FutureDRV Recommendations

Getting ready for the future of transport

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With contributions from:
FutureDRV consortium

IO: 03 ▫ Last update: August 2019

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www.project-futuredrv.eu

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

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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

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Summary

The publication at hand provides a comprehensive overview of the research work conducted within the FutureDRV project on “Preparing professional drivers for their role within the fourth industrial revolution and its innovations within road transport” and presents the recommendations that have been derived from three years of intensive research work on the future of professional driving. It provides an inside view into the research activities conducted, into the extreme scenarios that have been developed in order to describe the scope of potential future developments and finally a set of recommendations directed to the stakeholders concerned such as policy makers, authorities, employers, social partners and vocational education and training providers.

The recommendations describe the key findings and possible actions to take in order to prepare professional drivers for a future characterised by digitisation and automation in all areas of road transport. They take up future tasks of professional drivers, innovations in learning and training, the organisation of training as well as the urgent need to start an informed dialogue in the sector beyond the challenges of todays driver shortage but on the future ahead of this exciting profession.

Content

(1) FutureDRV set up and approach

There are major changes within and related to the job of professional drivers ahead of us, and these changes need to be planned for and supported by vocational education and training incl. all stakeholders concerned such as VET providers, employers, social partners and policy makers to reach its full potential. These changes require actions to avoid in the one hand a further increase in today's major deficit of skilled workers in the profession, which continues to belong in the top ten jobs that employers have difficulty filling today and during the last decade and on the other hand prepare for a world of transport that is getting more and more digitised and automated. For this reason, it is of major importance to think ahead of time and to develop a future vision of the profession with consideration of megatrends, trends and innovations that will influence this occupational profile.

The FutureDRV project investigated the future of professional driving by taking a look into the tasks and role of professional drivers, their qualification requirements and the way work and learning are going to take place in 2030 and beyond.

In this regard the project took a whole range of parameters into consideration that influence this profession and the qualification for the profession:

This, of course, included the technical development of trucks, transport units, busses and coaches (e.g.automation and assistant systems) and infrastructure (e.g. loading systems and HUBs) in the transport sector. However, for the FutureDRV project it was particularly important in this respect that competencies play a very important role, because technical innovations in particular can often only develop their full potential if the person who is to apply them - in this case the driver - knows them, understands them and can apply them competently.

The project also concerned with the political decisions in this environment. The European initiatives have been particularly looked at, as well as initiatives that are taken nationally by politicians. Here among others question related to reliability, social aspects and education have been investigated. It is precisely here that decisions are taken that have a great influence on the development of this profession. Of course, economic considerations also play a very important role in transport such as related to the transport chain, to e-commerce or intermodal transport, and have accordingly been taken into account in the projects research work.

Social aspects, such as the ageing of society and the related concerns of young people in the industry, but also the shortage of professional drivers today, the professions difficult image and the characteristics of the new generations Y and Z, also played a role in the FutureDRV research activities. When it comes to sustainability considerations, the project dealt with issues such as alternative propulsion systems and noise pollution.

Finally, of course, changes in education and training especially related to new learning formats, new ways of learning and the learning behaviour and expectations of new generations of learners also have an influence on what the qualification of professional drivers will look like in the future and have therefore been given a high relevance in the FutureDRV research activities[1].

Different kinds of research and development activities have taken place in the context of the FutureDRV project. Those included primarily:

- desk research taking into consideration existing studies, trend reports and further material available on future developments within transport and logistics available in the project languages,
- more than 50 extensive interviews with stakeholders and experts from transport and logistics in the project partner countries on their perspective on the future of transport and the profession of professional drivers,
- a comprehensive quantitative online survey involving more than 70 professionals from the transport and education sector on the future of learning within professional driving,
- a 2-stage Delphi survey involving high-level experts from all across EU on future work tasks of professional drivers and determining factors,
- development, piloting and evaluation of innovative learning solutions with involvement of more than 100 drivers and trainers across the project countries into piloting,
- numerous consultations and interviews with different kinds of stakeholders and professionals on individual aspects of the projects research activities such as on future perspectives of manufacturers or on national initiatives/ perspectives related to the FutureDRV results and
- the work of closely related projects having been implemented alongside the implementation period of the FutureDRV project.

All those activities finally led to the FutureDRV major outomes and have been consolidated into the recommendations at hand.

[1] See also report on Future Learning within Professional Driving at www.project-futuredrv.eu.

(2) FutureDRV activities and results

Based on the research activities described above four major project results have been developed in order to support stakeholders to get a better view into the future of professional driving and shape their initiatives and activities accordingly:

The **FutureDRV PROFILE** describing the professional driver, their future role and the related knowledge, skills and competences within the 4th industrial revolution has been developed within the FutureDRV project. The profile has been provided in order to serve as a major point of reference on the future skills needs within professional driving with a special view on the implementation of autonomous driving level 4 which has been evaluated by different experts and sources to be very likely for 2035, the point in time chosen by the FutureDRV project as general reference within all project activities.

