenario”) is at the upper end of the funnel, the extreme scenario with the worst possible development (“worst case scenario”) is at the lower end. The funnel illustrates the conceivable space of plausible futures that can be mapped with scenarios with the potential trend lying somewhere in the middle.

The following graph was adapted from a presentation by Prof. Jochen Baier<sup>4</sup> from the Hochschule Furtwangen and demonstrates the impact factors (a1, b1, etc.) influencing possible developments for a cross-impact analysis and the elaboration of future scenarios, in this case of professional truck driving. The graph shows a starting point of today to the future. The goal within the FutureDRV project was to create possible scenarios for future truck/bus drivers with a focus on their work requirements and to demonstrate the consequences for the occupational field:

For Round 1 of the Delphi Online Survey, 3srl developed two scenarios (Scenario I and II) that resulted from the screening of relevant literature, a FutureDRV basic profile<sup>5</sup>, the results from the first interview series with experts (on trends, innovations and future work requirements) and feedback loops within the project consortium. At the beginning of the Delphi Survey, a specific scenario was summarised in general terms, then the effects of the scenario on the respective work areas of professional drivers were described and the experts were asked for their feedback/comments.<sup>6</sup>

---

<sup>2</sup> Kosow, H. and Gaßner, R. (2008).

<sup>3</sup> Ibid. P. 1.

<sup>4</sup> Baier, J. (2018). It was presented during a FutureDRV expert meeting in January 2018 in Vienna. Prof. Baier works at the Business Informatics department, Hochschule Furtwangen University and was an associated partner in the FutureDRV project.

<sup>5</sup> Derived and adapted from the Professional Driver Occupational Profile from the Erasmus + project « ProfDRV ». Online : <https://www.project-profdrv.eu/index.php?id=254>. (26.08.2019).

<sup>6</sup> Work Areas of professional driving : ‘Driving & manoeuvring the vehicle’; ‘Performing pre-departure tasks’; ‘Loading and unloading’; ‘Planning driving times & routes’; ‘Maintenance of vehicle and vehicle combinations’;



## Scenario Funnel

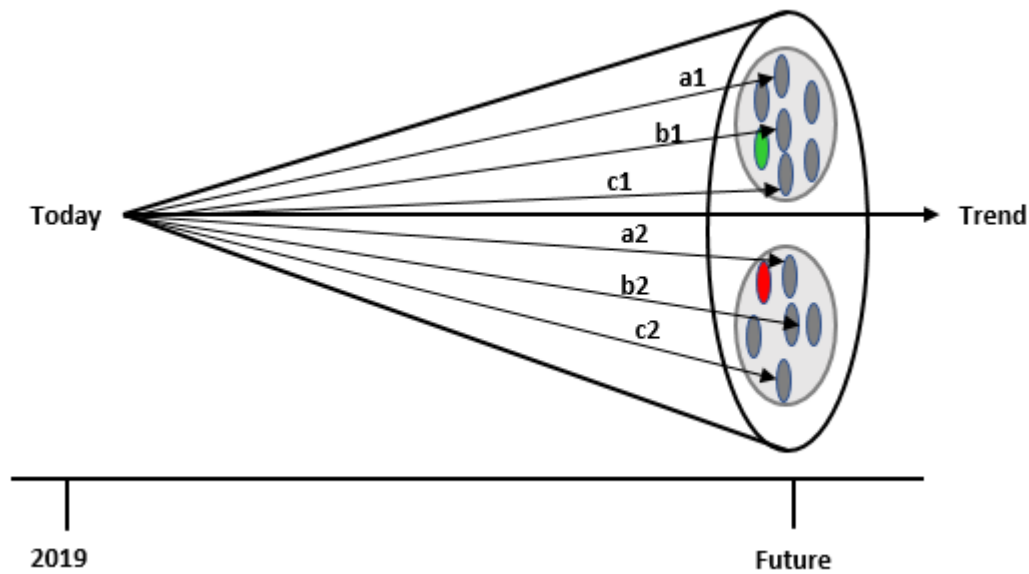


FIGURE 2: GRAPH ADAPTED FROM KOSOW, H. AND GABNER, R. (2008) AND FROM BAIER, J. (2018)

**Scenario I** described a fully automated driving scenario for professional truck drivers until 2035 where the driver still had to be in the vehicle (SAE level 4<sup>7</sup>) but didn't have to fulfil most of his/her traditional work tasks any more and carried out new requirements instead.

**Scenario II** presented a partially automated driving scenario of truck drivers.

For the Delphi Survey – Round 1, national, European and international transport experts (truck driving) were contacted online and presented with a questionnaire (see Annex 3). As mentioned above in the scenario technology description, FutureDRV Scenario I and II did NOT reflect the actual expected reality for future professional drivers in 2035 but exaggerated versions. Between November 2017 and April 2018, 14 experts gave their opinion on the plausibility of the two scenarios and on the qualifications and requirements for future professional drivers in the Delphi Online Survey – Round 1.

### 3.4 Results of the DELPHI Survey – Round 1

The results from the Delphi Online survey – Round 1 made it very clear that it was necessary to differentiate between long-distance drivers and short-distance or last mile drivers and at the same time to distinguish between a potential increase in qualification requirements for professional drivers on the one hand and a potential decrease of qualification requirements on the other.

<sup>7</sup>'Work documentation and paper work'; 'Cooperation with customers'; 'Cooperation with supervisors, colleagues, enforcement bodies and the public'; 'Occupational health and safety/ healthy lifestyle'; 'Continuous vocational education and training'.

<sup>7</sup><https://www.sae.org/news/2019/01/sae-updates-j3016-automated-driving-graphic> (26.08.2019).

Among many issues, the experts stressed the crucial importance of key factors when discussing future developments within the transport sector. Factors such as facilitating the appropriate infrastructure and ICT requirements but also the necessary connectivity and technological requirements as well as the clarification of legal regulations like liability issues after accidents or the implementation of EU-wide transport laws.

Controversial answers dealt for example with the necessity for specific motorway lanes for automated trucks, the question of how long drivers will actually be needed in the cab and whether the consequences of automation will lead to higher or lower qualification requirements for future professional drivers.

The following graph gives an impression of the abundance of influencing factors (more than 250) that play a role in the development of scenarios for future work requirements for professional truck drivers:

### Identifying impact factors



FIGURE 3: ADAPTED FROM BAIER, J. (2018), P.8.

## 3.5 DELPHI Survey – Round 2

For the second round of the FutureDRV Delphi Survey, all the Delphi results from Round 1 were analysed and combined with the ongoing research activities (Interview series 1 and 2) and the discussions and feedback loops within the project consortium. As a consequence, a

Scenario Grid was developed by 3srl which (with the support of the project partners) lead to “4 FutureDRV Scenarios”.

The following 4 FutureDRV Scenarios on professional driving (truck) differentiated between long-distance and short-distance transports and between “highly-skilled” and “low-skilled”<sup>8</sup> drivers. They were the basis for the Delphi Survey – Round 2:

- Scenario 1: Highly-skilled professional driver – long distance
- Scenario 2: Highly-skilled professional driver – short distance
- Scenario 3: Low-skilled professional driver – long distance
- Scenario 4: Low-skilled professional driver – short distance

### **Background Information on the 4 FutureDRV Scenarios**

For the Delphi Survey – Round 2, 3srl and the project consortium developed a new online questionnaire which was sent to the same 14 experts as for the Delphi Survey – Round 1. The involved national and international professional truck driving experts were informed about the most important Delphi survey results of Round 1 in order to give them an overview of the main outcome of answers before taking part in Round 2.

Since the number of interview questions on the 4 FutureDRV Scenarios was altogether more than 80, it was decided to split this second Delphi survey into two parts. The first part (2A) only asked questions on Scenario 1 and 2 for highly-skilled drivers and was conducted between December 2018 and February 2019. The second part of the Delphi survey (2B), only presented questions on Scenario 3 and 4 for low-skilled drivers and was undertaken between March and May 2019.

As mentioned before when explaining the scenario technique in the previous chapter, these scenarios presented rather extreme descriptions of the work requirements for professional drivers and their future work activities. This means that in 2035 and beyond, the scenarios cannot be expected to become a reality but show the “best case” occupational profile of highly-skilled drivers and the “worst case” occupational profile of low-skilled drivers both for long-distance and short-distance freight transport. The following prerequisites have to be stressed when looking at the FutureDRV scenarios 1 to 4 and were also communicated to the participating Delphi experts:

- All scenarios described professional truck drivers of vehicles with a weight of a minimum of 3.5 tons and above (no trucks below 3.5 tons, no smaller vans, etc.).
- All scenarios described the time period from 2030/35 and beyond
- All scenarios assumed a reached SAE automation level 4<sup>9</sup> which means that the driver still has to be present in the vehicle but the automated system is driving if possible.

---

<sup>8</sup> The highly-skilled driver scenarios correlate with the “best case” occupational profiles, the low-skilled driver scenarios correlate with the “worst case” occupational profiles of professional drivers.

<sup>9</sup>SAE International (2019).

- All necessary prerequisites for the implementation of each individual scenario were assumed to be fulfilled, i.e. the required infrastructure, connectivity, technology, investments and/or national/ European legal regulations, etc.
- All scenarios only included the occupational profile of ordinary professional truck drivers without additional knowledge and/or training (no ADR training for specific transports, oversize transports, etc.)

## **4. FutureDRV Scenarios of Professional Driving (freight transport)**

This chapter presents the 4 FutureDRV Scenarios that were the basis for the second round of the Delphi Online Survey and the FutureDRV profile (freight transport). The detailed questionnaire can be found in Annex 4 and 5.

### **4.1 Scenario 1 - Highly-skilled professional truck driver – long distance**

#### **General scenario description – Scenario 1**

By 2030/2035, when automation level 4 is in place, a professional driver, let's call him 'Tom', will likely shift into becoming a "professional pilot", as his actual driving times (i.e. when automatic driving is not in play) will be reduced, but only to pave way to new sets of skills to be mastered and displayed.

Tom will hence be known as a truck pilot rather than merely driver, and rely on automated solutions for most of the physical tasks he carries out himself today, but the number of different sets of tasks expected of him is likely to increase.

Tom will not need to perform pre-departure checks or personally carry out loading and unloading procedures, but with the free time allowed by automation, he will be expected to perform new tasks, mirroring a much wider variety (device programming, device reading, customer-relations middle and back-office tasks, continuous training) that will ultimately and substantially change Tom's professional profile.

At the same time, though some tasks will be automated, the extent of potential liability of the driver may also be extended because legislators usually prefer to focus on making sure a victim (an individual hurt in an accident, the shipper or the client whose cargo does not reach its destination when and as expected etc.) receives compensation. Therefore, even if in praxis Tom may not need to perform some of the traditional driver tasks (e.g. loading/unloading), there is a high chance he will still need to be able to do them and therefore master the underlying competences.

This will lead to a consistent change in the content and probably the manner in which Tom and his future colleagues will be acquiring the necessary skills to successfully perform their work. Training will indeed need to integrate new topical priorities (e.g. customer-relations, behavioural skills, digital skills, strategic route planning etc.), new timeframes as innovations are bound to

pour in at a fast pace in the coming years and new formats (new didactical schemes, virtual reality, improved e-learning features).

But overall, this should strengthen the attractiveness of the profession by offering labour market newcomers a chance to join a modernised industry while resorting to up-to-date technologies, developing abilities in numerous professional areas (transport, logistics, customer relations etc.) that considerably widen the spectrum of potential career evolution for any person on the verge of starting his/her career.

The likes of Tom and his future colleagues, when deciding to become a long-distance highly qualified road transport pilot, will not only decide to take on a job, but will decide to open the first door that will lead them to numerous other doors all leading, in turn, to a variety of jobs, all accessible to them as they will have tackled some of the fundamentals leading to these different jobs.

### **Scenario 1 : Work Task 1 – Driving and Manoeuvring the vehicle**

Once automated systems are fully operational in trucks, Tom will not only need to be able to read and comply with the information given by the various on-board systems and screens, but he should also have acquired the necessary competencies to “type-in” instructions to these systems so as to, for instance, be able to program a new route under parameters he will need to translate in a “language”/format understood by the devices/software available, or to notify clients of a change in delivery time, or to propose a rescheduling of a delivery etc.

On top of the already acquired ability to drive and manoeuvre a vehicle, he will also need to continue to be able to drive the vehicle in case of system failure or be able to know when and how to take control of the vehicle if and when needed. His reaction skills will have to improve and be trained so as to allow for a quick reaction when necessary.

### **Scenario 1 : Work Task 2 – Performing pre-departure tasks**

The assumption is that when level 4 automation is in place, as well as are automated logistics platforms, legal provisions will provide for a substantial –if not total- decrease in the driver’s liability with regard to pre-departure checks as well as with the safe and correct securing of cargo. Nevertheless, this will not dispense Tom from carrying out at least an educated visual inspection of the vehicle prior to departure. He will also need to check whether the automated systems - especially since the evolution of road transport regulations will probably take into consideration an enhanced training of the drivers on the use of automation software (used for daily maintenance such as checking tyres, breaking, lighting etc. on the one hand, but also for checking the proper securing of cargo, using proper lashing procedures, on the other) which could lead to some form of residual liability or co-liability. Therefore, even though its intensity may decrease, Tom’s liability as a driver may very well increase to cover new grounds that require to learn how to be able to read the automated pre-departure checks assistance software, the cargo securing assistance software, but also be able to detect any kind of failure in the software that go undetected. This extends Tom’s responsibilities, his liability and hopefully his abilities, while perhaps reducing the physical effort expected from the driver.

[Click here to view the scenario description](#)

### **Scenario 1 : Work Task 3 – Loading and unloading (incl. prior and subsequent tasks)**

Since loading and unloading will be fully automated, such tasks will not be of Tom's responsibility. However, as a long-distance highly skilled professional driver, more skills will be expected from Tom rather than the mere passive observation of automated loading/unloading procedures. Tom will indeed need to be able to spot and eventually correct any failure in the automated loading/unloading of cargo for any given transport operation.

### **Scenario 1 : Work Task 4 – Planning driving times and routes**

Even though planning driving times and vehicle routes is automated, Tom will not only need to follow and comply with the routes and driving times announced by the software, he will also need to be able to insert in the system all the parameters (destination, times, freight volume etc.) needed for it to provide an automated calculation of these items. This will essentially boil down to the acquisition of digital skills, but the best performing drivers will learn, or most likely, will have learned an optimised manner of typing in the parameters and of fixing the software settings so as to be consistent with a certain strategy. Where this activity used to be of the responsibility of non-mobile professionals of transport, in the future strategic route planning will likely become a driver's competency. Moreover, in case of route changes, and given the fact drivers will likely take on new customer relation tasks, Tom will need to be able to communicate with customers in case of delays or changes in route planning or delivery times.

[Click here to view the scenario description](#)

### **Scenario 1 : Work Task 5 – Maintenance of vehicle and vehicle combinations**

Even though maintenance will be fully automated, some elementary tasks will still need to be carried out by drivers (e.g. change of windshield cleaners). Tom will also be expected to communicate with designated maintenance facilities to which automated maintenance software will point.

[Click here to view the scenario description](#)

### **Scenario 1 : Work Task 6 - Work documentation and paper work**

Tom, in a digitised and automated work environment will need to acquire sufficient digital skills to electronically process all the administrative tasks he will be expected to carry out (bill of lading, confirmation of delivery, etc.). Overall, Tom will need to use electronically connected devices with as much ease as he today uses pen and paper. If on top of the basic tasks, the driver is also asked to process mid or back-office documentation, he will have to be trained so as to master the underlying company policy and procedures. In all these tasks, language and digital fluency will be expected of the driver.

