Case Study on

Readiness for the Future of Professional Driving

Country: Austria

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The professional driver qualification is one of the most suffering fields of work with regard to shortages of labour today and at the same time faces a very insecure future in the light of digitization and autonomous driving vehicles. This leads to a number of challenges that need to be addressed in order to at the same time tackle current deficits and prepare for a future that cannot be clearly described yet.

The FutureDRV project tried to give an insight view into potential future developments of the overall profession and training in the occupational field in order to prepare stakeholders concerned with professional drivers and their role in the supply chain for potential future scenarios. The case study at hand analysis the current situation for Austria in the light of the FutureDRV project results and provides concrete recommendations on how to prepare national, industry and other stakeholder structures, initiatives and practices in a way that supports the transport industry and professional drivers to get ready for a digitalised future of transport. Major emphasis of this case study is given to labour market considerations, ensuring a well-skilled workforce and employability of professional drivers over time.

Current state of play of professional driver qualification in Austria

When it comes to the requirements for becoming a professional driver in Austria, there are three different options:

1. A person must have passed the driving test for the C (or D) driving licence and must own the "Driver Certificate of Professional Competence" (CPC) including the initial qualification and a periodic training. Further requirements are: an accident-free driving career, good eye-hand coordination, good eyesight, interest in cars, the ability to concentrate, responsiveness, willingness to travel, technical understanding and a sense of responsibility".[1] If a person has three years of work experience in truck (bus) driving with a C (orD) licence and a minimum age of 21 years, he/she can also participate in the final apprenticeship exam (cf. option 2) to become a professional driver.[2]
2. The Austrian dual system for vocational education and training (VET) refers to a reciprocal and complementary system between education and company training during the apprenticeship. Since 1987, a three-year apprenticeship prepares for freight transport as

[1] https://www.berufslexikon.at/berufe/2895-BerufskraftfahrerIn_LKW-FahrerIn_AutobuslenkerIn/#anforderungen (02.08.2019).
[2] https://www.berufslexikon.at/berufe/2895-BerufskraftfahrerIn_LKW-FahrerIn_AutobuslenkerIn/#ausbildung (02.08.2019).

well as passenger transport; the focus depends on the apprentice's employer. Requirements for apprenticeships for professional driving are defined as: "physical endurance; manual dexterity; eye-hand coordination; insensitivity of the skin; spatial imagination; mathematical and computational skills; technical understanding; organisational talent; ability to make contact; logical and analytical thinking; good responsiveness; retentiveness; working independently and mental resilience[3]. The apprenticeship training for professional driving (for truck or bus) is already possible at the age of 17 during which the apprentice can drive for training purposes. After the three-years of training, the apprentice takes the final apprenticeship examination (theoretical as well as practical) which includes the CPC test. The Austrian Qualifications Framework places the professional driver apprenticeship qualification at level four out of a total of eight AQF levels whereas the CPC is not referenced in the AQF.

3. If a person has already completed an apprenticeship as a construction machinery technician, automotive electrician, automotive engineer, agricultural machinery technician or forwarding merchant and also owns the C driving licence, he/she is allowed to participate in the final apprenticeship examination to become a professional driver. These persons have to complete a simplified additional test.[4]

The following table from the Austrian Chamber of Commerce shows the number of persons who took part in an apprenticeship training for professional driving between 2009 and 2018, including the proportion of women[5]. These numbers are extremely low in comparison to the fact that 4.449 persons received a C drivers licence in Austria in 2018.[6] Unfortunately, no numbers are available on the amount of CPC-exams in Austria since each of the Austrian "Länder" organises them independently.

BerufskraftfahrerIn - Gesamt (inkl. Doppellehren)

Quelle: WKÖ - Wirtschaftskammer Österreich

Anz./Jahr	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
männlich	16	13	14	10	11	11	8	13	14	22
weiblich	1	1	0	0	0	0	1	2	2	1
gesamt	17	14	14	10	11	11	9	15	16	23
Frauenanteil	5,9%	7,1%	0,0%	0,0%	0,0%	0,0%	11,1%	13,3%	12,5%	4,3%

Quelle: WKÖ - Wirtschaftskammer Österreich

When it comes to industry initiatives in the field of professional driver training, one current initiative can be mentioned. It is an initiative by the "Professional Driver Academy" (Berufslenker Akademie) which is organised by the Chamber of Commerce Lower Austria (Wirtschaftskammer Niederösterreich) in cooperation with the Public Employment Service (AMS), the Institute for