The FutureDRV profile is accompanied by a number of supporting results and ressources. Those are among others a comprehensive research report on its development and short videos describing the FutureDRV scenarios on the future of truck and bus/coaching driving.

Two exemplary **FutureDRV LEARNING SOLUTIONS** have been developed that are supposed to support the current workforce to keep up with the changing and increasing qualification requirements. The focus has been put on two topics that have been evaluated to remain or become of major importance also in future for professional drivers: load security and communication.

The learning solutions take up trends within learning and adapt them to the characteristics of professional drivers by applying a gamification approach. They can be used as enrichment and innovation within classroom training as well as individually by learners. With the methodical approaches they are applying they are pointing the way towards the future of competence-building as part of lifelong learning within and outside the classroom.

Both learning solutions are available as Open Education Resources and can be further used also beyond the FutureDRV consortium. First interests have already been raised by stakeholders to further develop and use the FutureDRV learning solutions also outside the project consortium within regular training praxis. In addition, the learning solutions come with

a trainer manual on how to use them in the classroom in order to make use of their full innovative potential.

The **FutureDRV RECOMMENDATIONS** (described in the publication at hand) address different stakeholders such as social partners and VET providers with suggestions on how to prepare professional drivers for future requirements beyond the framework of a concrete national system. Finally, they also address European policy and its role within preparing professional drivers for the future. (see chapter 4 of this publication)

Alongside those general recommendations on the future of professional driving the project partners prepared individual country specific case studies on how to get ready for the future of professional driving taking into account the systems characteristics of the project countries France, Germany, Hungary and the UK.

Two more research reports on “Technological Innovations influencing Professional Driver Qualification” and “Future Learning of Professional Drivers as well as the FutureDRV scenarios on the future of truck and bus/coach driving accompany the recommendations.

The **FutureDRV TIMELINE** makes trends and innovations transparent and recognises their interrelation with the qualification requirements for drivers. It sets out a framework of developments to these upcoming changes and defines the responsibilities and steps to be taken by different stakeholders. The timeline is therefore a key tool for policy making, vocational education training and career planning in the context of professional driving describing the past of professional driver qualification and allowing a look into future developments leading in the one or the other direction of professional driving.

The timeline is of course closely related to the overall FutureDRV research results and strongly refers to the FutureDRV scenarios having been described for truck as well as bus/coach driving.

Those FutureDRV project results should in any case be looked at comprehensively in order to ensure a complete picture drawn by the FutureDRV project and documented in the results above. The different project results go in this regard hand in hand with each other and should be seen as a whole rather than alone standing separated results.

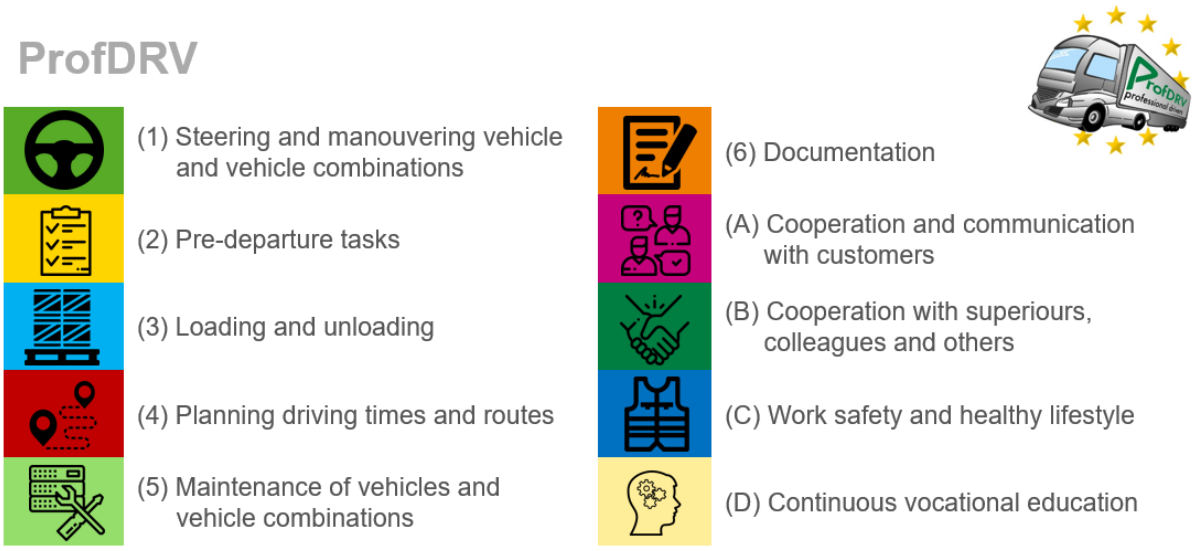
All project results can be accessed and partially downloaded from the project website. https://project-futuredrv.eu/index.php?id=5.

(3) The FutureDRV scenarios

The FutureDRV scenarios on the future of professional truck and bus/coach drivers have been a fundamental milestone in the overall projects research work. The scenarios and the results they are based on are therefore outlined here in order to provide the necessary background for the following recommendations.