### **Scenario 1 : Transversal Work Task (I) – Cooperation with customers**

Tom will need to be specifically trained in communication and behavioural skills so as to deal with customers, in a fashion that is consistent with company policy. Tom will need to alert

customers in case of changes in delivery times or any changes affecting the delivery of the awaited goods. This implies an enhanced sense of service provided to customers. Though the equipment Tom will use to communicate with customers should be widespread (mobile phones, tablets, computers etc.), thus not requiring further training, the behavioural and attitudinal aspects of customer relations should be a fundamental element of future driver training.

#### **Scenario 1: Transversal Work Task (II) – Cooperation with supervisors, colleagues, enforcement bodies and the general public**

Tom will be interacting with the usual sets of actors: fellow drivers, management, enforcement officers, warehouse agents, but since he will also be increasingly exposed with customers, it is likely his behavioural and communication skills will have improved so as to also become responsible for projecting a more positive image of the company and thus serve the company's overall communication policy, especially toward the general public whose opinion counts. In such a scenario, Tom will not only be a modern professional pilot, but also become some sort of “Ambassador” of the company, using his words and behaviour to enhance company attractiveness, after being made aware of the importance of his new role.

#### **Scenario 1: Transversal Work Task (III) – Occupational health and safety / healthy lifestyle**

Even though automation will (if used correctly) reduce the physical burden on drivers, Tom – especially because he is used to the “old way” of doing things – may experience some initial difficulty adapting to numerous tasks including new ones. This may entail health stress situations which may be reduced when a new generation of drivers enter the profession.

#### **Scenario 1: Transversal Work Task (IV) – Continuous vocational education and training**

Continuous VET (CVET) will become all the more important because of the new sets of tasks dealing with piloting modernised vehicles, dealing with digitised and connected software and equipment, communicating with customers, etc. The rapid evolution of technology and its gradual but nonetheless fast introduction into industry praxis will change not only the topical content of CVET but also its frequency. CVET will need, even more so than before, to be constantly updated with the integration of new available technology, new business patterns, new customer relation paradigms etc. It will therefore no longer make sense to have CVET carried out outside work times nor locations. Training, if regulation and CVET offers allow for it, will take place more and more during work processes (e.g. aboard the vehicle, while waiting, during loading times, etc.) through digitised channels (e.g. e-learning).

### **4.2 Scenario 2 - Highly-skilled professional truck driver – short distance**

#### **General scenario description – Scenario 2**

By 2030/2035 the professional driver ‘John’ is still working in the vehicle, although he does not steer it or control it while travelling on private land or around transport hubs. In built-up



areas he must take full control of the vehicle when speeds are over 30kph. John is responsible for maintaining safety standards and must always be aware of the environment around the vehicle; he has been trained not to rely on the automated system. The industry now refers to John as a road pilot and not a driver. He is legally responsible for the load and for basic checks, which need to be carried out using diagnostic tools providing real-time data through an 8G network. The data identifies and alerts John to developing faults as well as existing ones. John does not carry out manual maintenance tasks; this is done through onboard AI using robotics to ensure vehicle downtime is minimised while ensuring personal safety. John must understand how the automated system works and needs to be aware of vehicle alerts and system failures; he must be ready to take control whenever he is made aware of a problem. The vehicle does not use an internal combustion engine; propulsion is provided through battery technology underneath the chassis and between the two axles, while high speed contactless charge is provided by a network of charging hubs located just underneath the road surface. John is responsible for ensuring that the vehicle has enough charge to complete his deliveries.

John can change vehicles whenever he needs to through a delivery network. In almost all cases vehicles are no longer owned by transport companies and a truck share network is well established, allowing total flexibility to move loads from one vehicle to another part-way through a delivery schedule. This is made possible by the leasing companies (the vehicle owners) having an arrangement with transport companies to keep their vehicles on-site. These vehicles are fitted with AI robotics which are used to transfer a variety of loads in a similar way to the old-fashioned fork lift truck. They are integrated with each vehicle and are powered by a built-in vehicle battery.

## **Scenario 2: Work Task 1 – Driving and Manoeuvring the vehicle**

John needs to understand the system alerts and potential failures to take control when needed. He spends some of his time driving the vehicle; at lower speeds level 5 autonomy is activated and John is required to observe the environment and be ready to take control in an emergency. At higher speeds John must take full control of the vehicle because he is able to identify risks more easily than the AI. John has no need to control the vehicle when performing turns or manoeuvres during unloading and docking. At such low speeds the vehicle is totally autonomous, continuously calculating the environment around it. In this case John monitors the vehicle from outside to ensure that it's safe for pedestrians and other road users and that the manoeuvre is being performed as it should be. He has a remote cut-off switch to kill the power in the event of an emergency.

Street architecture is still being developed and high-rise buildings can cause a problem resulting in a sudden loss of connectivity or signal, which is crucial to level 5 autonomy. Reflections from windows and buildings sometimes confuse the system, which is why John must maintain a high degree of awareness.

### **Scenario 2 : Work Task 2 – Performing pre-departure tasks**

The pre-departure checks involve a walk around the vehicle and checks inside the cab. John makes a visual check of tyres, bodywork, AI robotics, sensors, lights and doors. He then uses the real time diagnostics tool to check the condition of the powertrain, strength of the vehicle connectivity and amount of charge remaining on the batteries. The diagnostic tool uses augmented reality to scan the vehicle and project a 3D image above the screen to enable John to see exactly where the fault (or developing fault) is. A virtual report is generated and uploaded to the transport office, the vehicle leasing company and the enforcement agency at the same time. Bodywork and paintwork have self-healing properties so routine maintenance is confined to the powertrain, batteries and robotics. However, John is still responsible for checking fluid levels including water and hydraulics. In the cab John uses a virtual pre-departure checklist to confirm that the controls are active and in good working order. All controls, including lights, wipers and indicators, are fully automated, although John can assume manual control when necessary. Before leaving, John must check that the load has been positioned according to the daily deliveries. The onboard robotics are pre-programmed with the correct route and schedule. Although the loading and unloading is done automatically, John needs to manually check the load to confirm it's secure.

### **Scenario 2 : Work Task 3 – Loading and unloading (incl. prior and subsequent tasks)**

In almost all cases the loading and unloading procedure is fully automated. The built-in AI controls and manages most situations of loading and unloading. Vehicles have integrated hydraulic robots / robotic arms that deploy to load / unload a range of goods in different types and different sizes. They utilise the customer schedule (which is programmed as part of the pre-departure checks), while a common system of load security is used which removes the traditional methods using straps and lashings; instead magnetic technology is deployed to eliminate friction and lateral movement. John is still responsible for the vehicle and its load, so he must ensure that the technology is being effective. Manual checks are still performed but the physical task of loading and unloading has ended.

### **Scenario 2 : Work Task 4 – Planning driving times and routes**

Level 5 automation can be used in many situations but there are limits on where it can be activated depending on the routes. Certain factors need to be considered. John manages all aspects of the route, from customer scheduling to road suitability and efficiency. To do this he needs a good knowledge of routes and the requirements relating to the vehicle, although he does not need to know the roads in any detail. As this is a key part of John's work activities, he receives training on width and height limits at regular intervals. He must also demonstrate knowledge of site and route restrictions, as well as road signs. Routes and customer schedules are not as rigid as they used to be. Now it is possible to use different vehicles and different routes depending on the circumstances, with smaller vehicles used for urban deliveries.

### **Scenario 2 : Work Task 5 – Maintenance of vehicle and vehicle combinations**

Vehicle maintenance is John's responsibility. However, he is only responsible for managing the maintenance. He is legally responsible for the load and for basic checks, which need to be carried out using diagnostic tools providing real-time data through an 8G network. The data identifies and alerts John to developing faults as well as existing ones. John does not carry out manual maintenance tasks; this is done through onboard AI using robotics to ensure vehicle downtime is minimised while ensuring personal safety. John must understand how the automated system works and needs to be aware of vehicle alerts and system failures; he must be ready to take control whenever he is (made) aware of a problem.

### **Scenario 2 : Work Task 6 – Work documentation and paper work**

John does not use paperwork. He uses a real time augmented reality device to monitor, record and submit data about the vehicle and its performance. Customer schedules are integrated with the vehicle telematics, meaning that when a job is complete John simply records the information on a screen in the vehicle.

### **Scenario 2 : Transversal Work Task (I and II)<sup>10</sup> – Cooperation with customers as well as supervisors, colleagues, enforcement bodies or the general public**

John is an expert in customer service, having received formal and informal training on the importance of managing customers and their expectations. To make communication easier he carries a small device which translates his words into any language, ensuring there is no misunderstanding with customers and colleagues. This is part of John's role as a road pilot. He has also been formally trained as a first responder in road emergencies. He is highly valued, particularly with members of the public who consider him as a fourth emergency service.

### **Scenario 2 : Transversal Work Task (III) – Occupational health and safety / healthy lifestyle**

Safety standards are extremely high and John works in an environment where accidents are very rare. However, regulation still controls what can and can't be done with vehicle autonomy, particularly around speeds and urban environments. This affects John because he often works in these situations.

### **Scenario 2 : Transversal Work Task (IV) – Continuous vocational education and training**

There are strict conditions in place to ensure John knows when to take control of the vehicle, and he has received the necessary training. VET uses a combination of augmented and virtual reality (VR) because they provide a real-life scenario without the associated risks.

---

<sup>10</sup> For scenario 2, two transversal tasks were combined : cooperation with customers on the one hand and cooperation with supervisors, colleagues and so forth on the other. To keep the general numbers of the transversal tasks the same for all scenarios, the following transversal work task has the number III.

## 4.3 Summary of Scenario 3 – Low-skilled professional truck driver – long distance

### General scenario description – Scenario 3

By 2030/2035 on automation level 4, the driving process is completely automated but the professional driver 'Peter' still has to be present to accompany his truck from hub to hub. He only has a small scope of tasks and responsibilities and only has to deal with driving matters (e.g. being able to understand the information he is given by the automatic driving system or by the management, being able to take over the driving process in case of system failure or hazardous situations and head for the nearest parking lot and /or secure the breakdown/accident site according to regulations). The road network provides among other things special lanes for autonomous traffic as well as all other necessary prerequisites for autonomous driving.

An interstate network of hubs and associated truck service points (departure control, vehicle repairs, maintenance, etc.) has been created along the motorways to ensure regular maintenance and inspection of the trucks by specialised personnel. Peter has nearly nothing to do with those tasks any more. These hubs also ensure correct truck load securing which is carried out automatically or by specialised staff. Standardised loading units that enable the use of standardised load carriers are the rule. Loading and unloading can therefore be automated on a huge scale. From the hubs, goods are distributed via separate distribution traffic to the destination area. Legal responsibility for load securing or departure control no longer lies with Peter but with the personnel in the hubs and service facilities.

The responsibility for accidents caused by his autonomous truck (accident liability) also no longer lies with Peter but with the freight operator which applies to all other safety aspects (e.g. vehicle inspection in hubs or at customers' premises) as well. Competence requirements on Peter are reduced to a minimum (monitoring function), also his contact with customers is very limited and only necessary in exceptional cases because there is Hub to Hub traffic. Therefore, Peter only needs a low level of skills.

The image of professional drivers like Peter is, however, negatively affected as the profession is a job that more or less everybody with a truck driving license can do which also increases the shortage of professional drivers on the labour market. Only special transports (e.g. oversize or heavy loads) are accompanied by specially trained personnel.

### Scenario 3: Work Task 1 – Driving and Manoeuvring the vehicle

Peter needs to know very little of the automated self-driving system, i.e. he is only expected to handle digital devices and understand the information he is given by the automated system or the management in a very easily understandable manner with high usability. He is required to be able to drive the vehicle and interfere/react appropriately only if necessary (e.g. take over the driving process when the system requires him to do so). Those processes are limited

to a minimum such as steering the vehicle to the next safe parking opportunity. The task of driving and manoeuvring a vehicle has shifted to a basic understanding of the self-driving systems and to being able to react adequately. Peter's necessary knowledge with regard to sensors and their proper functioning is very basic.

### **Scenario 3: Work Task 2 – Performing pre-departure tasks**

By 2030/35, all pre-departure checks (e.g. tyres, steering/lighting/braking/signalling systems) are automated using all available kinds of digital technology (e.g. sensors, mobile apps, cloud-based data/links, remote control systems, etc.). The legal responsibility for pre-departure tasks does not longer lie with Peter but with the freight carrier. The same applies to cargo securing, which is automated as well.

### **Scenario 3: Work Task 3 – Loading and unloading (incl. prior and subsequent tasks)**

Since loading and unloading is a fully automated process, Peter is no longer involved in the loading and unloading of the truck.

### **Scenario 3: Work Task 4 – Planning driving times and routes**

The whole process of planning driving times and vehicle routes is automated. Peter receives his optimum route from automated routing systems (which will, for example, consider costs, customer requests, the actual traffic situation, cargo requirements, time windows at customers, legal working hour regulations, etc.). He is able to understand the incoming information and react appropriately (e.g. in case of irregularities, signs of system failure, etc.). The complete communication process is automatised as well, and Peter is only required to communicate with customers, hubs or the management in very rare cases. Usually, he is told what to do and receives alternative routes in case of problems (traffic jams, accidents, etc.) directly from his onboard system.

### **Scenario 3: Work Task 5 – Maintenance of vehicle and vehicle combinations**

The maintenance of truck vehicles is completely automated and everything is checked by sensors (e.g. tyre/ oil/water pressure, wear parts). In case of emerging technical vehicle problems, the automatic system warns Peter and initiates the appropriate measures (e.g. Peter is informed that the vehicle will navigate to a garage facility or that it will be picked up by a maintenance service team).

### **Scenario 3: Work Task 6 – Work documentation**

Since all work documentation is digital, Peter needs only minor skills beyond everyday skills related to understanding and dealing with digital devices and digital media for being able to

work with different kinds of documentation tools throughout his job. (e.g. using a mobile app or other digital devices to confirm the correct completion of a transportation process or the taking over of cargo, etc.). [Click here to view the scenario description](#)

### **Scenario 3: Transversal Work Task (I) – Cooperation with customers**

Peter is very rarely required to communicate or cooperate with customers, since all communication processes will be either automated or carried out by other service personnel (e.g. automatic digital communication processes constantly inform hubs/clients about the whereabouts of the cargo and about delays). Since Peter only drives between hubs, he usually also does not get into direct contact with customers. In case of unforeseen problems, specifically trained service support personnel are doing the communication/cooperation process for him.

### **Scenario 3: Transversal Work Task (II) – Cooperation with supervisors, colleagues, enforcement bodies and the general public**

Peter is only required to communicate with enforcement bodies or the general public to a limited extent because this also happens automatically or is done by other specialists. But he still will need basic skills of understanding and handling digital and other communication tools/devices for communicating with his supervisors (e.g. in case of unforeseen problems that have to be communicated to superiors).