[3] https://www.berufslexikon.at/berufe/8-BerufskraftfahrerIn/#anforderungen (02.08.2019).
[4] https://www.berufslexikon.at/berufe/8-BerufskraftfahrerIn/#verwandte (02.08.2019).
[5] https://www.berufslexikon.at/berufe/8-BerufskraftfahrerIn/#lehrlingszahlen (05.08.2019).
[6] https://statcube.at/statistik.at/ext/statcube/jsf/graphView/chartView.xhtml (05.08.2019)

Economic Development (WIFI), the working group LogCom, the Union VIDA Lower Austria, the Commander Club and training companies. The initiative promotes professional driver training as a dual training that leads to the apprenticeship certificate professional driver in only 18 months. Requirements for entering this training are to be officially registered as being unemployed with the PES, to be a teenager or young adult (older than 19) without any apprenticeship certificate, to have good knowledge of written and spoken German and to own a driving licence B as well as a car.[7]

Formal qualification provided for professional drivers

In 2008, the "Bundesgesetzblatt BGBl. II Nr. 139/2008[8]" (Federal Law Gazette) legally implemented the Directive 2003/59/EC for the CPC for truck and bus drivers into Austrian Law. The BGBl. regulates the CPC qualification (initial and periodic training) and since that time, professional drivers have to hold a CPC besides their driving license. The CPC is inscribed in the Austrian driving license with the Code 95 (C95). The EU Directive stresses the "differences between current systems in certain Member States" (article 8)[9] and therefore allows different options of how to acquire the CPC i.e. mandatory classes or only completing a test for the certificate. In April 2018, an amendment of Directive 2003/59/EC was passed by the European Parliament that has to be implemented into Austrian law by 2020 at the latest.[10]

The second option of becoming a professional driver is the three year apprenticeship training that is regulated by the "Regulation for Professional Drivers Apprenticeship"[11]. Further important legal acts when it comes to professional driver training are the "Drivers Licence Law" (Führerscheingesetz)[12] and the "Decree of the Federal Ministry for Traffic, Innovation and Technology[13] (which is an addition and clarification on the interpretation of Directive 2003/59/EC).

In Austria, free forms of professional driver training can be found where there are no obligatory training programmes that people have to attend. Instead, applicants have to study independently and professional driver training providers offer initial CPC classes on a voluntary basis. This pathway is the most prominent one in Austrian PD training whereas the apprenticeship plays a minimal role as mentioned above. In the Austrian test-only option for the initial training, an exam has to be

[7] https://www.bl-akademie.at/ (02.08.2019).
[8] https://www.ris.bka.gv.at/eli/bgbl/II/2008/139/20080502 (05.08.2019).
[9] Verordnung des Bundesministers für Verkehr, Innovation und Technologie über die Grundqualifikation und Weiterbildung der Fahrer bestimmter Fahrzeuge für den Güter- oder Personenkraftverkehr (Grundqualifikations- und Weiterbildungsverordnung – Berufskraftfahrer - GWB). Online: https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20005794 (05.08.2019).
[10] https://www.eumonitor.eu/9353000/1/j9vvik7m1c3gyxp/vko159rs0qzv (06.08.2019).
[11] Verordnung des Bundesministers für Verkehr, Innovation und Technologie über die Grundqualifikation und Weiterbildung der Fahrer bestimmter Fahrzeuge für den Güter- oder Personenkraftverkehr (Grundqualifikations- und Weiterbildungsverordnung – Berufskraftfahrer - GWB). Online: https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10007979&FassungVom=2007-06-30 (05.08.2019).
[12] https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10012723 (05.08.2019).
[13] Erlass des österreichsichen Bundesministeriums für Verkehr, Innovation und Technologie. Online: https://www.wko.at/branchen/ooe/gewerbe-handwerk/fahrzeugtechnik/GZ._BMVIT-167.533-0040-II-ST5-2010_-_Fragen_der_Bundeslaende.pdf (05.08.2019).

completed. A preparation course for the initial CPC examination is not legally binding but it is recommended.

The initial qualification exam

The initial qualification exam consists of a theoretical and a practical test. The theoretical test takes 4.5 hours for the oral and written sections. In the first part, multiple-choice questions[14] have to be answered (60 to 80 questions, differing from province to province). In the second part of the theoretical exam, the candidates discuss 'real life scenarios'.