(3.1) Research basis for the FutureDRV scenarios

The FutureDRV scenarios have been derived from the 1st round of a Delphi study that has been implemented with a group of highly specialised experts on the topic of road transport from across Europe representing among others research, associations, praxis and education. This Delphi round asked the experts on their opinion about changing tasks and responsibilities of professional drivers (freight) under automation level 4 according to the competence areas identified and defined in the ProfDRV project[2]:



(Task 1) Steering and manoeuvring vehicle and vehicle combinations: All experts who contributed to this Delphi round assumed that autonomous driving will have prevailed in the investigated time frame until 2035[3], but that it will not yet be possible to do without the driver at this point in time. The driver will have to be able to take over the vehicle at any time and must have basic knowledge of the corresponding automation functions in order to be able to assess the situation correctly, etc. For this it is of course necessary to understand how the autonomous vehicle reacts in certain situations. However, there is controversy as to whether this will actually require further skills to understand the systems, or whether everything will be so self-explanatory that driving itself will basically reduce to an everyone's qualification that can be carried out by anyone with a driving licence. However, the results also make it clear

[2] See www.project-profdrv.eu for further information.
[3] Nevertheless, FutureDRV does not want to make a prediction regarding a concrete timeframe of the changes ahead. The project rather follows potential effects of crucial events on the driver's profession and tries to predict potential developments based on them.

that the requirements for driving in the future will differ greatly between driving on the motorway and driving in rural/urban traffic and that the profile of the professional driver will differ here.

(2) Pre-departure tasks: The experts have been astonishingly unanimous in this area of competence. It is almost unanimously assumed that departure control and all associated tasks will continue to lie with the professional driver in the future. However, they are strongly supported by apps and digital services/assistance systems, which of course need to be operated and read correctly. This should continue to be the case even if numerous vehicle parts are already remotely monitored. However, it is assumed that there will be double control via remote monitoring.

(3) Loading and unloading: The tasks of the driver during loading and unloading (which also includes load security) are less clear and opinions differ strongly at some points. Experts agree that the driver will only take on a supervisory role here and the responsibilities will be divided between the loader and the driver. It is also assumed that the driver will be provided with assistance systems for his monitoring function, which will make this task easier for him/her, but which will also represent a digital application that must be operated and used correctly. Opinions differ as to whether the driver will have to deal with highly automated loading units during loading and unloading or whether this will be done by specialised personnel at the respective loading points. Both are regarded as possible, although economic considerations in particular suggest that this could be a task for the driver. However, this in turn is strongly dependent on the direction the development of the profession generally takes. It also remains unclear how complex this monitoring function will be. And here, too, there is again a distinction between the development of requirements in long-distance transport over the motorway and first-mile and last-mile transport. While some still assume a lot of manual work, the other shows that these tasks are more likely to be performed by personnel in HUBs. Many questions remain unanswered in this competence area.

(4) Planning driving times and routes: Experts opinions are clearer with regard to tasks relating to time and route planning. The experts assume that drivers will receive the relevant information and specifications via automated systems and that their task will again be limited to a test function. Here, too, it will be necessary for the driver to be able to operate the appropriate terminal devices in order to make any necessary entries or make changes. Communication between drivers and dispatchers will also be indispensable in the future. It is also conceivable, however, that in future the driver will be almost completely outside the system and will consult a helpdesk only in the event of problems. Everything else will be completely taken over by the system. Including communication with the dispatcher.

(5) Maintenance of vehicles and vehicle combinations: In the area of maintenance and service, there is a broad consensus that drivers will perform far fewer tasks themselves in the future, as much will be monitored by sensors. This development is already in evidence today. All that remains is for the driver to react to any corresponding messages from the system and to communicate any further information to the workshop or the relevant department in the company, insofar as this cannot already be taken over by the system. Whether appropriate technical knowledge is still necessary for this is questioned here. In the opinion of the experts,

the entire area will be greatly reduced in the driver's task portfolio in the future - and this has already been seen from practical experience.

(6) Documentation: It should come as no surprise that in the future all documentation processes will run digitally and the driver will have to be able to operate corresponding programs/applications. What is almost categorically excluded by the experts, however, is the assumption of disposition or financial processing tasks by the driver. It is assumed that these tasks will also be performed automatically by appropriate algorithms and that the driver will only have to confirm orders at the most. However, opinions differ on the complexity of operating such systems. Some experts assume that no user competence is necessary and that the operation is limited to a click. Others envisage more complex tasks for the driver, which must be implemented with the appropriate digital applications.