### **Scenario 3: Transversal Work Task (III) – Occupational health and safety / healthy lifestyle**

With fully automated long-distance transportation, it is possible to have vehicles on the road 24 hours, 7 days a week. Self-driving systems reduce accident rates and improve driving safety which will have a positive effect on occupational safety. The hub-to-hub system enables Peter to work in regular shifts with regular working hours even within long-distance driving. However, poor work demands on drivers can lead to stress, depression and other kinds of illnesses resulting from poor work tasks. [Click here to view the scenario description](#)

### **Scenario 3: Transversal Work Task (IV) – Continuous vocational education and training**

Continuous vocational education and training plays a minor role for Peter. He is only required to do a minimum of continuous vocational training according to the national/European legal requirements (e.g. applicable EU directive) and the requirements of his employer and his clients. At the same time, continuous vocational education and training (CVET) is much more flexible and easier to access as well as self-explanatory and applicable to Peter's individual needs (e.g. digital/virtual training tools that can respond to the learner's needs).

## **4.4 Summary of Scenario 4 - Low-skilled professional truck driver – short distance**

### **General scenario description – Scenario 4**

By 2030/2035, the driving process at automation level 4 is automated, but the professional driver Michael must still be present to accompany his truck in and around the city, to load and unload it and to communicate with the customer. He has a variety of tasks and responsibilities. He deals with driving matters (e.g. driving in complex situations, shunting at the customer, loading and unloading, load securing). He must also have communication skills to deal with unexpected situations with other road users.

Michael primarily delivers goods from a hub (that is supplied by long-distance trucks) to the goods' final destination and picks up goods from small manufacturers and suppliers to deliver them to a hub. At the hub he can take advantage of the hub's full set of services including parking, loading and associated truck services (incl. departure control, vehicle repairs, maintenance, etc.) implemented by specialist personnel. When being at the hub, Michael has almost nothing to do with these tasks any more. The loading and service points ensure a correct load securing of the vehicle, which is either carried out automatically or by qualified personnel. However, when taking goods from clients to the hub, he is personally responsible for the correct load security. His contacts with the customers are regular but not very complicated, i.e. he has to hand over and pick up the delivered goods and load them again for the hubs. Therefore, Michael only needs a limited amount of skills.

The responsibility for accidents caused by his autonomous truck (accident liability) no longer lies with Michael but with the traffic control system and its operators. The competence requirements for Michael are reduced to a minimum (monitoring function and presence in case of problems with other road users).

### **Scenario 4: Work Task 1 – Driving and Manoeuvring the vehicle**

Michael needs to know and be able to operate all relevant functions of his vehicle that are necessary for both automated and manual driving. In regular operation, Michael's vehicle is automated: he performs a monitoring task but he must also be able to intervene immediately if the situation requires it. In complex traffic situations and with the customer (especially in small companies because large companies usually run hubs of their own), he may without the support of sensors have to drive the vehicle himself in order to be able to react in time.

### **Scenario 4: Work Task 2 – Performing pre-departure tasks**

By 2030/35, all prior checks (e.g. tyres, steering, lighting, braking and signalling systems) will be automated with all available digital technologies (e.g. sensors, mobile apps, cloud-based data/links, remote control systems, etc.). The legal responsibility for the tasks before departure



no longer lies with Michael, but with the traffic or transport organisation. For route planning, Michael is supported by telematics systems, which includes possible traffic jams and time windows at a customer in the planning.

#### **Scenario 4: Work Task 3 – Loading and unloading (incl. prior and subsequent tasks)**

The planning of the loading, the load securing and the actual loading is carried out by employees of the hub. Michael is responsible for the further planning of the loading, the load securing and the actual loading, supported by app applications for calculating the load distribution and by lashing computers when picking up goods at the customers. Michael's vehicle will be equipped with assistance systems for axle load control and automated load securing.

#### **Scenario 4: Work Task 4 – Planning driving times and routes**

The entire process of planning driving times and routes is automated. Michael gets his optimal route through automated routing systems (which take into account customer wishes and time windows, normal and actual traffic situations, costs, freight requirements, legal working time regulations, etc.). However, he also has to be able to plan and control his driving and working times independently in order to react to possible delays and/or customer requests. In the event of delays due to unforeseeable traffic situations or delays at the customers, Michael can independently intervene in the tour planning, search for alternative routes and communicate these changes to his superiors and/or the customer using appropriate terminology.

#### **Scenario 4: Work Task 5 – Maintenance of vehicle and vehicle combinations**

Truck maintenance is fully automated and is checked by sensors (e.g. tyre/oil/water pressure, wear parts). If technical vehicle problems occur, the automatic system warns Michael and initiates the appropriate measures (e.g. Michael is informed that the vehicle has to go to a workshop or is picked up by a maintenance team). But usually, this is all taken care of automatically. In the event of a breakdown, Michael's job is to secure the breakdown site and notify customers, supervisors, and the workshop, for example.

#### **Scenario 4: Work Task 6 – Work documentation**

The entire documentation of the work is digitised. Michael needs the knowledge to be able to handle these digital media efficiently. Apps, telematic systems or scanners, for example, are used here. For the delivery of goods directly to the customer, an acknowledgement of receipt may be required, which is sent via an app or handheld. When a customer needs support with the records, he/she is usually supported by office personal in his/her company. Michael usually has nothing to do with those things.

#### **Scenario 4: Transversal Work Task (I)– Cooperation with customers**

When picking up and delivering goods, Michael is in direct contact with the customers. However, his task is usually limited to working with the customers' personnel when it comes to loading and unloading the truck. Many communication processes are also automated so that the customers can track the position of the vehicle or the goods on the computer. If the delivery address is a collection point, there is no need for communication. In case of complex problems, communication with Michael's company takes place via specially trained personnel.

#### **Scenario 4: Transversal Work Task (II)– Cooperation with supervisors, colleagues, enforcement bodies and the general public**

Michael is required to cooperate with control officers in control situations, to answer open questions and to actively work on problem solutions. Communication with colleagues and superiors usually takes place via telematic systems or apps. When communicating problems, Michael selects the most appropriate communication medium for doing so.

#### **Scenario 4: Transversal Work Task (III)– Occupational health and safety / healthy lifestyle**

Due to the individuality of each customer, the working hours in local public transport go hand in hand with the goods acceptance times of the customers. Autonomous systems reduce the accident rate and improve driving safety which has a positive effect on occupational safety. However, poor working conditions and a poor working climate can lead to stress, depression and other illnesses for truck drivers.

#### **Scenario 4: Transversal Work Task (IV)– Continuous vocational education and training**

Professional development plays an important role for Michael. He is obliged to carry out a minimum of further training in accordance with national/European legislation (e.g. EU Directive). At the same time, CVET is much more flexible and accessible, self-explanatory and applicable to Michael's individual needs (e.g. digital/virtual tools that can respond to a learner's needs).

### **4.5 Results of the Delphi Survey – Round 2A and 2B**

The results of the second round of the Delphi study broadly confirmed the four FutureDRV scenarios. All experts approved of the differentiation between competence requirements for long-distance and for short-distance professional drivers and also of the “best case” (highly-skilled) and “worst case” (“low-skilled”) professional driver scenarios with the related competence requirements.

Although all four scenarios were accepted in principle, there were, of course, different opinions when it came to details such as how much manual work will actually be left for the highly

qualified drivers or when automated vehicles will actually mix with private traffic. Once again, the experts referred to many framework conditions having to be clarified on a national and European level (e.g. liability issues, existing infrastructure, connectivity, AI). Some experts predicted full automation to start much later between 2040-2050 with the exception of fixed automated bus routes that are already tested on European public roads today. The descriptions of the work tasks with their future competence requirements for professional drivers were mostly accepted as well with again some controversies on specific matters (e.g. some experts predicted very strict traffic regulations for urban areas in the future, others predicted AI (Artificial Intelligence) taking over most of the driver tasks much sooner than expected). The survey results showed a clear tendency that a majority of the professional driver experts supported the assumption, that IT-Skills, social skills and communication skills will play a much more important role in future competence requirements for professional drivers, especially for short-distance truck drivers and long-distance bus drivers.

## **5. FutureDRV Scenarios of Professional Driving (passenger transport)**

### **5.1 Additional Interviews on the future of professional bus/coach driving**

In addition to the interviews and Delphi Surveys on the future of truck driving, the project consortium also conducted parallel expert interviews in the field of bus and coach driving, as the competence requirements for future bus or coach drivers can differ greatly from those for truck drivers. (e.g. passenger service, passenger safety). Although four scenarios on the future of bus/coach driving were developed by the project members, the consortium decided to turn them into one questionnaire only for interviewing the target group experts (see annex 6) due to capacity reasons of the available experts.<sup>11</sup>

These interviews took place between February and May 2019 and also based on scenarios for long-distance and short-distance bus/coach drivers. The target groups were bus/coach driving experts, private or public bus/coach service providers, employers, bus/coach drivers, bus/coach stakeholders, and representatives/HR managers of urban transport services. The analysis results of these interviews were integrated in the development of the Future Driver Profile (freight/passenger transport) like all other research results.

The following chapters 5.2 to 5.5 give an overview on the scenarios (A, B, C, D) about competence developments and work tasks for future professional bus/coach drivers in 2035 and beyond. The scenarios were also developed using the scenario technique described in Chapter 3.3 and show the “best case” or proficient occupational profile of highly-skilled bus/coach drivers and the “worst case” or absolute minimum occupational profile of low-skilled bus/coach drivers both for long-distance and short-distance passenger transport.

### **5.2 Scenario A – Long-distance coach driver (occasional service) – highly skilled**

Long-distance highly skilled coach drivers will continue to acquire and use “ordinary” driving abilities whilst developing new sets of competences involving non-driving tasks. On the one hand, driving skills will need to be improved as to be able to adapt driving to new energy sources the vehicle operates on (e.g. electric vehicles) as well as to be able to read and use all the internet of things (IoT) and other technological equipment made available on board optimally.

At the same time, drivers will be lead to acquire in depth new competences focused on customer care with the objective of maximising customer satisfaction (quality of service) and

---

<sup>11</sup> To ask the target group experts for their feedback on all four scenarios for the bus sector was not feasible.

perhaps company satisfaction (customer quantity through on-board payment services). The physical and infrastructural environment will need to evolve so as to adapt to the changes in the driver's tasks and to allow for the autonomous transport to benefit from all of what technology has to offer (e.g. IoT, interoperability, etc.). In the end, long distance bus/coach passengers transportation will become a more valuable service to companies, passengers and perhaps to Society (clean energy use).

### **5.3 Scenario B - Short-distance bus/coach driver – highly skilled**

A highly skilled driver operating over short distances (e.g. on public busses and other fixed routes) will experience a major shift in work conditions and work environment. The development of infrastructure by traffic planners will focus on the safety of other road users and pedestrians in urban areas. Drivers working in towns and cities will need to be aware of new routes, more street architecture and increased restrictions on vehicle dimensions, weights and engine efficiency, as well as a higher volume of road users and sharing more road space. Although a highly qualified and / or experienced driver may be able to cope with these factors, there is a clear indication that their training will need to include other ways of interpreting road traffic and situational risk, though this type of driver is likely to adapt very well to new technology and automated systems, having used similar technology in everyday life. The evolution of autonomous vehicles will be progressive, helping drivers to become familiar with system characteristics and to better understand their role. Safety will still be an essential part of driver training, but the focus will shift from driving technique to concentration and hazard awareness as autonomy becomes more mainstream.

### **5.4 Scenario C – Long-distance bus driver (fixed routes) – low-skilled**

When looking at the future of long-distance bus drivers in the low-skilled scenario, most of the driving will be done by automated systems. Therefore, the driver will be rather a vehicle attendant who only needs to be able to take control of the vehicle in case of an emergency and where the safety of the passengers and the vehicle has to be protected (breakdown/accident). So, with regard to driving, the vehicle attendant is reduced to monitoring functions and taking necessary action to protect the passengers. His/her competence requirements will be downgraded to a very low level of qualification. As a result, the vehicle attendant will mainly be there for the passengers to provide services and for communication purposes, this is within fixed route passenger transports as described here rather limited to very basic services.

### **5.5 Scenario D – Short-distance bus/coach driver – low-skilled**

On short distances (e.g. fixed routes with public busses) the driver is also reduced to be a "vehicle attendant" with monitoring functions, since the driving is completely automated. In

case of vehicle-breakdown or accident, the driver has to be able to secure the safety of the passengers and the vehicle (e.g. support the passengers when leaving the vehicle, take the vehicle to and park it at a safe location). The driver has to be able to handle all necessary ICT and communication tools as well as understand and react to all signals/alarms by the automated system as well inform and react to orders by the surveillance personel. Communication skills when it comes to passenger contact are reduced to a minimum (e.g. inform passengers if necessary, inform authorities/company personel in case of danger). Passenger service skills remain to be a core tasks also for the low skilled driver in short distance traffic.

For further information on this publication please get in touch with:

**Sabine Schwenk**  
3s research laboratory

Wiedner Hauptstr. 18, 1040 Vienna, Austria  
E-mail: [schwenk@3s.co.at](mailto:schwenk@3s.co.at)  
Telephone: 0043/1/585 09 15-54  
URL: [www.3s.co.at](http://www.3s.co.at)



Images: © paulbranding - Fotolia.com (cover)

## References

2025AD (2015): Definition: levels of AD. Online: <https://www.2025ad.com/definition-levels-of-ad> (26.08.2019).

Australian Industry Standards (2017): Transport and Logistics IRC skills forecast 2017. Online: <http://www.australianindustrystandards.org.au/wp-content/uploads/2017/03/TLI-Key-Findings-Paper-2017V1.2.pdf> (27.08.2019).

Baier, J. (2018): FutureDRV- New Business Processes. Unpublished PowerPoint presentation for a FutureDRV expert meeting in Vienna. Hochschule Furtwangen University.

Baier, J. et al (2013): Zukunft des Berufskraftfahrers: Konsequenzen für die Logistik im Jahre 2025. Online: <https://docplayer.org/43340451-Zukunft-des-berufskraftfahrers-konsequenzen-fuer-die-logistik-im-jahre-studie.html> (26.08.2019).

Bundesministerium für Verkehr, Innovation und Technologie (2016): IND4LOG4 - Industrie 4.0 und ihre Auswirkungen auf die Transportwirtschaft und Logistik. Online: <http://www.forschungsnetzwerk.at/downloadpub/ind4log.pdf> (26.08.2019).

CEDEFOP (2004): Scenarios Toolkit. Cedefop Dossier series 8. Online: [https://www.cedefop.europa.eu/files/6009\\_en.pdf](https://www.cedefop.europa.eu/files/6009_en.pdf) (26.08.2019).

Devault, G. (2018): How to Conduct a Delphi Survey. Online: <https://www.thebalancesmb.com/how-to-conduct-a-delphi-survey-2297116> (26.08.2019).

ERTRAC (2015): Automated driving- Roadmap. Version 5.0. Online: [http://www.ertrac.org/uploads/documentsearch/id38/ERTRAC\\_Automated-Driving-2015.pdf](http://www.ertrac.org/uploads/documentsearch/id38/ERTRAC_Automated-Driving-2015.pdf) (last access 23.11.2017).

European Commission (2017): Connected and Automated Transport – Studies and Reports. Online: <https://ec.europa.eu/programmes/horizon2020/en/news/connected-and-automated-transport-expert-group-report> (31.08.2019).

Financial times (30.03.2017). Out of road: driverless vehicles and the end of the trucker. Online: <https://www.ft.com/content/2d70469c-140a-11e7-b0c1-37e417ee6c76> (last access 23.11.2017).