For the theoretical initial qualification exam, the following subject areas are tested:

a) Improvement of rational driving behaviour
b) Optimisation of fuel consumption
c) Ensuring the safety and comfort of the passengers and cargo securing
d) Labour and social law regulations
e) Provisions applicable to the carriage of passengers
f) Health, Transport and Environmental Safety (e.g. ergonomics, behaviour in emergencies, image of the profession)
g) Economic environment of road haulage and market organisation

The practical test for the initial qualification has two options: If the CPC and the practical exam for the driver's license are pursued together, the candidate completes a 45 minute practice test (driving a vehicle) and afterwards continues with another 45 minutes of driving to pass the CPC practical driving test. If the candidate is only performing the practical exam for the initial qualification, a 90 minutes practice test (driving a vehicle) has to be completed

In Austria, professional driving is not perceived as an occupation that requires specific abilities but it is still assumed that anybody holding the C/C1 licence is able to drive a truck. This perception has not really changed after the implementation of Directive 2003/59. Most of the drivers perceive the initial qualification and the periodic training as an "additional burden". At the same time, the recognition of informally/non-formally acquired skills is not very common in Austria since there is not yet a system in place to recognise such skills.

Competences of a professional driver with a completed three years apprenticeship training

After the completion of their apprenticeship training, professional drivers with a focus on freight transport are qualified to carry out the following activities:

a) Checking motor vehicles for readiness to drive, operational safety and road safety,
b) maintenance of vehicles,

[14] This is an example of multiple choice CPC questions in the province of Upper Austria. Online: https://www.verwaltung.steiermark.at/cms/dokumente/11684913_74838460/f7672d0b/MC-Fragenkatalog%20schriftlich%20Version%2014.07.10.pdf (05.08.2019).

c) the systematic detection and assessment of faults on vehicles and the correction of simple faults,
d) safe and agile driving of heavy goods vehicles, road trains and articulated vehicles, taking into account the relevant provisions of motor vehicle and traffic law and applying a safe, economic, environmentally conscious and considerate driving style and providing first aid,
e) correct behaviour in the event of traffic accidents, other incidents and exceptional situations so that incidents involving other persons involved are also covered,
f) handling of goods during storage and transport,
g) loading, stowing and securing the cargo,
h) route planning and scheduling,
i) Correctly prepare and transmit reports of damage, injury and other incidents,
j) correct conduct in the international carriage of goods by road, including knowledge of the authorisations required and the charges to be paid,
k) applying the rules on the carriage of goods,
l) customer-oriented behaviour and support of customers,
m) identification of the effects of performance-influencing factors.[15]

Recent years' European studies in the field of professional driving[16] suggest that personal skills will become more and more important in the future. This is also one of the many research results of the FutureDRV project on the future competence requirements of professional drivers in the age of automation in 2035 and beyond. If in a future long-distance truck, driving the vehicle, pre-departure tasks, loading/unloading, planning routes & driving times or the maintenance will be taken over by ICT and AI as a consequence, many knowledge areas and future competence requirements of professional drivers will change dramatically. This is already happening today (with the first automated public mini-buses being on the road[17]), and EU legislation (the EU Directive with the equivalent Austrian implementation) but also the vocational education and training programme for professional drivers will be forced to react to these changes. Normally, legislation processes are rather slow which is already a challenge when it comes to the use of e-learning, simulator-based training (SBT) or virtual reality (VR) tools and serious gaming in professional driver training. Digitalisation is progressing so fast that legislators responsible for vocational professions are finding it difficult to meet and define the requirements of current training regulations. This is particularly true for the field of professional driving, where it appears that employers, training providers and stakeholders are rather passive, basically only reacting to digitisation and automation but hardly actively prepare for the future.