(Tasks A+B) Cooperation and communication: When it comes to communication and cooperation, the experts' assessments are unfortunately less clear than the results of the survey of practitioners interviewed on this subject[4]. While the answers of practitioners in the field have shown a clear increase in these areas, the opinion of the experts diverges as to whether this need will actually exist in the future. For example, only some of the Delphi experts assume that professional drivers will have pronounced customer contact in the future and will therefore also have the necessary skills. The other part rather assumes that communication with the customer will be automated for the most part and will no longer be part of the driver's tasks. This discrepancy can, however, easily be explained by the previously mentioned profile delimitation between long-distance traffic on the motorway and first/last mile transport. While in long-haul traffic, for example, such demands on drivers decrease from hub to hub, this component of the profession in first-load-mile transport is increasing significantly and will still require a great deal of competence from drivers than before. It is also quite possible that numerous other competences in the area of accompanying services will be expected from drivers who are not yet anchored in the profession to this extent.

The Delphi survey results clearly suggest the need to look into different future scenarios for truck driving because tasks and competence requirements are according to the experts' opinion very likely to differ between drivers in first/last mile transport and drivers on long-haul routes in hub-to-hub traffic. For this purpose, scenarios have been developed taking up this distinction as well as the potential development directions already indicated by the expert survey results.

Similarly, the FutureDRV research results also suggest a distinction between bus and coach drivers focussing describing different future scenarios for drivers driving fixed bus routes (long or short distance) on the one hand and on the other driving coaches in occasional traffic (long and short distance).

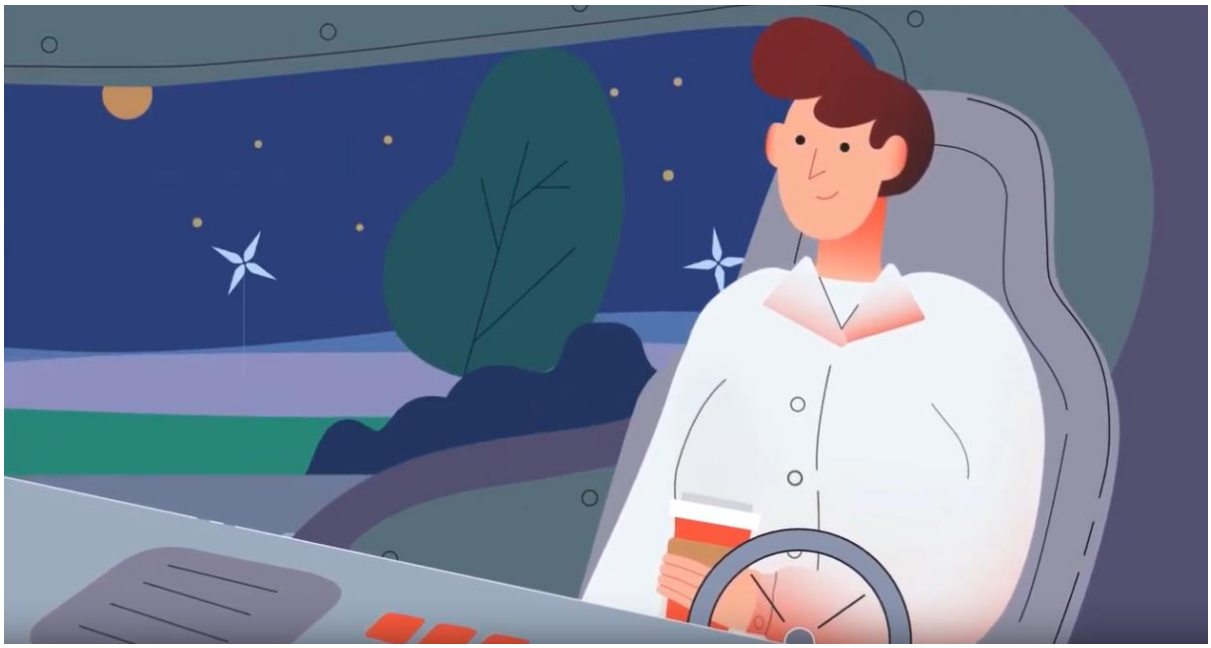
(3.2) Extreme scenarios truck driving

In order to present the entire range of the potential future comprehensively, there have been extreme scenarios, which on the one hand discuss conditions under which they will realise

[4] See FutureDRV report on the future of professional drivers learning at www.project-futuredrv.eu.

which on the other hand make it possible to draw conclusions about the necessary qualifications in each case. Reality will probably lie between these extreme scenarios, although of course some potential future developments are more likely than others. Which future ultimately will occur and when depends very much on political decisions, the legal framework, the availability of technology and the corresponding infrastructure.

For freight transport there have been extreme scenarios developed for professional drivers in first/last mile transport and drivers on long-haul routes in hub-to-hub traffic, since the Delphi survey results strongly suggested this differentiation in the professions future development. In both cases a highly skilled scenario and a low skilled scenario have been developed and further researched by the FutureDRV project in order to explore tasks and qualification requirements in the different scenarios. It, however, needs to be taken into consideration that the drawn scenarios are extreme scenarios that rather describe the overall scope of potential developments than a scenario that is very likely to take place. They take current trends in the sector into consideration addressing among others economical, societal, technological as well as political trends and initiatives.