Germany Federal Highway Research Institute (BASt) (2014). Legal consequences of an increase in vehicle automation. Consolidated final report of the project group. Part 1. Report on the research project F 1100.5409013.01 of the operational programme of the Federal Highway Research Institute: Legal consequences of an increase in vehicle automation. Online: [http://bast.opus.hbz-nrw.de/volltexte/2013/723/pdf/Legal\\_consequences\\_of\\_an\\_increase\\_in\\_vehicle\\_automation.pdf](http://bast.opus.hbz-nrw.de/volltexte/2013/723/pdf/Legal_consequences_of_an_increase_in_vehicle_automation.pdf) (24.08.2019).

Hsu, C.C. and Sandford, B.A. (2007): The Delphi Technique: Making Sense of Consensus. In "Practical Assessment, Research & Evaluation", Vol. 12 Nr. 10. Online: <https://pareonline.net/getvn.asp?v=12&n=10> (26.08.2019).

Horx Zukunftsinstitut (2010): Delphi-Methode. Online: [https://sharedoc.us/view-doc.html?utm\\_source=seite-1-4](https://sharedoc.us/view-doc.html?utm_source=seite-1-4) (26.08.2019).

International Transport Forum (2017): Managing the Transition to Driverless Road Freight Transport. Online: <https://www.itf-oecd.org/managing-transition-driverless-road-freight-transport> (26.08.2019).

International Transport Forum (2015): Automated and Autonomous Driving. Online: <https://www.oecd-ilibrary.org/docserver/5jlwvzdfk640->



[en.pdf?expires=1568911243&id=id&accname=guest&checksum=4B2CDBCCF421094FBA94573085CA9285](#) (31.08.2019).

Kosow, H. and Gaßner, R. (2008): Methods of future scenario analysis. Online: [https://www.die-gdi.de/uploads/media/Studies\\_39.2008.pdf](https://www.die-gdi.de/uploads/media/Studies_39.2008.pdf), p.25

Mauer, M. et al (2016): Autonomous Driving. Technical, Legal and Social Aspects. Daimler und Benz Stiftung.

McKinsey (2016): Delivering Change. The transformation of commercial transport by 2025. Online: <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/delivering-change-the-transformation-of-commercial-transport-by-2025> (27.08.2019).

Mietzner, D. and Reger, G. (2005): Advantages and disadvantages of scenario approaches for strategic foresight. Online: <http://www.forschungsnetzwerk.at/downloadpub/strategicforesight2005.pdf> (26.08.2019).

NHTSA – National Highway Traffic Safety Administration (no date): Automated Vehicles for Safety. Online: <https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety> (26.08.2019).

PWC (2016): The era of digitized trucking. Online: <https://www.strategyand.pwc.com/gx/en/insights/digitized-trucking.html> (27.08.2019).

SAE International (2019): SAE updates J3016 - Levels of Automated Driving graphic to reflect evolving standard. Online: <https://www.sae.org/news/2019/01/sae-updates-j3016-automated-driving-graphic> (26.08.2019).

Semantic Scholar (1997): The Delphi method\* - Abstract. Online: <https://www.semanticscholar.org/paper/The-Delphi-method-Crisp-Pelletier/21a4a0ac70928452880eae6c51e171aa9289a00a> (26.08.2019).

## Annex 1: Interview Questions – Interview Series 1



### Interview guideline

Initial research/ Task 1.1

#### Target groups of the initial research interviews

---

Please consider the following groups of stakeholders within your initial research. Every partner is expected to contribute at least 10 interviews (covering as many different target groups as possible) to the initial research.

- Experts in the field of transport looking at transport from different angles (such as telematics, transport infrastructure, etc.) and/or education
- VET providers (incl. schools and colleges)
- Manufacturers/ Service providers (not only trucks but also other transport related products and services)
- Publishers/ Learning material/ technology developers
- Employers
- Sector organisations/ associations
- Drivers and their representatives (unions)
- Driver agencies / Temporary employment agencies
- Chambers of labour/commerce
- Cities clusters
- Policy makers

(Not all questions are relevant for all potential interview partners! The interview guideline to be used for a specific interview should be built out of the guiding questions below on a case-by-case basis.)

#### Interview implementation

---

##### Initial remarks and interview introduction:

As initial remarks, it is strongly recommended that partners take the time to explain to interviewees the purpose of the FutureDRV project (i.e. to identify future trends and innovations that will lead to new work requirements that our project will incorporate in the FutureDRV profile, learning solutions, recommendations and timeline) and the conclusions that are to be drawn from this particular initial research (i.e. development of future scenarios of professional driving, a comprehensive overview about the future ahead of professional driving, basic considerations for development of the FutureDRV profile and learning solutions). Therefore, it is important- beyond all the formal questions contained in the template – to get the stakeholders interviewed to provide as many details as possible regarding their prospective view on these changes.

**It is especially important to clarify that we are primarily interested in the working context (i.e. tools, processes, work organisation, technique, interactions with others ...) professional drivers will work in in future because an understanding of this working context will enable us to draw conclusions on the drivers future skill requirements.**

Please also raise the following aspects in your introduction:

- The projects co-funding through the European Commission,

- The timeframe of the project between Sep 2016 and Aug 2019,
- The timeframe looked at between now and 2030/2035,
- The interviews are conducted with experts and stakeholders from all across Europe, there will be in total about 40-50 stakeholders representing different areas interviewed, further will be involved at later project phases,
- The possibility to treat all information provided anonymously, but it will be asked again at the end of the interview if and to what extent the interview partners name/organisation may be mentioned in the research report,
- Not all questions can be answered by all experts equally it is therefore no problem to skip questions that appear not to be applicable or to further investigate on questions that are especially relevant in the interview partners context.

### **Interview questions**

*(Please note: Block A and C should be presented to all kinds of stakeholders, block B is for VET providers and related specialists only. Feel free to elaborate on every question as far as possible/needed with the individual interview partner and/or to skip questions if not relevant for an interview partner. If sending interview questions before the interview to the interviewee please only send the actual questions and leave the hints in italic out, those are just meant as hints for the interviewer during the interview!)*

#### **An Identification of trends, innovations, future work requirements and their impact**

- (1) Which trends, developments and innovations in the following areas are relevant from your point of view for the future of professional driving in the upcoming years?
  - *Technological (e.g. truck, trailers, automation, connectivity, loading and unloading facilities/ transport/logistics infrastructure in general, traffic management systems, alternative transport with/without driver, ...)*
  - *Environmental trends (e.g. city regulations, reduction of noise, new types of fuel)*
  - *Economic trends (e.g. intermodality, home delivery, urbanization, consolidation)*
  - *Social and behavioral (e.g. ageing workforce, new generation of workers and their requirements on work, working hours, languages skills, IT/communication skills)*
  - *Policy (e.g. legal requirements, ethical considerations, city regulations)*
  - *Safety (e.g. urban driving, country driving, hazard perception)*
- (2) Which effect will these trends, developments and innovations have – from your point of view - on the future work/ working context of professional drivers?  
*(Which forms of new work might emerge? How will this new work be performed?)*
- (3) What characteristics should future professional drivers have in order to be ready for the future?  
*(Examples: attitudes, technological competence, language skills)*
- (4) Which effects will these trends and developments have – from your point of view - on skills requirements? How does this work differ from current requirements?
- (5) In your opinion, will the expected changes lead to the need of new training solutions? If so, what features should these new solutions bear?
- (6) Looking into the future of the professional driver profession, where do you see the most important future fields of competence development for professional drivers in the upcoming 10 to 15 years from your particular perspective?  
*Please refer (one after another) to*  
 \_*technological changes – in vehicles as well as infrastructure (e.g. truck, trailers, automation, connectivity, loading and unloading facilities/ transport/logistics infrastructure in general, traffic management systems, alternative transport with/without driver, ...),*  
 \_*ecological changes, climate change, ... (e.g. city regulations, reduction of noise, new types of*

fuel)

*\_changes in logistics economy, ... (e.g. intermodality, home delivery, urbanization, consolidation)*

*\_changes in society, ... (e.g. ageing workforce, work-life-balance, new generation of workers and their requirements on work, working hours, languages skills, IT/communication skills)*

*\_changes in policy (e.g. legal requirements, ethical considerations, city regulations)*

*\_safety aspects (e.g. urban driving, country driving, hazard perception)*

- (7) Are you aware of any innovations (or emerging/upcoming practices or pilot initiatives) within training/ education for professional drivers or related professional fields that you would consider as addressing those requirements (all different dimensions) already? If yes, please describe!  
*(Please ask after every area of change indicated in question 6)*
- (8) What changes are necessary within organisations in order to get ready for future requirements?
- (9) Do you know of any national, European or international study, project or article on how the professional drivers' (or relevant related) activities and/or the context they take place in will evolve in the future? If so, please specify.

## **B Identification of innovative learning solutions**

- (1) Looking into professional driver qualification that you are aware of, which measures related to qualification (this can be measures such as training offers, training organisation approaches, validation standards, requirements on trainers, legal requirements with regard to training, etc.) would you consider as innovative? Why?  
*(Make sure to address micro – meso – and macro level innovations – maybe split this questions into three – one per level?)*
- (2) Do you think existing training solutions (see q1) sufficiently address professional drivers' skill needs in order to stay competent in the specific field they address also in future?
- (3) Are there such training innovations in related professional fields that you would consider as relevant for professional driving as well? Why would you consider them as relevant?
- (4) Looking into the way training takes place (provided through VET providers, in companies, etc.), what would you consider as innovative and future oriented in the field of professional driving? What examples of such innovative training approaches (within professional driving or related fields) are you aware of? Please describe!
- (5) Are you aware of national or sectoral innovations with regard to professional driver qualification (such as revised sector standards, legal regulations, guidelines, laws, etc.)? Please describe?
- (6) What kind of training will – from your point of view - be necessary in future in order to ensure professional drivers employability on the one hand and on the other ensure a competent handling of the changes ahead of us by drivers?
- (7) Do you know of any national, European or international study, project or article on how the professional drivers' activities will evolve in the future and lead to new VET engineering and didactical approaches? If so, please specify.

## **C General questions to the interview partner:**

- (1) Whom else would you recommend with regards to this topic for an expert interview?
- (2) May we mention your name/organisation in the list of stakeholders and experts interviewed that we will publish in the related research report and the final project publication (available in print and electronically online)? Yes/no
- (3) May we approach you with single statements/ answers from this interview in order to get your permission to quote your answer in our research report or later on within our project work?  
Yes/no

- (4) May we contact you again in case there are additional questions on a certain element of this interview? Yes/no
- (5) May we contact you again for further stakeholder/expert interviews throughout the implementation of the project and/or do you want to get engaged into the project in other ways (associated partner, ...)? Yes/no
- (6) Do you want to receive further updates about the projects progress? Yes/no

### **Conclusion of the interview**

Please give the interview partner a short summary how we will proceed with the collected data:

- Individual interviews will be summarized and evaluated from different perspectives by the project consortium,
- Results will be the basis for development of future scenarios on professional driving, starting point of our FutureDRV profile and for deciding about the FutureDRV learning solutions focus,
- Furthermore, the results will be the basis for further research throughout the course of the project leading to the project recommendations and timeline,
- All interviews collected will be summarized in a research report that will be integral part of a final project publication (potentially earlier available as individual publication on the project website).

### **Interview documentation**

Please document every interview individually by summarizing the answer of the interviewed expert/stakeholder as detailed as possible by interview question in English. A full transcription is not necessary. Please send the summary as soon as you have it available to Claudia for upload and sharing on the virtual project space.

## Annex 2: Interview Questions – Interview Series 2



### Complementary questions from the perspective of innovation

Prepared by Moncef SEMICHI, AFT (FR)

Initial research/ Task 1

The following questions have been developed so as to acquire a better understanding of:

- Innovations' adoption pace
- Production process or organisational changes
- Driver tasks changes
- Future resulting training needs

For this purpose, a series of complementary questions have been developed so as to target separately:

- Professional drivers
- Transport undertakings (operational managers)
- Truck/trailer or technology/software manufacturers

These questions can often be broadly understood, which is a convenient way of limiting the topical scope of expected answers, while leaving enough room for interviewees to express their own vision of expected innovations impact in a "guided" approach. It is therefore not a problem to end up with very different answers to a same question, as what we are trying to grasp here is not a commonly accepted scenario on how innovations will be implemented and their impact, but a wide set of indications as to how and when these innovations will shape the performance of road transport driving in the future.

#### Questions for professional drivers

- (1) When do you think you will get to drive a fully automated vehicle?
- (2) Do you see yourself piloting a platoon of trucks in the foreseeable future?  
If so, when?  
How will this expand or reduce your work tasks as a driver in the future (e.g. more deliveries, more handling, longer distances etc.)?
- (3) With the development of automated loading features, do you believe you will continue to ensure as a driver loading/unloading operations yourself?
- (4) If automated loading/unloading features become fully operational, do you see yourself still be held responsible for load security?
- (5) Smart cities are developing an increasing integration of complex routing systems and sometimes new subsequent infrastructures. Do you believe, as a professional driver, reading and complying with such systems will be easy for you, or will it on the contrary require you to undergo further training?
- (6) With technical innovations being gradually integrated into trucks, would you find acceptable to still be responsible for truck maintenance and thus undergo additional training, or would you rather see such tasks fall under the responsibility of technologically specialized personnel other than drivers?

- (7) If offered further training in the use of the related software, do you think you should be given the responsibility to perform the dispatching of freight yourself in the future?

### **Questions for transport managers**

- (1) When do you foresee the arrival of at least partially automated trucks? ...of fully automated trucks?
- (2) Would full automation affect the size of your driving workforce? To what extent?
- (3) Do you believe platooning will be a direct result of the availability of fully automated trucks, or do you believe certain infrastructure and/or regulatory changes will need to be made before platooning can be viewed as viable and efficient by the industry?
- (4) In your view, would platooning lead to:
- the redefinition of production processes?
  - the re-allocation of production equipment (lorries)?
  - the re-allocation of human resources (drivers)?
- (5) Should the loading and unloading of freight still be placed under the responsibility of the transport segment of the supply chain or should it be placed under the responsibility of warehousing/logistics actors?
- (6) If loading and unloading is no longer the driver's duty in the future, which tasks should however remain performed by the drivers so as to check load security?
- (7) With the development of e-trucks, would you rather have your drivers still be in charge of the truck maintenance - providing extra training in the use of the relevant technology- or would you rather have these tasks outsourced in the future?
- 8) With the expected development of telematics, do you foresee increased physical intervention of drivers (e.g. scanning, printing etc.)?
- 9) In your opinion, will the development of user-friendly load distribution software lead to organizational changes in transport undertakings where dispatching decisions will be made on the road by drivers rather than in office headquarters?

### **Questions for (trailer) manufacturers and (software) developers**

- (1) When do you foresee the arrival of at least partially automated trucks? ...of fully automated trucks?
- (2) When will platooning of automated trucks be technically and commercially available?
- (3) When will a logistics platform be able to implement fully automated loading/unloading operations? Will the technical innovations allow for automated load security checks?
- (4) With the development of electronically operated and monitored trucks (e-trucks), will the drivers in your view need to undergo special training so as to become able to read vehicle maintenance automated indicators?
- (5) Will maintenance operations be the same as today or will they require additional technology-based skills?
- (6) Will future load distribution software offer decision making tools that require drivers' ability to make decisions themselves or will the software automatically propose optimised dispatching solutions?