During the numerous FutureDRV project meetings and discussions with experts, the different views of the different stakeholders became clear: While the employee representatives are worried about the decline of the profession (bad image, bad earnings, bad working conditions), the employers are

[15] https://www.wko.at/branchen/transport-verkehr/gueterbefoerderungsgewerbe/Ausbildung-und-Voraussetzungen-fuer-den-Beruf---Kraftfahr.html (05.08.2019).
[16] For example „ProfDRV" (https://www.project-profdrv.eu/) or „ICTDRV" (https://www.project-ictdrv.eu/index.php?id=2) (06.08.2019).
[17] https://www.wienerlinien.at/eportal3/ep/channelView.do/pageTypeId/66528/channelId/-4400525 (07.08.2019).

under enormous economic pressure (competition from abroad, price dumping, lack of drivers) while the Austrian public officials hope for clearer guidelines for the CPC from the EU Directive. At the same time, some driving schools try to offer a high-standard professional CPC training while others only provide minimal training quality, especially when it comes to the periodic training. The three-year apprenticeship training of professional driving which is the really profound and high-quality education doesn't play an important part anymore because in Austria because most professional driver trainees choose the CPC test.

A look both at the exam subjects of the CPC exam as well as at the competence areas of the apprenticeship certificate very clearly shows that according to the FutureDRV research results, many subjects of current PD training might decrease or even disappear in the future. As suggested in the new FutureDRV Profile of Professional Driving (cf. IO 1), a differentiation between the training of long-distance and short-distance (or last-mile) professional drivers is necessary.

The biggest difference here seems to be that long-distance truck drivers will probably be confronted with an enormous amount of automation where ICT and automation will take over a lot of activities they have been doing so far (e.g. pre-departure tasks, loading & unloading, planning driving times & routes, vehicle maintenance, work records or communication with customers). This includes the danger of a further deterioration of the profession where unskilled workers are only co-drivers and are more or less only expected to be in the vehicle and ensure its safety in case of an emergency/ vehicle breakdown. The most extreme version could be that the person in the truck doesn't even know how to drive anymore which will boost the shift to level 5 of full automation even faster.

A short-distance professional driver on the other hand, might be expected to have even better competences than in the current three year PD apprenticeship certificate. He/she brings and takes goods to and from the customers every day which asks for very good communication and problem-solving skills. Since customer requirements are increasing, drivers must be able to deal with these requirements much more confidently and might also have to act as "ambassadors" of the transport company. New and more profound services might be expected from these drivers in the future (e.g. not only unload the new kitchen but also offer the whole service of building it up, taking the old one and dispose of it etc.).

In the following, some education policy recommendations are presented on how to prepare for the future of training professional drivers and increase their chances to keep their job or find a new one in the mobility sector. Some of these recommendations come from a study that 3s conducted together with the Austrian Institute of Technology (AIT) in 2018. It concentrated on job profiles and opportunities for new employment in an automated and digitalised Austrian mobility sector in 2040[18].

The IT penetration of the mobility sector is a prerequisite for its further development - be it by means of appropriate hardware-related IT in combination with sensor technology and robotics, which

[18] AIT Austrian Institute of Technology (2018): Berufsbilder und Chancen für die Beschäftigung in einem automatisierten und digitalisierten österreichischen Mobilitätssektor 2040. BM für Verkehr, Innovation und Technologie. Online: https://mobilitaetderzukunft.at/resources/pdf/projektberichte/Mob_2040_Endbericht_2018_Septemberfinal.pdf (07.08.2019).

makes (partially) automated driving possible in the first place, be it by means of appropriate control of traffic control systems, or be it by means of cross-platform ticketing systems in public transport. IT will play an even greater role in all areas of mobility in the future, so that a basic understanding of IT will generally be a basic prerequisite for employment in the mobility sector. Since this not only affects the mobility sector, but also almost all other work sectors, basic IT training should already be taught in primary and secondary education ("digital literacy"). Another aspect that should be considered in the future is the growing service orientation in the entire mobility sector. This should already be taken into account during training, e.g. by concentrating on areas like customer orientation, cross-sector cooperation and communication, team orientation and management orientation.

Since the overall long-term development is subject to relatively uncertain parameters regarding the details of the future development standards (e.g. political influence on individual legal areas, which will then have an impact on the entire mobility sector), education policy would also be well advised to react flexibly to short-term changes. This means that a broader basic education could be followed by different phases of learning during employment, which in the best case - modularly designed - would lead to flexible job descriptions.