Scene from the FutureDRV long-distance scenario video
(available at: https://project-futuredrv.eu/index.php?id=81)

Long-haul transports/ low qualification: According to the results described above (that take the current situation as reference) there is a trend towards decreasing qualification requirements within long-haulage in hub-to-hub traffic once automation level 4 has been put in place on highways for trucks. Within this low-qualification scenario the actual tasks of the driver are reduced to a minimum that focusses on road and work safety related tasks to be still carried out by the driver him/herself. This trend towards a de-qualification within this part of road freight transport results from a high level of automation in major work areas of current drivers such as within the driving task itself, documentation, planning, maintenance and even communication as well as a shift of major tasks carried out by todays drivers such as load security or pre-departure checks to specialised personal in HUBs. The drivers' role reduces to the role of a pure truck attended that can be considered an Everyman qualification rather than

a skilled worker. The FutureDRV profile describes the relevant qualification requirements in its entry qualifications. Prerequisites for the realisation of such a scenario are besides the applicability of automation level 4 on the road, also major shifts with regard to legal questions such as reliability within road transport and the availability of the necessary infrastructure such as exhaustive HUB networks to realise the HUB-to-HUB transport. Especially the continuously increasing driver shortage, the difficult work conditions especially within long-haulage as well as a despite of the implementation of the driver CPC still rather low entry requirement into this profession support this low qualification scenario within long haulage. The applicability of this extreme scenario is, however, limited to hub-to-hub transport and therefore not applicable to the whole range of long-haulage transports (see also the FutureDRV video on long-haulage transport for further specification of this scenario).

Long-haul transports/ high qualification: The long-haulage/ high qualification scenario sees the long-haul driver as a road freight transport specialist being able to overlook all relevant tasks and processes in the truck and related to freight transport on the road. This driver requires a high level of qualification in order to handle new digital systems and technical innovations professionally and takes on additional tasks currently carried out by others such as the dispatcher or technical personnel. Furthermore, it is on him/her to understand, control and handle all relevant systems in the truck related to driving as well as to the load and the truck itself. According to the Delphi experts this scenario is under current circumstances rather unlikely to realise but in parts limited to highly specialised drivers carrying out transports that contain a majority of tasks not possible to be automated.

Scene from the FutureDRV short-distance/ last mile scenario video
(available at: https://project-futuredrv.eu/index.php?id=81)

First/last mile/ high qualification: According to the FutureDRV research results there is a trend towards this scenario within first/last mile transport. In this scenario professional drivers will take on a number of additional transport accompanying services starting from customer communication and the provision of customer support related to the transport order leading up to addition services related to the transported good itself such as the installation of

delivered devices. The professional drivers' tasks will strongly shift in this scenario towards a more service-related profession that goes far beyond the actual task of transporting goods from one place to another. In addition, this scenario askes the driver to deal with tasks related to load security and the handling of related technical (automated) equipment and systems at the customers as an accompanying service. A major task of drivers in this scenario will also be the handling of customer complaints and satisfaction. This kind of driver is a specialist for freight transport and/or the kind of transport carried out by him/her taking on additional tasks similarly to the ones described above in the long-haul / high qualification scenario. (See also the FutureDRV video on first/last mile transport for further specification of this scenario).

First/last mile / low qualification: The first/last mile/ low qualification scenario is rather unlikely to take place due to the high unlikeliness of the necessary framework conditions. It, however, assumes that the drivers' tasks are also within first and last mile transport from the customer to an HUB and back primarily limited to very basic tasks limited to road and work safety while the majority of tasks are carried out by either others or are automated. The competence requirement still exceed those described in the long-haul/ low qualification scenario because there are additional tasks such as communication with the customer and assistance in handling the load required from drivers in this scenario as well although on a very basic level only.

(3.3) Extreme scenarios bus/coach driving

Within passenger transport the identified divergence of competence requirements is primarily expected within occasional passenger transport by coach and fixed route passenger transports by bus. A specification by short- and long-distance transport as outlined within freight transport appears to be of less relevance within passenger transport. The scenarios nearly equally apply on short- and long-distance passenger transport. Although here extreme scenarios have been developed describing for both areas low- and high-qualification scenarios in order to draw a comprehensive picture of the potential future developments.

Occasional passenger transport: Within occasional passenger transport there is according to the interviewed experts a high-qualification scenario more likely than a trend towards lower qualification. This results especially from the increasing competence requirements related to passenger service and support incl. the take over of tasks currently carried out by tour guides/leaders as well as tour organisers. This includes among others the coordination of catering and sightseeing stops along the trip, the organisation of connection transport to the passengers' final destinations, the handling of passengers purchase orders as well as the operation of digital devices on board of the coach incl. enter-/edutainment devices such as tourism related AR and VR applications in order to increase the travel experience. A low-qualification scenario would on the contrary reduce the coach drivers' tasks to safety and support related tasks such as support for passengers with disabilities. Of course, also the high-qualification scenario includes those tasks to be taken over by the driver as part of his/her job.