## Annex 3: Questionnaire Delphi Online Survey – Round 1



Dear experts,

thank you for your interest to participate in this Delphi inquiry. In the FutureDRV project we are investigating the future of professional driving by taking a look into the tasks and role of professional drivers and their qualification requirements in 2035. FutureDRV recognises the pathway towards a well-qualified future workforce as a joint effort between different stakeholder groups. For this purpose, we have developed two scenarios of how the future of professional driving might look like and how they will impact future working tasks of drivers.

This Delphi inquiry aims at further elaborating the two scenarios and finding out more about the future skills needs and competence requirements of professional drivers. This is an open process for which we need a wide range of input and we are therefore looking forward to your contribution.

The completion of the questionnaire depends on the time you are willing to invest and contains both closed and open questions. Since Delphi studies consist of at least two rounds, please be so kind to give us your email address with which we can contact you again for the second round **in April/May 2018**. As a small thank you for your participation you will receive the major project results and will be invited to the FutureDRV final conference (accommodation and flight expenses) which will be held from 11 to 12 June 2019 in Potsdam, Germany. Your data will be treated confidentially and will only be used for the purpose of the project.

For contacting you for the second round of the Delphi inquiry, we would ask you to add your name and email address below.

Name

Institution

Email

*If you have any questions, please feel free to contact your national project partner or [anja.bacher@3s.co.at](mailto:anja.bacher@3s.co.at).*

*Thank you for your participation!*

*The FutureDRV project team*

### PART A – FutureDRV scenario and future working activities of professional drivers

In the following, we present you the FutureDRV scenario and future working activities of professional drivers and ask you to rate and comment on them.

#### Scenario I: Fully automated driving

*Within this scenario, the vehicle is 'fully' automated. The entire driving task is conducted automatically and the whole driving environment is monitored by the self-driving system in defined use cases. Although the driver is not required any more – neither for monitoring nor as backup – the driver is still required to be in the vehicle in order to be able to hit the off-button any time and drive manually if required. This might for example be necessary when entering or leaving highways, when entering*

urban areas or in other unforeseen situations. Changing consumer behaviour, especially an increase in online shopping, will lead to an increase in freight transport. Most motorways in Europe will have a specific lane for fully automated trucks, especially for long distance freight transport.

All these developments will lead to new roles and competence requirements of drivers, and the job will in general require higher skills levels. As the driver will have to monitor self-driving system, additional tasks could be undertaken by drivers e.g. coordination tasks concerning clients, booking time windows for loading/unloading, other coordination activities (e.g. digital paper work, communication with fleet managers or customers, etc.) or getting involved in learning activities. The collaborative economy will offer new forms of sharing resources (e.g. digitised fleet management, sharing of trucks among several drivers, etc.) which will require more flexibility from professional drivers. The fully automated and digitised truck will lead to increased technological literacy and digital skills of drivers and an increasing need for skills for customer support and communication.

1. Do you think this scenario is plausible?

Please choose one of the answers below, you can also explain your answer in the text box below.

☐

Strongly agree

☐

Agree

☐

Neither agree/disagree

☐

Disagree

☐

Strongly Disagree

Please explain your answer:

Please provide your answer in the open text field below.

2. According to this scenario how will competence and qualification requirements of professional drivers change in future?

Please provide your answer in the open text field below.

3. When and under what circumstances could this scenario become reality?

Please provide your answer in the open text field below.

In the following we are presenting you six working tasks and four cross-cutting areas that will become more important for professional drivers within this scenario from our point of view and would like to ask you to provide us with your feedback on each of these working tasks / cross-cutting areas.

### **Working task 1 – Driving and manoeuvring the vehicle**

The driver will need to know how the self-driving system is working i.e. what is the system actually doing. It is of course not necessary to know programming, but knowledge about automated driving will be required, because only this knowledge will enable the driver to interfere/react appropriately, if required and to find the right balance between automated and manual driving. Hence, the driver will have to be familiar with the truck's IT system in order to anticipate the truck's automatic reaction to unexpected events ahead that have not yet been noticed by the truck's IT system. In this way, the acceptance of automated driving will also increase among drivers, which is a prerequisite for its implementation. Apart from that, there will always be moments where the driver has to interfere although the system could interfere/react far better or the other way around. The issue of shunting will change as well, because trucks will undertake these tasks automatically. Still, the driver will have to be aware of the things mentioned above in order to interact with his/her truck (in case of panicking if the truck is coming in a very dangerous situation, but at the same time he/she will still have to be able to also recognise and identify actual emerging dangers). The future task of driving and manoeuvring will hence shift to an understanding of how the self-driving system works and what the truck will do, in order to judge a situation adequately. For this judgement process, also knowledge with regard to sensors and their proper functioning will be necessary. All of this also applies to platooning and the systems behind. The driver will need to be aware of his/her vehicle's position and size if traffic becomes complex, like when other vehicles join or leave a motorway. There is the danger that a road

*train's autonomous sensors may not react to other traffic in time, so the driver will have to know how to quickly override the system without turning off vital systems!*

4. Do you think these changes in **driving and manoeuvring** the vehicle are plausible?

*Please choose one of the answers below.*

☐

*Strongly agree*

☐

*Agree*

☐

*Neither agree/disagree*

☐

*Disagree*

☐

*Strongly Disagree*

5. Would you like to add / change anything in the description of the working task of **driving and manoeuvring**?

*Please provide your answer in the open text field below.*

6. Are there any working activities missing that with regard to driving and manoeuvring that will become more relevant in the future?

*Please provide your answer in the open text field below.*

### **Working task 2 – Performing pre-departure tasks**

*Pre-departure checks related to roadworthiness will mostly be automated (e.g. checking tyres, steering systems, lighting and signalling systems as well as brake systems) however, human intervention might still be required (integrity of tyres e.g. by visual inspection). Pre-departure checks will be done using an app or a cloud-based weblink while paper-based systems will disappear. In regard to cargo securing, the 'human factor' will still be necessary to a degree of approx. 90 percent in contrast to roadworthiness checks. However, the driver's job might be supported by pre-departure assistance systems and calculation devices and methods, e.g. calculating necessary lashing force, pre-tension force, calculating friction coefficient, calculating load surface resting on the platform, calculating the minimum number of lashing devices depending on the lashing method (top-over lashing, lashing angle etc.). In the future, the proportion of standardised cargo in relation to general cargo will grow which will lead to an increased need for automated cargo security. This will lead to new competence requirements in order to perform the necessary checks. However, the major point regarding pre-departure checks will remain in raising the driver's awareness of making an actual and complete check because it is of utmost importance but often not done and will be even more important in the future when a lot of the driving will rely on self-driving systems. Remote checks will be done by a manager or workshop engineer to confirm the driver's correct execution of required procedures. For this working task, a lot of technical background understanding will be required from the driver.*

7. Do you think these changes in **performing pre-departure tasks** are plausible?

*Please choose one of the answers below.*

☐

*Strongly agree*

☐

*Agree*

☐

*Neither agree/disagree*

☐

*Disagree*

☐

*Strongly Disagree*

8. Would you like to add / change anything in the description of the working task of **performing pre-departure tasks**?

*Please provide your answer in the open text field below.*

9. Are there any working activities missing with regard to **performing pre-departure tasks** that will become more relevant in the future?

*Please provide your answer in the open text field below.*

### **Working task 3 – Loading and unloading (incl. prior and subsequent tasks)**

*Loading and securing cargo will primarily be the task of consigners (= large multinational companies) with well developed cargo loading and securing standards. The driver will become a cargo manager*

as well as a road pilot, overseeing the loading / unloading process whether done in an automated or manually way. The responsibility for loading and securing cargo will be split between consigners and the driver the latter will have to keep a final control obligation, because he/she is responsible for his/her truck in traffic. This means, the driver will need to know standards, norms etc. Probably the driver's competences will shift from actually doing load security to knowing accredited standards and being able to judge their proper application. This means that competences will shift from manual skills and skills applying load security techniques properly to more cognitive skills related to checking, comparing standards and applied security, etc. So, the driver will need to know and be able to apply far more (about) recognised standards and their proper application.

10. Do you think these changes in the working task **loading and unloading** are plausible?

Please choose one of the answers below.

☐

Strongly agree

☐

Agree

☐

Neither agree/disagree

☐

Disagree

☐

Strongly Disagree

11. Would you like to add / change anything in the description of the working task of **loading and unloading**?

Please provide your answer in the open text field below.

12. Are there any working activities missing with regard to **loading and unloading** that will become more relevant in the future?

Please provide your answer in the open text field below.

## Working task 4 – Planning driving times and routes

Drivers will receive the optimum route – considering costs, customer requests, actual traffic situations, weights, requirements of the load, time windows at customers, legal regulations regarding his/her working time, etc. – from automated routing systems. The driver's task will be to insert and check the information provided by the system especially with regard to legal limitations and regulations. When driving he/she will liaise with clients etc. and will need to update the information provided by the system, if necessary and in this way might initiate a change of route which then will again be calculated by the automated routing system according to optimum parameters in order to reach clients on time. In any case the driver will be able to take over control of the system, if required in order to adjust the routing according to relevant parameters for instance working times. For doing so the driver needs comprehensive understanding of the systems functioning in order to take competent decisions, if and when to interfere in decisions of the system. However, it will be one of the driver's core tasks to communicate deviations etc. resulting from the route taken and actual traffic situation to and with the customer as part of customer service.

13. Do you think these changes in **planning driving times and routes** are plausible?

Please choose one of the answers below.

☐

Strongly agree

☐

Agree

☐

Neither agree/disagree

☐

Disagree

☐

Strongly Disagree

14. Would you like to add / change anything in the description of the working task of **planning driving times and routes**?

Please provide your answer in the open text field below.

15. Are there any working activities missing with regard to **planning driving times and routes** will become more relevant in the future?

Please provide your answer in the open text field below.

## Working task 5 – Maintenance of vehicle and vehicle combinations

The increase of digitisation will allow monitoring vehicles from the distance by using modern telematic systems including monitoring tire pressures, oil and water levels, hydraulic fluid and wear parts like clutches and brake pads, etc. This will allow more efficient vehicle maintenance and evade stranded vehicles as vehicle parts will be exchanged in time. Maintenance tasks that the driver can actually do him-/herself will become less and less important and at a certain point will be reduced to an absolute minimum while the competence of being able to describe malfunctions and interpret data received from the truck will become much more important. This includes technical knowledge but also professional language skills in order to competently communicate with other professionals. Naturally, technical innovations such as automation etc. will also go along with new technical aspects that the driver will have to be proficient with. It is a question of continuous informal learning and learning ability (competence to learn) so that drivers can remain on top of all these increasingly rapid innovations. When it comes to the maintenance of vehicles/vehicle combinations, the driver's main responsibility will be pre-departure checks and the arrangement and management of maintenance schedules communicated to the driver by the assistance systems.

16. Do you think these changes in the **maintenance of the vehicle and vehicle combinations** are plausible?

Please choose one of the answers below.

☐

Strongly agree

☐

Agree

☐

Neither agree/disagree

☐

Disagree

☐

Strongly Disagree

17. Would you like to add / change anything in the description of the working task of **maintenance of the vehicle and vehicle combinations**?

Please provide your answer in the open text field below.

18. Are there any working activities missing that with regard to the **maintenance of the vehicle and vehicle combinations** will become more relevant in the future?

Please provide your answer in the open text field below.

## Working task 6 – Work documentation and paper work

Media competence with regard to competently working with electronic devices used for different kind of documentation will be one of the core competences of the future driver in order to be able to document work electronically through provided programmes, apps, etc. At the same time a lot of work load with regard to work documentation, but also with regard to additional tasks such as confirming transport assignments and filing all information for financial proceeding will be left with the driver. The driver therefore needs comprehensive competences on what is needed for those tasks with regard to commercial and financial aspects. Competent use of relevant programmes and applications is thus a basic requirement.

19. Do you think these changes in **work documentation and paper work** are plausible?

Please choose one of the answers below.

☐

Strongly agree

☐

Agree

☐

Neither agree/disagree

☐

Disagree

☐

Strongly Disagree

20. Would you like to add / change anything in the description of the working task of **work documentation and paper work**?

Please provide your answer in the open text field below.

21. Are there any working activities missing that with regard to **work documentation and paper work** will become more relevant in the future?

Please provide your answer in the open text field below.

In addition to the driver's core work tasks, also cross-cutting tasks and competences are of relevance and will probably become even more important in the future.

### (i) Cooperation with customers

*For drivers, both communication and additional services will play a key role by 2035. It can be expected that specialisations will be necessary not only with regard to communication but also to different additional services. This will once again entail a lot of media skills, etc. The driver will be a kind of 'company ambassador' and needs advanced customer service support skills. Companies will change their recruitment strategy and employ people with excellent customer service skills, above the skills required for operating an autonomous vehicle.*

22. Do you think these changes in **cooperation with customers** are plausible?

*Please choose one of the answers below.*

☐

*Strongly agree*

☐

*Agree*

☐

*Neither agree/disagree*

☐

*Disagree*

☐

*Strongly Disagree*

23. Would you like to add / change anything in the description of the working task of **cooperation with customers**?

*Please provide your answer in the open text field below.*

24. Are there any working activities missing with regard to **cooperation with customers** that will become more relevant in the future?

*Please provide your answer in the open text field below.*

### (ii) Cooperation with supervisors, colleagues, enforcement bodies and general public

*The driver / road pilot will be the coordinator between companies and customers / enforcement agencies. Therefore, he/she will need diplomatic skills for dealing with tricky situations, and be responsible for managing customer expectations. The future professional driver will also have a higher status among his/her colleagues. He/she will work with colleagues, supervisors, and enforcement bodies more self-dependently and autonomously considering legal regulations, company-internal regulations and according to his/her decision-making powers as well as assuring smooth processes. He/she will adjust his/her professional behaviour to relevant legal regulations and ethical norms and consider his/ her responsibilities towards supervisors, employers, customers and other persons as part of being professional. In physically dangerous situations caused by others such as violent persons, robberies or hijackings, he/she will act defensively. He/she will pay special attention to his/her own safety and initiate all necessary steps. Media skills will be an essential part of these cooperation processes.*

25. Do you think these changes in **cooperation with supervisors, colleagues, enforcement bodies and general public** are plausible?

*Please choose one of the answers below.*

☐

*Strongly agree*

☐

*Agree*

☐

*Neither agree/disagree*

☐

*Disagree*

☐

*Strongly Disagree*

26. Would you like to add / change anything in the description of the working task of **cooperation with supervisors, colleagues, enforcement bodies and general public**?

*Please provide your answer in the open text field below.*

27. Are there any working activities missing with regard to **cooperation with supervisors, colleagues, enforcement bodies and general public** that will become more relevant in the future?

*Please provide your answer in the open text field below.*

### (iii) Occupational health and safety and healthy lifestyle

*A healthy lifestyle will come into focus much more, but issues covered so far (e.g. fatigue and stress, physical condition) will probably shift to other areas, such as caused by computer working places. Safety issues that have to be addressed will of course change with technical innovations etc. The driver's average physical condition will improve because there will be less time spent sitting behind the wheel and more time carrying out physical checks, dealing with customers etc. In the years to come, the driver's mental health will become more important, particularly for drivers who frequently spend time away from home.*

28. Do you think these changes in **occupational health and safety and healthy lifestyle** are plausible?

*Please choose one of the answers below.*

☐

Strongly agree

☐

Agree

☐

Neither agree/disagree

☐

Disagree

☐

Strongly Disagree

29. Would you like to add / change anything in the description of the working task of **occupational health and safety and healthy lifestyle**?