Concrete recommendations are as follows:

- **Promotion of the cooperation of all stakeholders concerned** (social partners, mobility companies, employees, educational institutions, technical innovators) for the determination of the need for new job profiles and thus also possibly new or changed educational offers for the professional driving/mobility sector. Increased coverage of basic IT skills in primary and secondary education in the form of "new" literacy. This "digital basic competence" will be needed in the future in all labour market sectors and is a prerequisite for the development of new or existing occupational profiles in the professional driving/mobility sector.
- **Definition of framework conditions needed to attract young, innovative people to the professional driving**/mobility sector as a training or study area. This includes not only making existing training and studies more attractive and promoting them, but also making relevant job profiles on the labour market more attractive to young people.
- **Formulation and development of new basic training for the professional driving/mobility sector, in which interdisciplinarity, service orientation and social skills are in the foreground**, as a basis for broad employment opportunities that can subsequently be deepened in certain special fields (in the form of in-service training or learning phases during employment). These basic trainings should aim at the training of "generalists with some degree of specialised knowledge for the professional driving/mobility sector", with a combination of technical, social and sectoral competences, also at the risk of graduates switching to other labour market sectors.
- In view of the much discussed imbalance between men and women in technical occupations, **additional and ongoing educational policy measures must be taken to encourage women and girls to take up technical occupations at an early stage**. This requires a rethinking of teaching practice, which sometimes still starts from stereotypical gender roles and offers too little individualised and differentiated support for pupils.

- **In the mobility sector, CVET (continuous vocational education and training) will among other things have to offer the possibility of flexible specialisation for a specific occupation**. Building on a broad basic training, dynamic occupational field definitions must form the basis of a dynamic further training concept. Qualification should therefore be part of labour market and employment policy, which enables both employed and registered unemployed persons to "upskill" in specific future areas of the professional driving/mobility sector. This requires both the modularisation of educational measures (with coordination between the modules across providers) and the guarantee of high permeability of educational measures.
- **IT-specific upskilling** should also take place in the area of further training in order to enable access to and the use of rapidly changing technology in the mobility sector for all employees. For this, companies themselves could be made responsible for coordinating their continuing training measures. Here the Chambers of Commerce could take over the lead as a strong player.
- Since many occupational profiles in the mobility sector will change considerably in terms of content**, appropriate support for retraining measures must be provided**. From the point of view of many stakeholders in the mobility sector, it would be necessary to standardise the funding landscape in Austria for retraining measures, as there are major differences between the provinces in this respect.

Lifelong learning of professional drivers

In Austria, the initial qualification for professional driving is combined with a mandatory periodic training that has to be done every five years. It is also regulated by the EU Directive 2003/59 and by its Austrian implementation in the BGBl. II Nr. 139/2008. The periodic training encompasses 35 hours and is offered by accredited training providers.

The subject areas of the periodic training courses comprise an actualisation of the drivers' knowledge emphasising traffic security and eco driving. The modules can be mainly theoretical or practical. Of the total 35 hours, 28 hours are assigned to specific topics: improvement of rational driving (7 hours); eco driving (7 hours); ensuring cargo safety (5 hours); knowledge of social laws (4 hours); knowledge of the regulations for the road freight sector (1hour); health, transport and environmental safety, service and logistics (3hours) and knowledge of the business environment (1hour). The remaining seven hours can be done in special trainings courses for the C licence.

For obtaining the accreditation as a training centre to conduct CPC trainings, a request has to be made at the appropriate provincial government office. A training program, information about instructors, information on teaching materials, the estimated class size and a description of a quality-assurance system have to be produced.[19]

Since the Directive is not learning outcomes oriented, also the training methods do not reflect knowledge, skills and competences. Furthermore, there is no indication how periodic training should

[19]BGBl. II N. 139/2008 , p.11.

be conducted. Therefore, each training provider can decide how to do it for him/herself. Most training providers conduct the periodic training mainly theoretically in order to be cost-efficient. Many experts criticise that the Directive and the BGBl. II Nr. 139/2008 does not explicitly mention how the periodic training should be handled.[20] As already mentioned, the theoretical exam of the periodic training consists of multiple-choice questions[21] and an oral exam about practical situations.

In Austria, it is not possible to enter closely related occupations with the CPC. The only possibility is to change between freight and passenger transport as specified in the BGBl. II Nr. 139/2008. Further training opportunities for professional drivers are also offered by the Berufsförderungsinstitut (bfi) and the Wirtschaftsförderungsinstitut (WIFI), e.g. courses on the transport of dangerous goods, on foreign trade transports, on cargo insurance, IT and foreign languages etc. Apart from that, there are also company-based training offers for professional drivers. The CPC is not required for entering further education. This periodic training has no interrelation with the formal Austrian initial vocational education and training system and there are no certificates issued (just a confirmation of the participation).