Fixed route passenger transport: Contrary to occasional passenger transport expert interviews with regard to fixed route passenger transport (long- and short-distance) indicated a trend

towards a low-qualification scenario within fixed route passenger transport. Here the drivers' tasks are limited to observing the driving process and providing safety and need related support to passengers during entering and leaving the bus. Also handling of payments and tickets is no longer in his/her scope of work within this scenario but is taken over by digital/automated systems or other personal at bus HUBs. However, also here a high-skilled scenario is of course in scope enriching the bus drivers' tasks by passenger service and support tasks related to among others ticketing, connecting transports.

Scene from the FutureDRV bus/coach scenario video
(available at: https://project-futuredrv.eu/index.php?id=81)

(4) FutureDRV recommendations and the stakeholders concerned

FutureDRV understands the way towards a well-qualified future workforce within professional driving as a joined effort that requires the engagement of all groups of stakeholders concerned. It approaches the future of professional driving from different angles in order to take the occupation as a whole into the focus and address all aspects relevant for its future development sufficiently and comprehensively. In this sense also the following recommendations have been developed taking the results of the FutureDRV research and development work as well as the current situation within transport and other related fields into account. The FutureDRV recommendations aim – together with all other FutureDRV project results – to equip the major stakeholders addressed by the FutureDRV project being education providers, employers, social partners and policy makers with suggestions on how to prepare for the future of professional driving. The recommendations take up different aspects having been identified within stakeholder consultations and research work as being of major relevance in order to shape the future of the profession even for a time that goes beyond drivers who steer trucks and buses.

(4.1) FutureDRV recommendations derived from the overall project work

The following recommendations have been derived from the FutureDRV research and development results:

Preparing for a major shift of competences within professional driving from a rather technically oriented profession focussed on the task of driving towards a service- and safety-orientated profession requiring a high level of digital literacy from across the whole scope of professional drivers' tasks and responsibilities.

Professional driver training is across Europe still strongly perceived as a very technically oriented profession focusing on technical aspects of the vehicle/ vehicle combination and on the task of driving. Already the ProfDRV project[5] "Professional driving more than just driving" clearly showed that this is no longer valid but requires a reconsideration. The FutureDRV results and especially the FutureDRV profile clearly underline a very strong shift of the professions future development towards a strongly service- and safety-oriented focus with a very high demand of digital literacy/ competence and a clear downturn of technical competences.

This becomes especially evident when looking into the technical development of trucks and buses over the last decades that made a fundamentally shift into highly complex, digitised and interconnected systems requiring a high level of specialist mechatronical understanding going far beyond and being to a large extend clearly separated from the regular tasks of a professional driver. Instead already today steering of a bus or a truck includes a lot of highly digitised tasks such as reading and understanding telemetry data or operating and reading out the digital control unit. Other core tasks of the driver such as communication with dispatchers and clients, route planning, work documentation or handling of electronic transport papers are just some examples of tasks that are already today undergoing a fast progression towards digitisation. Digital transport units, connected driving, platooning, intelligent traffic systems etc. are other examples that already show up on the horizon and will lead to a demand of even higher digital competences of professional drivers in order to do their job professionally and especially safely. The trend toward service- and safety-orientation has been outlined earlier in this paper.

It is of major importance that these changes in the professions' focus are also reflected in relevant curricula of training programmes offered to professional drivers within initial and continuous training. In many cases this will require a courageous and strictly forward-looking move in existing curricula in order to make sure todays new drivers but also experienced drivers are ready to take on tomorrows challenges when it comes to the their tasks. This is not only a question of employability for the professional drivers' workforce but also a question of increasing the professions attractiveness as a career for young people and career changers

[5] See www.project-profdrv.eu.

by reflecting the professions future as a service- and safety-oriented profession with a high level of digitisation already in todays curricula preparing current and future professional drivers for the future of transport ahead of them.

Paving the way for (innovative) digital and technology-supported learning that improves and enriches professional drivers learning experience by stronger interrelating the world of work and learning and increasing professional drivers learning motivation with the aim to foster transfer and sustainability of learning.

Todays' training for professional drivers is to a large extend still strongly based on classical classroom and trainer-centred training with a rather low level of praxis related elements. The opportunities of modern learning technology are so far used only very rarely and limited to flagship projects that have a very limited scope only. The most widely used learning technology applications within professional driver training today are driving simulators with different levels of proficiency.

However, digitisation offers a whole range of new possibilities in order to enrich and improve learning in general and for professional drivers in particular. For example: Just as many other professions also within professional driving technological or other kinds of innovations hit the road very quickly and need to be applied at short notice by the professionals concerned. Digitised training on digital devices to be used in the truck or bus can make a major contribution here in order to provide training ad hoc when it is needed in the actual practical situation. Such new training formats therefore open up new possibilities in order to make learning more relevant, praxis oriented and stronger oriented on the actual needs of the drivers.