*Please provide your answer in the open text field below.*

30. Are there any working activities missing with regard to **occupational health and safety and healthy lifestyle** that will become more relevant in the future?

*Please provide your answer in the open text field below.*

### (iv) Continuous vocational education and training

*Continuous training will play an increasingly important role, especially because innovation cycles will become shorter and shorter and drivers will need to learn informally all the time in order to be able to catch up with the changing requirements. Relying on the current EU directive on the initial and continuous vocational education and training of drivers (2003/59/EC) in its current format won't be sufficient in the future. Learning will rather have to be a continuous process that is integrated into work. When it comes to self-organised learning and competence development, skills and competences will therefore have to improve. The borders between the world of learning and work will become increasingly flexible which naturally also requires a lot of self-reflection for one's own skills and skills deficits.*

31. Do you think these changes in **continuous vocational education and training** are plausible?

*Please choose one of the answers below.*

☐

Strongly agree

☐

Agree

☐

Neither agree/disagree

☐

Disagree

☐

Strongly Disagree

32. Would you like to add / change anything in the description of the working task of **continuous vocational education and training**?

*Please provide your answer in the open text field below.*

33. Are there any working activities missing that with regard to **continuous vocational education and training** will become more relevant in the future?

*Please provide your answer in the open text field below.*

Finally, we would like to present you a scenario that could already become a reality in the near future. Please be so kind as to assess this scenario.



## PART B – Scenario of professional driving in the near future

### Scenario II: Partially automated driving

*Trucks and buses will be increasingly automated and digitised. Assistance systems that are already available (e.g. lane change assistant, park distance control, lane keeping assistant, emergency brake assistant, adaptive cruise control including stop and go, etc.) will be extended and driving will partially be automated insofar as assistance systems can take over both steering and acceleration/deceleration in defined use cases. These new technological developments will allow platooning, where up to five or more vehicles will drive behind each other in a close distance.<sup>12</sup> The increase of digitisation will allow monitoring vehicles from the distance by using modern telematic systems including monitoring tire pressures, oil and water levels, hydraulic fluid and wear parts like clutches and brake pads. This will allow more efficient vehicle maintenance and evade stranded vehicles as vehicle parts will be exchanged in time. Furthermore, vehicles will have different kinds of driving engines: on short distances, electronic drive technologies will be used whereas on long distances the use of biofuels and hybrid technology will become mainstream.*

*All these developments will change the driver's environment and his/her information interface which will lead to new skills and competence requirements of drivers. In this scenario, the driver is still in the vehicle constantly monitoring the ride. If necessary, he/she must be able to resume vehicle control at any time. Hence, within this scenario, the driver monitors the driving environment and enables the driving assistance system to partially take over for a certain amount of time and/or in specific situations (e.g. platooning). Therefore, the competence requirements of drivers will change from a full-time performance of all aspects of the dynamic driving task to a part-time driving mode-dependent execution by one or more driver assistance systems of both steering and acceleration/deceleration where the driver is still able to perform all other aspects of the dynamic driving task, but can assign driving tasks to the system.*

34. Do you think this scenario is plausible?

*Please choose one of the answers below, you can also explain your answer in the text box below.*

☐

Strongly agree

☐

Agree

☐

Neither agree/disagree

☐

Disagree

☐

Strongly Disagree

35. According to this scenario, how will competence and qualification requirements change?

*Please provide your answer in the open text field below.*

36. When and under what circumstances could this scenario become reality?

*Please provide your answer in the open text field below.*

<sup>12</sup>In the platoon, each driver has his/her hands on the wheel, but the engine and brakes are linked to the front truck allowing for slowing down and speeding up synchronically.



## Annex 4: Questionnaire Delphi Online Survey – Round 2A



### FutureDRV Delphi Online Survey – Round 2 A

Dear experts,

this is the second round of the Delphi Inquiry we are conducting in the framework of the Erasmus+ project “FutureDRV” ([www.project-futuredrv.eu](http://www.project-futuredrv.eu)). The project investigates the future of professional driving by taking a look into the tasks and role of professional drivers and their qualification requirements in 2035 and beyond. For making meaningful predictions in this respect, we need the input of you as an expert in the area of transport & logistics. Most of you were so kind as to already participate in the first round of the Delphi Inquiry, which took place between December 2017 and March 2018. Thank you once again for your valuable inputs. In Round 2, some new experts will be joining us and we would like to give them a warm welcome!

In order to conduct the Delphi Inquiry, it will be required for us to collect some of your personal data (*Name, Institution, E-mail*), mainly for follow-up reasons. These data will be saved on the 3s company server, as we are managing the Delphi Inquiry. We respect your trust and protect your privacy and will not sell or share your personal data for any other purpose.

By filling in this questionnaire, you agree that we will process your data in line with our [privacy policy](#).

If you have any questions or want to change or delete your personal data please contact Sabine Schwenk: [schwenk@3s.co.at](mailto:schwenk@3s.co.at)

I agree to the terms mentioned above ☐

---

### FutureDRV Delphi Online Survey – Round 2A

(This question is mandatory)

#### Results of the FutureDRV Delphi Inquiry–Round 1

Your valuable and quite diverse answers to our online questionnaire gave us the foundation for conceptualising this Delphi Online Survey–Round 2 and made several things very clear: when it comes to professional driving, it is necessary to distinguish between long-distance and short-distance professional driving. When it comes to future competence requirements of professional drivers, there is a wide spectrum of expected qualifications ranging from higher qualified to lower qualified professional drivers. As a direct consequence of the analysis of your comments to the Delphi Survey–Round 1, we developed four scenarios on how the future of professional drivers could look like in 2035 and beyond:

- Scenario 1 – Highly-skilled professional driver, long distance
- Scenario 2 – Highly-skilled professional driver, short distance
- Scenario 3 – Low-skilled professional driver, long distance
- Scenario 4 – Low-skilled professional driver, short distance

As is usual in the scenario technique, it is important to mention that within the scenarios certain preconditions are already assumed to be a reality; this concerns, for example, the necessary infrastructure, the necessary legal conditions or the required technical conditions. So please try to get involved in each scenario and when answering the questions leave all these necessary preconditions aside. You will have the chance to give us your point of view on the framework conditions that need to be in place for the scenarios to become a reality in the last question on each scenario.

Since we don't want to take up too much of your valuable time, we suggest to do the Delphi Survey Round 2 in two parts. This means that in the following Online Questionnaire, we ask you to provide us with your feedback and comments only on Scenario 1 and 2. After you provided your input on the first two scenarios, you will receive another online link presenting Scenario 3 and 4 which will follow the same structure.

The procedure of the FutureDRV Delphi Survey–Round 2 is as follows:

- First, we will give you a complete summary of the given scenario and ask you for your feedback on it.
- We then will present you a description of specific work tasks of professional drivers that are relevant within the given scenario. Each work task is followed by questions (e.g. what is right, what is wrong in your opinion, what instruments/tools have to be used, etc.).
- At the very end, we would like to know the necessary framework conditions that you think have to prevail (e.g. legal regulations, infrastructure, technology, etc.) so that the given scenario can actually become a reality.
- The Online Questionnaire can be interrupted and saved at any time. For this please use the “resume later” function in the right upper corner, you then will be asked to provide your name, email and to create a password.

Please complete the questionnaire until **22 December 2018**. As already mentioned in the Delphi Survey–Round 1, as a small thank you for your participation, you will receive the major project results and will be invited to the FutureDRV final conference (accommodation and flight expenses covered) which will be held from 11 to 12 June 2019 in Potsdam, Germany.

Please give us your name, institution and e-mail address:

Name

Institution/Organisation

E-mail

## Scenario 1: Highly-skilled Professional Driver – Long Distance

### General scenario description

By 2030/2035, when automation level 4 is in place, a professional driver, let's call him 'Tom', will likely shift into becoming a “professional pilot”, as his actual driving times (i.e. when automatic driving is not in play) will be reduced, but only to pave way to new sets of skills to be mastered and displayed. Tom will hence be known as a truck pilot rather than merely driver, and rely on automated solutions for most of the physical tasks he carries out himself today, but the number of different sets of tasks expected of him is likely to increase.

Tom will not need to perform pre-departure checks or personally carry out loading and unloading procedures, but with the free time allowed by automation, he will be expected to perform new tasks, mirroring a much wider variety (device programming, device reading, customer-relations middle and back-office tasks, continuous training) that will ultimately and substantially change Tom's professional profile.

At the same time, though some tasks will be automated, the extent of potential liability of the driver may also be extended because legislators usually prefer to focus on making sure a victim (an individual hurt in an accident, the shipper or the client whose cargo does not reach its destination when and as expected etc.) receives compensation. Therefore, even if in praxis Tom may not need to perform some of the traditional driver tasks (e.g. loading/unloading), there is a high chance he will still need to be able to do them and therefore master the underlying competences.

This will lead to a consistent change in the content and probably the manner in which Tom and his future colleagues will be acquiring the necessary skills to successfully perform their work. Training will indeed need to integrate new topical priorities (e.g. customer-relations, behavioural skills, digital skills, strategic route planning etc.), new timeframes as innovations are bound to pour in at a fast pace in the coming years and new formats (new didactical schemes, virtual reality, improved e-learning features).

But overall, this should strengthen the attractiveness of the profession by offering labour market newcomers a chance to join a modernised industry while resorting to up-to-date technologies, developing abilities in numerous professional areas (transport, logistics, customer relations etc.) that considerably widen the spectrum of potential career evolution for any person on the verge of starting his/her career.

The likes of Tom and his future colleagues, when deciding to become a long-distance highly qualified road transport pilot, will not only decide to take on a job, but will decide to open the first door that will lead them to numerous other doors all leading, in turn, to a variety of jobs, all accessible to them as they will have tackled some of the fundamentals leading to these different jobs.

1. Thinking about the specifications made in this scenario, what kind of long-distance drivers are not affected by this scenario and will on the contrary to this scenario require a medium or low level of qualification?

*Please provide your answer in the open text field below.*

2. In your opinion, what factors make it unlikely that this scenario will occur in this way?

*Please provide your answer in the open text field below.*

### **Scenario 1: Work Task 1– Driving and Manoeuvring the vehicle**

Once automated systems are fully operational in trucks, Tom will not only need to be able to read and comply with the information given by the various on-board systems and screens, but he should also have acquired the necessary competencies to “type-in” instructions to these systems so as to, for instance, be able to program a new route under parameters he will need to translate in a “language”/format understood by the devices/software available, or to notify clients of a change in delivery time, or to propose a rescheduling of a delivery etc.

On top of the already acquired ability to drive and manoeuvre a vehicle, he will also need to continue to be able to drive the vehicle in case of system failure or be able to know when and how to take control of the vehicle if and when needed. His reaction skills will have to improve and be trained so as to allow for a quick reaction when necessary.

[Click here to view the scenario description](#)

2. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

4. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 1: Work Task 2 – Performing pre-departure tasks**

The assumption is that when level 4 automation is in place, as well as are automated logistics platforms, legal provisions will provide for a substantial –if not total- decrease in the driver's liability with regard to pre-departure checks as well as with the safe and correct securing of cargo. Nevertheless, this will not dispense Tom from carrying out at least an educated visual inspection of the vehicle prior to departure. He will also need to check whether the automated systems - especially since the evolution of road transport regulations will probably take into consideration an enhanced training of the drivers on the use of automation software (used for daily maintenance such as checking tyres, breaking, lighting etc. on the one hand, but also for checking the proper securing of cargo, using proper lashing procedures, on the other) which could lead to some form of residual liability or co-liability. Therefore, even though its intensity may decrease, Tom's liability as a driver may very well increase to cover new grounds that require to learn how to be able to read the automated pre-departure checks assistance software, the cargo securing assistance software, but also be able to detect any kind of failure in the software that go undetected. This extends Tom's responsibilities, his liability and hopefully his abilities, while perhaps reducing the physical effort expected from the driver.

[Click here to view the scenario description](#)

5. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

6. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 1: Work Task 3 – Loading and unloading (incl. prior and subsequent tasks)**

Since loading and unloading will be fully automated, such tasks will not be of Tom's responsibility. However, as a long-distance highly skilled professional driver, more skills will be expected from Tom rather than the mere passive observation of automated loading/unloading procedures. Tom will indeed need to be able to spot and eventually correct any failure in the automated loading/unloading of cargo for any given transport operation.

[Click here to view the scenario description](#)

7. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

8. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 1: Work Task 4– Planning driving times and routes**

Even though planning driving times and vehicle routes is automated, Tom will not only need to follow and comply with the routes and driving times announced by the software, he will also need to be able to insert in the system all the parameters (destination, times, freight volume etc.) needed for it to provide an automated calculation of these items. This will essentially boil down to the acquisition of digital skills, but the best performing drivers will learn, or most likely, will have learned an optimised manner of typing in the parameters and of fixing the software settings so as to be consistent with a certain strategy. Where this activity used to be of the responsibility of non-mobile professionals of transport, in the future strategic route planning will likely become a driver's competency. Moreover, in case of route changes, and given the fact drivers will likely take on new customer relation tasks, Tom will need to be able to communicate with customers in case of delays or changes in route planning or delivery times.

[Click here to view the scenario description](#)

9. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

10. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 1: Work Task 5– Maintenance of vehicle and vehicle combinations**

Even though maintenance will be fully automated, some elementary tasks will still need to be carried out by drivers (e.g. change of windshield cleaners). Tom will also be expected to communicate with designated maintenance facilities to which automated maintenance software will point.

[Click here to view the scenario description](#)

11. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

12. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 1: Work Task 6 – Work documentation and paper work**

Tom, in a digitised and automated work environment will need to acquire sufficient digital skills to electronically process all the administrative tasks he will be expected to carry out (bill of lading, confirmation of delivery, etc.). Overall, Tom will need to use electronically connected devices with as much ease as he today uses pen and paper. If on top of the basic tasks, the driver is also asked to process mid or back-office documentation, he will have to be trained so as to master the underlying company policy and procedures. In all these tasks, language and digital fluency will be expected of the driver.

[Click here to view the scenario description](#)

13. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

14. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 1: Transversal Work Task (I)– Cooperation with customers**

Tom will need to be specifically trained in communication and behavioural skills so as to deal with customers, in a fashion that is consistent with company policy. Tom will need to alert customers in case of changes in delivery times or any changes affecting the delivery of the awaited goods. This implies an enhanced sense of service provided to customers. Though the equipment Tom will use to communicate with customers should be widespread (mobile phones, tablets, computers etc.), thus not requiring further training, the behavioural and attitudinal aspects of customer relations should be a fundamental element of future driver training.

[Click here to view the scenario description](#)

15. Thinking of this work task within the scenario described above, are these work activities accurate,

would you like to add or delete anything?

*Please provide your answer in the open text field below.*

16. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 1: Transversal Work Task (II)– Cooperation with supervisors, colleagues, enforcement bodies and the general public**

Tom will be interacting with the usual sets of actors: fellow drivers, management, enforcement officers, warehouse agents, but since he will also be increasingly exposed with customers, it is likely his behavioural and communication skills will have improved so as to also become responsible for projecting a more positive image of the company and thus serve the company's overall communication policy, especially toward the general public whose opinion counts. In such a scenario, Tom will not only be a modern professional pilot, but also become some sort of "Ambassador" of the company, using his words and behaviour to enhance company attractiveness, after being made aware of the importance of his new role.