The BGBl. II Nr. 139/2008 regulation does not specify the kind of training (e.g. classroom training, e-learning, simulator training) that can or should be used for the periodic training. So far, three of the five training modules for the periodic training can also be done in the form of e-learning[22]. At the same time, more and more training providers and driving schools offer computer-based trainings (CBT) including learning apps and low-end driving simulators, but as a private initiative and not as a part of any exam.

Article 7 of the new Directive (EU) 2018/645 that has not been implemented into Austrian law, yet, provides some additional information on the content of the periodic training and on how it can be offered: "*periodic training shall consist of training to enable holders of a CPC to update the knowledge which is essential for their work, with specific emphasis on road safety, health and safety at work, and the reduction of the environmental impact of driving*." … "*Training shall consist of classroom teaching, practical training and, if available, training by means of information and communication technology (ICT) tools or on top-of-the-range simulators*."[23]

So far, only one training provider in Tyrol was accredited to offer three of the five periodic training modules in the form of e-learning ("vehicle & safety technology", "social legislation", "working environment") and offers these e-learning modules all over Austria by cooperating with local training providers.[24]

[20] "The periodic training (...)shall deepen and repeat all the subjects covered by the licence for the category in question to the extent of the minimum number of hours required, with particular emphasis on road safety and more rational use of fuel. ... The duration of the training shall be 35 hours within five years, which may be divided into training units of at least seven hours each." (BGBl. II Nr. 139/2008, §12).

[21] https://www.verwaltung.steiermark.at/cms/dokumente/11684913_74838460/f7672d0b/MC-Fragenkatalog%20schriftlich%20Version%2014.07.10.pdf (06.08.2019).

[22] Only one provider in Tyrol is allowed to offer e-learning modules but offers these modules all over Austria by cooperating with local providers.

[23] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0645&from=EN (06.08.2019).

[24] https://berufskraftfahrer.easydrivers.at/c95-weiterbildung?m1=1&m2=1&m3=1&m4=1&m5=1 (07.08.2019).

Experts request that subjects like load security and eco driving should always be taught directly on a vehicle or at least on a high-end simulator. The amended Directive 2018/645 suggests the use of "top-of-the-range simulators" for periodic training but unfortunately does not define what kinds of simulators are meant by this term.

For becoming self-employed as a professional driver, an examination "to prove professional suitability for the freight transport industry" has to be passed, since in Austria, the freight transport business is a "regulated craft" (reglementiertes Gewerbe). Furthermore, additional legal and financial requirements must be met (e.g. trade registration, financial capacity, availability of parking spaces according to the number of vehicles in the location municipality).

When it comes to the further training of future professional drivers, similar recommendations apply as formulated in the previous chapter:

- **Promotion of the cooperation of all stakeholders concerned** (social partners, transport companies, employees, educational institutions, technical innovators) to define the need for new or changed periodic training offers for the professional driver sector. Informing involved bodies on the new training needs (EU bodies for the CPC, national bodies for non-formal training offers) regularly and improving the time-span for doing so.
- **IT-specific upskilling** in the area of further training in order to enable access to and the use of rapidly changing technology in the professional driving sector for all employees. Here, the companies themselves could offer continuing training measures.
- **Formulation and development of new periodic training for the professional driving/mobility sector, in which interdisciplinarity, service orientation and social skills are in the foreground**, as a basis for broad employment opportunities that can subsequently be deepened in certain specific fields (in the form of in-service training or learning phases during employment).
- **Possibility of a flexible specialisation for a specific (new) occupation within professional driving.** Dynamic professional profile definitions should build the basis for a dynamic further training concept which enables professional drivers to "upskill" in specific future areas of the professional driving/mobility sector. This will require the modularisation of educational measures and the guarantee of high-permeability of educational measures.
- **Appropriate support for retraining measures,** standardised funding in this field in Austria.

Correlation with neighbouring occupational fields

When it comes to professional driving and interrelations with neighbouring occupational fields, the already mentioned AIT/3s study on job profiles and opportunities for employment in an Austrian digitised mobility sector will be mentioned again[25]: among other things, it examined the future development of occupations within the mobility sector.