At the same time innovative training technology offers multiple new and fascinating ways of training that can strongly improve learner engagement and motivation as well as praxis relevance. Which is of special relevance when it comes to target groups such as professional drivers that are characterised by a rather sceptical attitude towards training. The two FutureDRV learning solutions on load security and communication provide examples on how such learning technology used in the classroom or remotely by individual learners can enrich the learning experience of drivers in a way that fosters their engagement through (in those cases) gamified learning experiences. Innovative learning technology such as virtual and augmented reality open up unique new opportunities to train for instance topics such as load security, pre-departure checks, loading and unloading or practicing of emergency situations on the road.

The opportunities provided by learning technology to improve and enrich training are of course not limited to the training of professional drivers. The future of training in general is perceived as being highly digitised by making use of the digital technologies opportunities to improve training and the transfer of training into praxis. As described above this starts with learning

technology in the classroom and leads to learning in digital networks such as currently tested with professional drivers in Germany in the LaSiDig project[6].

Digitisation of learning is of course not the solution per se. Digital and technology-supported training needs to be applied where appropriate and where it can provide a benefit to the learning experience. However, there is strong consensus amongst education experts that digital learning and learning technology will play a major role in the future of learning in order to individualise learning and adapt it to the learners needs, to make learning more relevant and bring it closer to the work reality of the learners, to allow learning where and when needed and at the learners own pace. All for the sake of creating sustainable learning experiences. The FutureDRV future learning survey clearly shows that those trends are also applicable within professional driver training.

It is therefore urgently needed to open up and extend professional driver training to/with digital learning opportunities in order to ensure that professional drivers' training and learning can in the long run benefit from the opportunities offered by digitisation within training and therefore allow training to accompany professional drivers on their way in the 4th industrial revolution.

Ensuring of a continuously high and increasing qualification level of professional drivers within their unique field of work as well as beyond this framework in order to ensure employability of drivers also beyond driving and transferability of competences into other potential fields of employment for professional drivers.

As described in the FutureDRV scenarios and the accompanying Delphi study results, some parts of the professional driver profession (especially long distance/ freight) are with increasing automation of transport and logistics processes at risk to become an Everyman's qualification with very low qualification requirements and very limited remaining tasks. This trend receives strong support by the current shortage of professional drivers and the related call to even lower (entry) requirements into the profession in order to attract more workers for professional driving and make their entry into the profession easier. The FutureDRV results predict this de-qualification trend for the point in time when level 4 of automation is implemented at least on highways. The majority of experts interviewed and consulted within FutureDRV considered 2035 as a potential point in time when this could realise[7]. It has also been taken as likely that level 4 will rather quickly be replaced by level 5 trucks at larger scale and with the usual transition periods. First autonomously driving buses and trucks are already today reality in limited areas and even in cities and on public roads.

[6] See www.projekt-lasidig.info (German only)!

[7] It was not possible during the FutureDRV project to come to a really valid prediction with regard to the point in time when the different levels of automation are realised. The project does therefore not make any prediction regarding a concrete timeline but takes the level of automation as reference for the future requirements on professional drivers. Expert opinions differ widely on when what automation level is going to be dominant on the road and also times of mixed traffic need to be considered.

Considering the predicted trend towards decreasing qualification requirements this would lead to a high level of unemployed drivers with only very low competences and therefore major difficulties to be placed in other (related) parts of the labour market. A de-qualification of professional drivers must therefore not be desirable in order to avoid such a difficult labour market situation related to the introduction of level 5 trucks that might not be there yet but already on the horizon (see test drives and routes all across the globe incl. Europe) a split of the professional driver workforce into winners and losers auf autonomous vehicles.

Although the FutureDRV scenarios describe extreme scenarios only that are not likely to realise in exactly this way, they should be considered as trends that can either be supported by for instance keeping the qualification of professional drivers on a minimum or even lowering it or prevented by actively promoting a higher qualification level of professional drivers for instance through the competence areas highlighted above as fields of future (additional) competence requirements. It is up to employers, social partners and policy makers to make sure professional drivers qualification takes rather a trend towards higher qualification with the upcoming changes within the profession in order to ensure drivers employability and transferability of competences also beyond level 4 of automation when no drivers are any longer needed on (parts of) trucks and buses.[8]

Modularisation of professional driver qualification allowing for a continuous update and increase of drivers' professional competence and opening the way for specialisation within professional driving as well as for connectivity to other (neighbouring) professions/ professional fields.

The FutureDRV results clearly show a trend towards an even further heterogenization of the already today very heterogeneous field of professional driving. This partially results from the huge divergence described above in the FutureDRV scenarios but also from a trend towards addition tasks added to the pure delivery of products that are strongly dependent on the transported good within freight transport. Already today this leads to partially very different qualification requirements when qualification goes beyond the actual core of the professional driver profession being (today still) the actual driving of the vehicle. In order to, however, keep vocational education and training especially within continuous training meaningful to drivers and praxis oriented there is a need to modularise the overall profession as it is partially already today the case with specialisation such as ADR, crane or live animal transports. But also within core fields of the profession the FutureDRV results show a very strong variety of differing profiles of professional drivers because requirements profiles of drivers strongly differ in different companies and areas of work.