[Click here to view the scenario description](#)

17. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

18. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 1: Transversal Work Task (III)– Occupational health and safety / healthy lifestyle**

Even though automation will (if used correctly) reduce the physical burden on drivers, Tom – especially because he is used to the "old way" of doing things – may experience some initial difficulty adapting to numerous tasks including new ones. This may entail health stress situations which may be reduced when a new generation of drivers enter the profession.

[Click here to view the scenario description](#)

19. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

20. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 1: Transversal Work Task (IV)– Continuous vocational education and training**

Continuous VET (CVET) will become all the more important because of the new sets of tasks dealing with piloting modernised vehicles, dealing with digitised and connected software and equipment, communicating with customers, etc. The rapid evolution of technology and its gradual but nonetheless fast introduction into industry praxis will change not only the topical content of CVET but also its frequency. CVET will need, even more so than before, to be constantly updated with the integration of new available technology, new business patterns, new customer relation paradigms etc. It will therefore no longer make sense to have CVET carried out outside work times nor locations. Training, if regulation and CVET offers allow for it, will take place more and more during work processes (e.g.



aboard the vehicle, while waiting, during loading times, etc.) through digitised channels (e.g. e-learning).

[Click here to view the scenario description](#)

21. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

22. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Final Question concerning Scenario 1 with all its work tasks:**

23. What needs to happen (with regard to legislation, technical developments, infrastructure developments and other factors) that this Scenario of a highly-skilled, long-distance professional driver with its work tasks can become a reality? What future key-factors need to come true?

*Please provide your answer in the open text field below.*

## **Scenario 2: Highly-skilled Professional Driver – Short Distance**

### **General scenario description**

By 2030/2035 the professional driver 'John' is still working in the vehicle, although he does not steer it or control it while travelling on private land or around transport hubs. In built-up areas he must take full control of the vehicle when speeds are over 30kph.

John is responsible for maintaining safety standards and must always be aware of the environment around the vehicle; he has been trained not to rely on the automated system. The industry now refers to John as a road pilot and not a driver. He is legally responsible for the load and for basic checks, which need to be carried out using diagnostic tools providing real-time data through an 8G network. The data identifies and alerts John to developing faults as well as existing ones. John does not carry out manual maintenance tasks; this is done through onboard AI using robotics to ensure vehicle downtime is minimised while ensuring personal safety.

John must understand how the automated system works and needs to be aware of vehicle alerts and system failures; he must be ready to take control whenever he is made aware of a problem. The vehicle does not use an internal combustion engine; propulsion is provided through battery technology underneath the chassis and between the two axles, while high speed contactless charge is provided by a network of charging hubs located just underneath the road surface. John is responsible for ensuring that the vehicle has enough charge to complete his deliveries.

John can change vehicles whenever he needs to through a delivery network. In almost all cases vehicles are no longer owned by transport companies and a truck share network is well established, allowing total flexibility to move loads from one vehicle to another part-way through a delivery schedule. This is made possible by the leasing companies (the vehicle owners) having an arrangement with transport companies to keep their vehicles on-site. These vehicles are fitted with AI robotics which are used to transfer a variety of loads in a similar way to the old-fashioned fork lift truck. They are integrated with each vehicle and are powered by a built-in vehicle battery.

24. Thinking about the specifications made in this scenario, what kind of short-distance drivers are not affected by this scenario and will on the contrary to this scenario require a medium or low level of qualification?

*Please provide your answer in the open text field below.*

25. In your opinion, what factors make it unlikely that this scenario will occur in this way?  
*Please provide your answer in the open text field below.*

### Scenario 2: Work Task 1– Driving and Manoeuvring the vehicle

John needs to understand the system alerts and potential failures to take control when needed. He spends some of his time driving the vehicle; at lower speeds level 5 autonomy is activated and John is required to observe the environment and be ready to take control in an emergency. At higher speeds John must take full control of the vehicle because he is able to identify risks more easily than the AI.

John has no need to control the vehicle when performing turns or manoeuvres during unloading and docking. At such low speeds the vehicle is totally autonomous, continuously calculating the environment around it. In this case John monitors the vehicle from outside to ensure that it's safe for pedestrians and other road users and that the manoeuvre is being performed as it should be. He has a remote cut-off switch to kill the power in the event of an emergency.

Street architecture is still being developed and high-rise buildings can cause a problem resulting in a sudden loss of connectivity or signal, which is crucial to level 5 autonomy. Reflections from windows and buildings sometimes confuse the system, which is why John must maintain a high degree of awareness.

[Click here to view the scenario description](#)

26. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?  
*Please provide your answer in the open text field below.*

27. What devices/ instruments/ tools will the driver use in order to perform those activities?  
*Please provide your answer in the open text field below.*

### Scenario 2: Work Task 2– Performing pre-departure tasks

The pre-departure checks involve a walk around the vehicle and checks inside the cab. John makes a visual check of tyres, bodywork, AI robotics, sensors, lights and doors. He then uses the real time diagnostics tool to check the condition of the powertrain, strength of the vehicle connectivity and amount of charge remaining on the batteries. The diagnostic tool uses augmented reality to scan the vehicle and project a 3D image above the screen to enable John to see exactly where the fault (or developing fault) is. A virtual report is generated and uploaded to the transport office, the vehicle leasing company and the enforcement agency at the same time. Bodywork and paintwork have self-healing properties so routine maintenance is confined to the powertrain, batteries and robotics. However, John is still responsible for checking fluid levels including water and hydraulics. In the cab John uses a virtual pre-departure checklist to confirm that the controls are active and in good working order. All controls, including lights, wipers and indicators, are fully automated, although John can assume manual control when necessary. Before leaving, John must check that the load has been positioned according to the daily deliveries. The onboard robotics are pre-programmed with the correct route and schedule. Although the loading and unloading is done automatically, John needs to manually check the load to confirm it's secure.

[Click here to view the scenario description](#)



28. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

29. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 2: Work Task 3– Loading and unloading (incl. prior and subsequent tasks)**

In almost all cases the loading and unloading procedure is fully automated. The built-in AI controls and manages most situations of loading and unloading. Vehicles have integrated hydraulic robots / robotic arms that deploy to load / unload a range of goods in different types and different sizes. They utilise the customer schedule (which is programmed as part of the pre-departure checks), while a common system of load security is used which removes the traditional methods using straps and lashings; instead magnetic technology is deployed to eliminate friction and lateral movement. John is still responsible for the vehicle and its load, so he must ensure that the technology is being effective. Manual checks are still performed but the physical task of loading and unloading has ended.

[Click here to view the scenario description](#)

30. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

31. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 2: Work Task 4– Planning driving times and routes**

Level 5 automation can be used in many situations but there are limits on where it can be activated depending on the routes; certain factors need to be considered. John manages all aspects of the route, from customer scheduling to road suitability and efficiency. To do this he needs a good knowledge of routes and the requirements relating to the vehicle, although he does not need to know the roads in any detail. As this is key part of John's work activities, he receives training on width and height limits at regular intervals. He must also demonstrate knowledge of site and route restrictions, as well as road signs. Routes and customer schedules are not as rigid as they used to be. Now it is possible to use different vehicles and different routes depending on the circumstances, with smaller vehicles used for urban deliveries.

[Click here to view the scenario description](#)

32. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

33. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 2: Work Task 5– Maintenance of vehicle and vehicle combinations**

Vehicle maintenance is John's responsibility. However, he is only responsible for managing the maintenance. He is legally responsible for the load and for basic checks, which need to be carried out using diagnostic tools providing real-time data through an 8G network. The data identifies and alerts John to developing faults as well as existing ones. John does not carry out manual maintenance tasks; this is done through onboard AI using robotics to ensure vehicle downtime is minimised while ensuring personal safety. John must understand how the automated system works and needs to be aware of vehicle alerts and system failures; he must be ready to take control whenever he is (made) aware of a problem.

[Click here to view the scenario description](#)

34. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

35. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 2: Work Task 6 – Work documentation and paper work**

John does not use paperwork. He uses a real time augmented reality device to monitor, record and submit data about the vehicle and its performance. Customer schedules are integrated with the vehicle telematics, meaning that when a job is complete John simply records the information on a screen in the vehicle.

[Click here to view the scenario description](#)

36. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

37. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 2: Transversal Work Task (I and II) – Cooperation with customers as well as supervisors, colleagues, enforcement bodies or the general public**

John is an expert in customer service, having received formal and informal training on the importance of managing customers and their expectations. To make communication easier he carries a small device which translates his words into any language, ensuring there is no misunderstanding with customers and colleagues. This is part of John's role as a road pilot. He has also been formally trained as a first responder in road emergencies. He is highly valued, particularly with members of the public who consider him as a fourth emergency service.

[Click here to view the scenario description](#)

38. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

39. What devices/ instruments/ tools will the driver use in order to perform those activities?  
*Please provide your answer in the open text field below.*

---

### Scenario 2: Transversal Work Task (III) – Occupational health and safety / healthy lifestyle

Safety standards are extremely high and John works in an environment where accidents are very rare. However, regulation still controls what can and can't be done with vehicle autonomy, particularly around speeds and urban environments. This affects John because he often works in these situations.

[Click here to view the scenario description](#)

40. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?  
*Please provide your answer in the open text field below.*

41. What devices/ instruments/ tools will the driver use in order to perform those activities?  
*Please provide your answer in the open text field below.*

### Scenario 2: Transversal Work Task (IV) – Continuous vocational education and training

There are strict conditions in place to ensure John knows when to take control of the vehicle, and he has received the necessary training. VET now uses a combination of augmented and virtual reality because they provide a real-life scenario without the associated risks.

[Click here to view the scenario description](#)

42. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?  
*Please provide your answer in the open text field below.*

43. What devices/ instruments/ tools will the driver use in order to perform those activities?  
*Please provide your answer in the open text field below.*

Final Question concerning Scenario 2 with all its work tasks:

44. What needs to happen (with regard to legislation, technical developments, infrastructure developments and other factors) that this Scenario of a highly-skilled, short-distance professional driver with its work tasks can become a reality? What future key-factors need to come true?  
*Please provide your answer in the open text field below.*

(This question is mandatory)

Do you agree to mention you as a participant (Name, Institution) in this Delphi Inquiry to the National Agency / European Commission funding this project?

☐

I agree

☐

I do not agree

## Annex 5: Questionnaire Delphi Online Survey – Round 2B



### FutureDRV Delphi Online Survey – Round 2B

Dear experts,

first of all, we would like to thank you very much for having already filled out the first part of our “**FutureDRV Delphi Online Survey - Round 2**” and for giving us your valuable opinion and feedback on our Scenarios<sup>1</sup> and 2 when it comes to the future of professional driving by 2035 and beyond.

This is now the **second part and the end of this Delphi Inquiry – Round 2** that we developed in the framework of the Erasmus+ project “FutureDRV” ([www.project-futuredrv.eu](http://www.project-futuredrv.eu)).

In the following questionnaire, we once again will ask you for your opinion and feedback on the two still missing FutureDRV Scenarios:

- **Scenario 3 – Low-skilled professional driver, long distance**
- **Scenario 4 – Low-skilled professional driver, short distance**

As mentioned before, in order to conduct the Delphi Inquiry, it will be required for us to collect some of your personal data (*Name, Institution, E-mail*), mainly for follow-up reasons. These data will be saved on the 3s company server, as we are managing the Delphi Inquiry. We respect your trust and protect your privacy and will not sell or share your personal data for any other purpose.

By filling in this questionnaire, you agree that we will process your data in line with our [privacy policy](#).

If you have any questions or want to change or delete your personal data please contact Sabine Schwenk: [schwenk@3s.co.at](mailto:schwenk@3s.co.at)

I agree to the terms mentioned above ☐

---

### FutureDRV Delphi Online Survey – Round 2B

As is usual in the scenario technique, it is important to mention that within the scenarios certain preconditions are already assumed to be a reality; this concerns, for example, the necessary infrastructure, the necessary legal conditions or the required technical conditions. So please try to get involved in each scenario and when answering the questions leave all these necessary preconditions aside. You will have the chance to give us your point of view on the framework conditions that need to be in place for the scenarios to become a reality in the last question on each scenario.

The procedure of the FutureDRV Delphi Survey–Round 2 is still the same:

- First, we present you a complete summary of the two missing scenarios and ask you for your opinion.
- We then will present you a description of specific work tasks of professional drivers that are relevant within the given scenario. Each work task is followed by questions (e.g. what is right, what is wrong in your opinion, what instruments/tools have to be used, etc.).

- At the very end, we would like to know the necessary framework conditions that you think have to prevail (e.g. legal regulations, infrastructure, technology, etc.) so that the given scenario can actually become a reality.
- The Online Questionnaire can be interrupted and saved at any time. For this please use the “resume later” function in the right upper corner, you then will be asked to provide your name, email and to create a password.

Please complete the questionnaire until **17 March 2019**. We would like to thank you for your participation by providing you with the major project results and by inviting you to the FutureDRV final conference (accommodation and flight expenses covered) which will be held **on 12 June 2019** in Berlin, Germany.

Please give us your name, institution and e-mail address:

- Name
- Institution/Organisation
- E-mail

---

## Scenario 3: Low-skilled Professional Driver – Long Distance

### General scenario description

By 2030/2035 on automation level 4, the driving process is completely automated but the professional driver ‘Peter’ still has to be present to accompany his truck from hub to hub. He only has a small scope of tasks and responsibilities and only has to deal with driving matters (e.g. being able to understand the information he is given by the automatic driving system or by the management, being able to take over the driving process in case of system failure or hazardous situations and head for the nearest parking lot and /or secure the breakdown/accident site according to regulations). The road network provides among other things special lanes for autonomous traffic as well as all other necessary prerequisites for autonomous driving.

An interstate network of hubs and associated truck service points (departure control, vehicle repairs, maintenance, etc.) has been created along the motorways to ensure regular maintenance and inspection of the trucks by specialised personnel. Peter has nearly nothing to do with those tasks any more. These hubs also ensure correct truck load securing which is carried out automatically or by specialised staff. Standardised loading units that enable the use of standardised load carriers are the rule. Loading and unloading can therefore be automated on a huge scale. From the hubs, goods are distributed via separate distribution traffic to the destination area. Legal responsibility for load securing or departure control no longer lies with Peter but with the personnel in the hubs and service facilities.

The responsibility for accidents caused by his autonomous truck (accident liability) also no longer lies with Peter but with the freight operator which applies to all other safety aspects (e.g. vehicle inspection in hubs or at customers’ premises) as well. Competence requirements on Peter are reduced to a minimum (monitoring function), also his contact with customers is very limited and only necessary in exceptional cases because there is Hub to Hub traffic. Therefore, Peter only needs a low level of skills.

The image of professional drivers like Peter is, however, negatively affected as the profession is a job that more or less everybody with a truck driving licence can do which also increases the shortage of

professional drivers on the labour market. Only special transports (e.g. oversize or heavy loads) are accompanied by specially trained personnel.

-----

1. Thinking about the specifications made above, what kind of long-distance drivers are not affected by this scenario and will require a higher level of qualification?

*Please provide your answer in the open text field below.*

2. In your opinion, what factors make it unlikely that this scenario will occur in this way?

*Please provide your answer in the open text field below.*

### Scenario 3: Work Task 1 – Driving and Manoeuvring the vehicle

Peter needs to know very little of the automated self-driving system, i.e. he is only expected to handle digital devices and understand the information he is given by the automated system or the management in a very easily understandable manner with high usability. He is required to be able to drive the vehicle and interfere/react appropriately only if necessary (e.g. take over the driving process when the system requires him to do so). Those processes are limited to a minimum such as steering the vehicle to the next safe parking opportunity. The task of driving and manoeuvring a vehicle has shifted to a basic understanding of the self-driving systems and to being able to react adequately. Peter's necessary knowledge with regard to sensors and their proper functioning is very basic.