[25] AIT Austrian Institute of Technology (2018): Berufsbilder und Chancen für die Beschäftigung in einem automatisierten und digitalisierten österreichischen Mobilitätssektor 2040. BM für Verkehr, Innovation und Technologie. Online:

Like in the FutureDRV project, a scenario technique was used for trying to describe potential future developments. In this case, three future mobility scenarios[26] were defined.

When looking at occupational fields that are interrelated with professional driving, the following table from the 3s/AIT study is of interest. It not only presents current neighbouring occupational fields but also assessments on the future developments of these mobility sector occupations (within the range of the three developed scenarios on passenger and freight transport)[27]. The table below clearly shows that most occupations interrelated with professional driving received a negative assessment because of the advancing digitalisation and automation. One exemption being the future of professional drivers within passenger transport that was assessed as "stable" because (among others) of higher passenger security needs and the shift towards additional service tasks.

Profession	**Long-term trend**	**Reasons, changes within the job profile**	**Scenarios**
Professional driver – freight transport	decreasing	In general, there is less need for drivers due to the increase in automated driving; in transitional periods, however, opportunities arise due to additional tasks.	all
Professional driver – passenger transport	stable	High security needs of passengers, shift towards additional service tasks, IT and maintenance/task integration	all
Courier (Bote)	increasing	Delivery services will gain importance, increased integration of additional services (set ups and installments)	all
Expedition employee (ExpeditarbeiterIn)	decreasing	Simple manual activities are replaced by automation, if affordable	all
Dispatcher	decreasing	More tasks when it comes to control tasks, but	all

https://mobilitaetderzukunft.at/resources/pdf/projektberichte/Mob_2040_Endbericht_2018_Septemberfinal.pdf (07.08.2019).

[26] Scenario 1 "Driving Ahead 2040" (Vorwärts 2040) described an Austria with increasing economic growth, increasing per capita traffic, established automated traffic (level 4) in all areas, increase in freight traffic, growing importance of sharing models and decreasing travel and transport costs. Scenario 2 "Live Local" (Lokales Leben) sketched an Austria with moderate population growth, moderate economic growth, strongly improved ICT and connectivity, increasing digital substitution of physical paths, reinforced regulatory measures (road tolls, waste charges), decreasing per capita traffic, where automated driving did not reach the maintstream and is only used in luxury segments, a strong regional awareness and a sense of responsibility for the environment. Scenario 3 "Digital Divide" (Digitale Kluft) encompassed stagnant population growth, rising income disparities, decreasing per capita traffic, increasing popularity of automated driving (level 4), especially within the commercial and freight transport sector, increasing importance of sharing models and of local public transport, low birth rates, low immigration rates and an ageing society. Ibd. p.40ff.

[27] Ibd. p. 60f.

		in fewer control centers	
Flight attendant	decreasing	Less long-distance trips, staff reductions due to competitive pressure	2,3
Airport worker (FlughafenarbeiterIn)	stable	Less long-distance trips, staff reductions due to competitive pressure, automation is sometimes difficult	all
Airport ground crew (Flughafenbodenpersonal)	decreasing	Change in the direction of digital competencies and service-oriented task fields and/or task integration	all
Air traffic engineer/air traffic controller	stable	Increasing requirements in the security and IT area	all
Freight forwarder	decreasing	Fewer manual activities in goods handling, small carriers and their employees come under high competitive pressure	1,2
Port master	decreasing	Activities can be partially automated	all
Automotive technician	stable	New vehicle concepts require new skills in repair and maintenance, more IT skills, fleet maintenance, some vehicles are requiring less maintenance	1,2
Warehouse worker	decreasing	Simple manual activities are replaced by automation, if affordable.	all
Logistician	stable	Logistics is becoming more global, IT skills are in high demand. Shift towards distribution logistics and service - relationship management	all
Postal operator	stable	The emergence of micro-hubs for parcel services is increasingly replacing traditional postal tasks	all
Ship personnel	stable (passenger transport) decreasing (freight transport)	Reduction of the range of activities through more self-service, activity profile supplemented by IT, but high need for security stabilises demand, especially in passenger transport	all

Forwarding specialist	decreasing	Shift towards special services, IT takes over many previous tasks. Higher qualification through IT, but with it also less demand	1,2
Taxi driver	decreasing	Automated driving replaces many taxi services, shift to new sharing services	all
Train driver (TriebfahrzeugführerIn)	stable (passenger transport) decreasing (freight transport)	Automated driving makes room for higher service orientation, security services and IT; will partially replace train attendants	all
Train attendant	decreasing	Higher service orientation, partly replaced by train drivers (because technical basis necessary)	all
Two-wheel technician	increasing	More local alternative traffic	2