[8] The Steer2Career project funded by the UK National Agency is taking up from FutureDRV at this point and explores career prospects of professional drivers beyond driving (https://www.project-steertocareer.eu/)

In order to cover all those differences in the profession the FutureDRV profile has been structured into relevant work tasks (competence areas) that can be added on top of the entry requirements (equalling the very minimum qualification needed to ensure a minimum level of safety within transport similarly to the current driver CPC today). Orientation on such a modularised qualification profile would therefore open up possibilities to increase the qualification level of drivers in a formal way by at the same time sticking close to the actual work tasks carried out by professional drivers in praxis. At the same time such a modularised system also allows the integration of additional qualification needs arising from technological or other kinds of innovations as they will take place in an increasing frequency with progression of digitisation in the related fields of transport and logistics.

In this way and especially when the FuterDRV profile is further extend to modules that prepare for a career beyond driving such as within passenger service also career paths for professional drivers can be opened up that allow drivers to specialise in a concrete field. This can increase their employability also beyond automation level 5 either within a field of work within professional driving that is not subject of truck/bus automation or by allowing drivers to transfer – based on their specialisation – into other fields of work such as into warehousing, maintenance or service.

Facilitation of a continuous dialogue on the future of professional driving among relevant experts and stakeholder and implementation of an appropriate information strategy about future developments beyond the scope of current challenges to ensure forward looking decision making.

The FutureDRV project has initiated and participated in numerous dialogues and discussions with a wide range of stakeholders representing the transport sector, authorities, education providers, social partners, policy makers as well as research. The today clearly dominating topic within such dialogues is in all cases the existing driver shortage which is also very understandable considering the enormous impact this shortage has on the sector. However, looking into the future the current shortage of professional drivers and the urgent need to quickly bring new drivers into the profession can be a difficult guiding concept for making decisions with a medium- and long-term impact.

At the same time the FutureDRV activities have shown that there is an alarming little interest and even less serious knowledge about innovations and future developments within professional driving and road transport in the transport sector available. Concepts of the future of professional driving are on the contrary very often strongly based on personal subjective opinions or widely spread concepts without a valid basis. It has therefore been a major challenge of the overall project to identify experts able to make a qualified and serious contribution to the discussion of this professions' future.

Therefore there appears to be a strong need to initiate a dialogue and the provision of valid information among the relevant stakeholder who are concerned with shaping the future of professional driving in one or the other area that starts a discussion on the future with the present situation in mind but focussed on the future developments in this profession. Such a dialogue should lead to a better and valid understanding of future developments and therefore also a qualified forming of opinions and decision making for a well-planned and safe future of professional drivers.

(4.2) Recommendations and different groups of stakeholders

The recommendations provided above are directed to different groups of stakeholders that can also vary strongly from country to country dependent on the vocational education and training systems in the different EU Member States. Therefore, national case studies have been developed for the five project countries Austria, Germany, France, Hungary and UK taking the different national VET systems into account and providing concrete recommendations for the different systems.[9] However, in all cases the shaping of the future of professional driving must be a joined effort amongst all those stakeholders including employers, social partners, policy makers, authorities and education providers. All of them need to make their contribution in order to lead professional drivers into a safe and well-planned future ensuring drivers employability on and beyond the road.

However, the European dimension of this profession and the high level of mobility of professional drivers far beyond the national scope of one EU Member State also suggests a consideration of the FutureDRV results and its recommendations at European level. This primarily refers to Directive 2003/59/EC as the major European tool steering professional drivers' minimum qualification across the EU and therefore already provided a trend-setting milestone for the future of professional drivers by providing a compulsory minimum qualification. Also the resent opening of the driver CPC towards e-learning formats provides the basis for innovation and more learner-centred training within professional driver qualification. It is up to the EU Member States, VET providers and employers to fill those new opportunities with life for the sake of increasing attractiveness and sustainability of professional driver training. The most important step at this point seems to be the maintenance and potentially the increase of the minimum level of qualification as required by the Directive. The content of the training required by the Directive already brought one major forward-looking topic into play by introducing the image topic into the curriculum. Within the future learning survey conducted by FutureDRV this has even been pointed out by one of the respondents as the most important training innovation within professional driver training today. However, the FutureDRV profile provides a number of further considerations worth to be taken into consideration for further developing of the Driver CPC.

[9] The FutureDRV country case studies are available online at: https://project-futuredrv.eu/index.php?id=81 in the download area.

At the same time European stakeholders are invited to take the FutureDRV results into consideration within their activities at European level and with their members across Europe or even world-wide. It is up to organisations such as social partners and industry representations to make use of the recommendations and FutureDRV results at hand. They have been prepared in order to support those stakeholders in their opinion formation and decision making. Some of them have been actively involved or accompanied the project along their way.

We want to thank those organisations such as ETF and IRU for their continuous support along the way in this fascinating and demanding project that allowed us to take a look into the exciting future of professional driving!

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