[Click here to view the scenario description](#)

3. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

4. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### Scenario 3: Work Task 2– Performing pre-departure tasks

By 2030/35, all pre-departure checks (e.g. tyres, steering/lighting/braking/signalling systems) are automated using all available kinds of digital technology (e.g. sensors, mobile apps, cloud-based data/links, remote control systems, etc.). The legal responsibility for pre-departure tasks does not longer lie with Peter but with the freight carrier. The same applies to cargo securing, which is automated as well (e.g. assistance systems that calculate lashing forces, the minimum number of lashing devices or the correct weight distribution) and Peter is no longer responsible here, either.

[Click here to view the scenario description](#)

5. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

6. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### Scenario 3: Work Task 3 – Loading and unloading (incl. prior and subsequent tasks)

Since loading and unloading is a fully automated process, Peter is no longer involved in the loading and unloading of the truck.

[Click here to view the scenario description](#)

7. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

8. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### Scenario 3: Work Task 4– Planning driving times and routes

The whole process of planning driving times and vehicle routes is automated. Peter receives his optimum route from automated routing systems (which will, for example, consider costs, customer requests, the actual traffic situation, cargo requirements, time windows at customers, legal working hour regulations, etc). He is able to understand the incoming information and react appropriately (e.g.in case of irregularities, signs of system failure, etc.). The complete communication process is automatised as well, and Peter is only required to communicate with customers, hubs or the management in very rare cases. Usually, he is told what to do and receives alternative routes in case of problems (traffic jams, accidents, etc.) directly from his onboard system.

[Click here to view the scenario description](#)

9. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

10. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### Scenario 3: Work Task 5– Maintenance of vehicle and vehicle combinations

The maintenance of truck vehicles is completely automated and everything is checked by sensors (e.g. tyre/ oil/water pressure, wear parts). In case of emerging technical vehicle problems, the automatic system warns Peter and initiates the appropriate measures (e.g. Peter is informed that the vehicle will navigate to a garage facility or that it will be picked up by a maintenance service team).

[Click here to view the scenario description](#)



11. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

12. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 3: Work Task 6– Work documentation**

Since all work documentation is digital, Peter needs only minor skills beyond everyday skills related to understanding and dealing with digital devices and digital media for being able to work with different kinds of documentation tools throughout his job. (e.g. using a mobile app or other digital devices to confirm the correct completion of a transportation process or the taking over of cargo, etc.). [Click here](#) to view the scenario description

13. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

14. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 3: Transversal Work Task (I)– Cooperation with customers**

Peter is very rarely required to communicate or cooperate with customers, since all communication processes will be either automated or carried out by other service personnel (e.g. automatic digital communication processes constantly inform hubs/clients about the whereabouts of the cargo and about delays). Since Peter only drives between hubs, he usually also does not get into direct contact with customers. In case of unforeseen problems, specifically trained service support personnel is doing the communication/cooperation process for him.

[Click here](#) to view the scenario description

15. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

16. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 3: Transversal Work Task (II)– Cooperation with supervisors, colleagues, enforcement bodies and the general public**

Peter is only required to communicate with enforcement bodies or the general public to a limited extent because this also happens automatically or is done by other specialists. But he still will need basic skills of understanding and handling digital and other communication tools/devices for

communicating with his supervisors (e.g. in case of unforeseen problems that have to be communicated to superiors).

[Click here to view the scenario description](#)

17. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

18. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 3: Transversal Work Task (III)– Occupational health and safety / healthy lifestyle**

With fully automated long-distance transportation, it is possible to have vehicles on the road 24 hours, 7 days a week. Self-driving systems reduce accident rates and improve driving safety which will have a positive effect on occupational safety. The hub-to-hub system enables Peter to work in regular shifts with regular working hours even within long-distance driving. However, poor work demands on drivers can lead to stress, depression and other kinds of illnesses resulting from poor work tasks. [Click here to view the scenario description](#)

19. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

20. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### **Scenario 3: Transversal Work Task (IV)– Continuous vocational education and training**

Continuous vocational education and training plays a minor role for Peter. He is only required to do a minimum of continuous vocational training according to the national/European legal requirements (e.g. applicable EU directive) and the requirements of his employer and his clients. At the same time, continuous vocational education and training (CVET) is much more flexible and easier to access as well as self-explanatory and applicable to Peter's individual needs (e.g. digital/virtual training tools that can respond to the learner's needs). [Click here to view the scenario description](#)

21. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

22. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### Final Question concerning Scenario 3 with all its work tasks:

23. What needs to happen (with regard to legislation, technical developments, infrastructure developments and other factors) that this Scenario of a low-skilled, long-distance professional driver with its work tasks can become a reality? What future key-factors need to come true?

*Please provide your answer in the open text field below.*

### Scenario 4: Low-skilled Professional Driver – Short Distance

#### General scenario description

By 2030/2035, the driving process at automation level 4 is automated, but the professional driver Michael must still be present to accompany his truck in and around the city, to load and unload it and to communicate with the customer. He has a variety of tasks and responsibilities. He deals with driving matters (e.g. driving in complex situations, shunting at the customer, loading and unloading, load securing). He must also have communication skills to deal with unexpected situations with other road users.

Michael primarily delivers goods from a hub (that is supplied by long-distance trucks) to the goods' final destination and picks up goods from small manufacturers and suppliers to deliver them to a hub. At the hub he can take advantage of the hub's full set of services including parking, loading and associated truck services (incl. departure control, vehicle repairs, maintenance, etc.) implemented by specialist personnel. When being at the hub, Michael has almost nothing to do with these tasks any more. The loading and service points ensure a correct load securing of the vehicle, which is either carried out automatically or by qualified personnel. However, when taking goods from clients to the hub, he is personally responsible for the correct load security. His contacts with the customers are regular but not very complicated, i.e. he has to hand over and pick up the delivered goods and load them again for the hubs. Therefore, Michael only needs a limited amount of skills.

The responsibility for accidents caused by his autonomous truck (accident liability) no longer lies with Michael but with the traffic control system and its operators. The competence requirements for Michael are reduced to a minimum (monitoring function and presence in case of problems with other road users).

specifications made above, what kind of short-distance drivers are not affected by this scenario and will require a higher level of qualification?

*Please provide your answer in the open text field below.*

25. In your opinion, what factors make it unlikely that this scenario will occur in this way?

*Please provide your answer in the open text field below.*

### Scenario 4: Work Task 1– Driving and Manoeuvring the vehicle

Michael needs to know and be able to operate all relevant functions of his vehicle that are necessary for both automated and manual driving. In regular operation, Michael's vehicle is automated: he performs a monitoring task but he must also be able to intervene immediately if the situation requires it. In complex traffic situations and with the customer (especially in small companies because large

companies usually run hubs of their own), he may without the support of sensors have to drive the vehicle himself in order to be able to react in time.

26. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

27. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### Scenario 4: Work Task 2– Performing pre-departure tasks

By 2030/35, all prior checks (e.g. tyres, steering, lighting, braking and signalling systems) will be automated with all available digital technologies (e.g. sensors, mobile apps, cloud-based data/links, remote control systems, etc.). The legal responsibility for the tasks before departure no longer lies with Michael, but with the traffic or transport organisation. For route planning, Michael is supported by telematics systems, which includes possible traffic jams and time windows at a customer in the planning.

28. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below*

29. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### Scenario 4: Work Task 3– Loading and unloading (incl. prior and subsequent tasks)

The planning of the loading, the load securing and the actual loading is carried out by employees of the hub. Michael is responsible for the further planning of the loading, the load securing and the actual loading, supported by app applications for calculating the load distribution and by lashing computers when picking up goods at the customers. Michaels vehicle will be equipped with assistance systems for axle load control and automated load securing.

30. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

31. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

### Scenario 4: Work Task 4– Planning driving times and routes

The entire process of planning driving times and routes is automated. Michael gets his optimal route through automated routing systems (which take into account customer wishes and time windows,

normal and actual traffic situations, costs, freight requirements, legal working time regulations, etc.). However, he also has to be able to plan and control his driving and working times independently in order to react to possible delays and/or customer requests. In the event of delays due to unforeseeable traffic situations or delays at the customers, Michael can independently intervene in the tour planning, search for alternative routes and communicate these changes to his superiors and/or the customer using appropriate terminology.

32. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

33. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

#### **Scenario 4: Work Task 5– Maintenance of vehicle and vehicle combinations**

Truck maintenance is fully automated and is checked by sensors (e.g. tyre/oil/water pressure, wear parts). If technical vehicle problems occur, the automatic system warns Michael and initiates the appropriate measures (e.g. Michael is informed that the vehicle has to go to a workshop or is picked up by a maintenance team). But usually, this is all taken care of automatically. In the event of a breakdown, Michael's job is to secure the breakdown site and notify customers, supervisors, and the workshop, for example.

34. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

35. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

#### **Scenario 4: Work Task 6– Work documentation**

The entire documentation of the work is digitised. Michael needs the knowledge to be able to handle these digital media efficiently. Apps, telematic systems or scanners, for example, are used here. For the delivery of goods directly to the customer, an acknowledgement of receipt may be required, which is sent via an app or handheld. When a customer needs support with the records, he/she is usually supported by office personal in his/her company. Michael usually has nothing to do with those things.

36. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

37. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

#### **Scenario 4: Transversal Work Task (I)– Cooperation with customers**

When picking up and delivering goods, Michael is in direct contact with the customers. However, his task is usually limited to working with the customers' personnel when it comes to loading and unloading the truck. Many communication processes are also automated so that the customers can track the position of the vehicle or the goods on the computer. If the delivery address is a collection point, there is no need for communication. In case of complex problems, communication with Michael's company takes place via specially trained personnel.

38. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

39. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

#### **Scenario 4: Transversal Work Task (II)– Cooperation with supervisors, colleagues, enforcement bodies and the general public**

Michael is required to cooperate with control officers in control situations, to answer open questions and to actively work on problem solutions. Communication with colleagues and superiors usually takes place via telematic systems or apps. When communicating problems, Michael selects the most appropriate communication medium for doing so.

[Click here to view the scenario description](#)

40. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

41. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

#### **Scenario 4: Transversal Work Task (III)– Occupational health and safety / healthy lifestyle**

Due to the individuality of each customer, the working hours in local public transport go hand in hand with the goods acceptance times of the customers. Autonomous systems reduce the accident rate and improve driving safety which has a positive effect on occupational safety. However, poor working conditions and a poor working climate can lead to stress, depression and other illnesses for truck drivers.

[Click here to view the scenario description](#)

42. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

43. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

#### **Scenario 4: Transversal Work Task (IV)– Continuous vocational education and training**

Professional development plays an important role for Michael. He is obliged to carry out a minimum of further training in accordance with national/European legislation (e.g. EU Directive). At the same time, CVET is much more flexible and accessible, self-explanatory and applicable to Michael's individual needs (e.g. digital/virtual tools that can respond to a learner's needs).

44. Thinking of this work task within the scenario described above, are these work activities accurate, would you like to add or delete anything?

*Please provide your answer in the open text field below.*

45. What devices/ instruments/ tools will the driver use in order to perform those activities?

*Please provide your answer in the open text field below.*

#### **Final Question concerning Scenario 2 with all its work tasks:**

46. What needs to happen (with regard to legislation, technical developments, infrastructure developments and other factors) that this Scenario of a low-skilled, short-distance professional driver with its work tasks can become a reality? What future key-factors need to come true?

*Please provide your answer in the open text field below.*

**(This question is mandatory)**

Do you agree to mention you as a participant (Name, Institution) in this Delphi Inquiry to the National Agency / European Commission funding this project?

- ☐ I agree
- ☐ I do not agree



## Annex 6: Interview Questions ‘Professional Bus Driver’



### Interview questions ‘Professional Bus Driver’

#### Interview questions

---

##### Professional Bus Driving in 2035

**1) We assume that in 2030/2035 buses will operate autonomously (automation level 4), which applies both to fixed bus routes (e.g. public transport, remote buses) as to on-demand bus tours (e.g. excursions). Although the driving process is fully automated, the bus driver is still present on the bus for example to assure safety and comfort of passengers or to bring the bus into a safe parking position in case of an accident/vehicle failure. Please note that the necessary prerequisites for fully automated driving (e.g. infrastructure and legal regulations) are already in place.**

In the following we present you a list of work tasks of bus drivers and would like to discuss with you whether these work tasks are still relevant under this assumption? What kind of activities will have to be done within these work tasks and what skills and competences will be required to fulfill these tasks?

##### **2) Take charge of the vehicle**

When you think about the fully automated driving process of a bus ride. What tasks will the bus driver still be required to be able to do (e.g. take over in case of an emergency)? What knowledge and skills do these tasks require from the bus driver? Are there any differences between drivers on fixed or on-demand routes?

##### **3) Safety & comfort assurance of passengers**

What skills and knowledge are required of a bus driver when it comes to dealing with passenger safety and passenger comfort? (e.g. safety measures, service & comfort measures during bus rides, food & beverages, entertainment?) Are there any differences between drivers on fixed or on-demand routes?

##### **4) Planning driving times and routes**

When the technical means of planning driving times and routes are available on a fully automated level (e.g. on fixed routes) or are heavily supported by IT systems (e.g. when planning specific on-demand routes), what tasks will still be the responsibility of the bus driver with regard to planning driving times and routes? What skills and knowledge are required to fulfill these tasks? Are there any differences between drivers on fixed or on-demand routes?

##### **5) Bus maintenance**

If maintenance issues are automated and controlled by assistance systems and/or specific maintenance service teams, what are the basic maintenance tasks a bus driver will still be required to do? (e.g. tyre/water/oil pressure, exchanging/organising small wear parts during a trip). What skills and knowledge are required to fulfill these tasks? Are there any differences between drivers on fixed or on-demand routes?



## **6)Work documentation**

When the complete work documentation process is digitalised and automated, what tasks will still have to be performed by the bus driver with regard to work documentation? What skills and knowledge are required to fulfill these tasks? Are there any differences between drivers on fixed or on-demand routes?

## **7)Cooperation/communication with customers/passengers**

What tasks will a bus driver have to fulfill when it comes to cooperating or communicating with passengers (e.g. specific services on tourist buses, communication in emergencies, etc.)? What skills and knowledge are required of him/her? Is there a difference between drivers on fixed or on-demand routes?

## **8)Cooperation/communication with supervisors, colleagues, enforcement bodies, the public**

What will be the tasks a bus driver has to fulfill when it comes to cooperating or communicating with supervisors, colleagues, enforcement bodies, the public? What skills and knowledge are required of him/her? Is there a difference when it comes to fixed or on-demand routes?

## **9)Occupational health and safety / healthy lifestyle**

What will be the requirements of a bus driver with regard to occupational health and safety / healthy lifestyle in a work context of automated bus driving-? What is a future bus driver expected to know and be able to do in this context?

## **10)Continuous Vocational Education and Training (CVET)**

In a world of permanent access to lifelong learning (through all kinds of ICT training offers on online platforms, smartphone apps, etc.), CVET will be much more flexible, individual and a basic requirement. What will bus drivers be expected to do/know in this respect?

## **11)Additional work tasks**

Are there any additional work tasks you would like to add or further discuss?

## **12)Comments**

Is there anything else you would like to mention?