In each of the three scenarios on the future of mobility occupations it was assumed that existing occupations will change or even disappear and new occupations will emerge. For example, the classic professional driver in long-distance transport might not be needed any more and instead "remote drivers" or "remote supervisors" might replace him/her. At the same time, parcel delivery staff might more and more take over the job of a plumber or take-back specialist. Train drivers and conductors integrate into train operators. The tasks of wagon masters and shunting staff are increasingly being automated, especially in larger shunting yards.

The AIT/3s study underlines that changes in service offers will have an immense influence on all mobility professions. Everything that has to do with direct customer contact will be continuously automated (if profitable), service employees become trouble shooters and will offer more and more services. The bus driver will perform additional services, train drivers will also become train attendants and vice versa. The classic manual operation of vehicles and machines will lose importance while the monitoring and remote control of automated processes in concentrated control points will increase. New maintenance occupations with higher or changed requirements will emerge, for example in the area of infrastructure and autonomous vehicles. Another important factor for the future success of the mobility sector will be the collection and management of data. Many new occupations will emerge while existing ones will be more concerned with data management.[28] The study also comes to the conclusion that the increasing complexity of professions in the mobility sector – due to higher service requirements, IT penetration rates and an increasing offer of diverse mobility services – asks for improved competences in the field of transport systems.

[28] AIT Austrian Institute of Technology (2018),p.57.

Here, a differentiation between individuals who are working on the moving of systems and individuals who have to control and supervise the systems is made. Increased service quality will also require improved social competences. Finally, IT competences are a core competence basically necessary for all professions. Therefore, as already mentioned above, education systems have to be redesigned in a more flexible way to open up the way for new technological and system transformation.[29]

Correlation with other occupational fields

The job profile of professional driving will undergo dramatic changes in the near future. In long-distance professional driving the FutureDRV research results suggest that automation will take over most of the traditional job requirements of a professional driver. At the same time, "remote drivers" or "remote controllers" will have to take over remote control and/or give instructions if necessary. The immense need for service offers will change all occupational fields, especially passenger transport and last-mile professional driving where all kinds of new service activities will arise.

The AIT/3s study also outlines possible future areas of work within the mobility sector that do not yet exist today. The following table shows potential new job profiles and new fields of activities for the mobility sector[30]:

- Cyber-Security Experts
- Data owners as employers of the future
- Empathic companion (technical and social skills, crisis management)
- Facility managers for mobility facilities (vehicles, hubs, regional)
- Vehicle escorts, operators for autonomous vehicles
- Highly qualified technical services (mechatronics, augmented reality, automation, sensor technology, etc.)
- Mobility experts - consultants for providers and customers
- New professions and activities in the hub sector (micro-hubs, local hubs)
- New environmental and energy efficiency professions (consultants)
- Programmers for traffic control and control of autonomous vehicles
- Legal experts in the field of mobility
- Service providers for freight
- Security personnel for mobility and different mobility participants
- Standardisers, optimisers (intermodal, cross-border)
- Start-ups in the maintenance and service area (fleet maintenance in the sharing area)
- Supervisor in fleet management
- traffic managers

Experts predict that competence requirements will increase for most occupations which means that initial and continuous training has to react accordingly because digital and transversal competences will continue to gain importance in the future. There will be persons working within the transport

[29] Ibid. p.15.
[30] Ibd. p. 61.

system and persons who will have to monitor and control the transport system. When it comes to controlling and monitoring activities, systematic thinking, creativity (social system design), programming, maintenance and repairing competences will play an important part but also operational activities and security activities (monitoring) will be required. More and more social competences will be required as well. Increasing mobility services will ask for more customer care and customer advice which requires communication skills, especially conflict management skills and negotiation skills. All these new competence requirements need educational processes that are designed in a much more flexible way so they can react to technological developments. In Austria, curricula are revised only every eight to ten years, which cannot meet the requirements of technological change. Modular training programmes that are flexible and able to adjust to changing circumstances are the logical answer to the challenge. At the same time, life-long learning will be a fundamental prerequisite in order to be able to cope with the rapid technological change where employees will have to be permanently retrained in the handling of digital systems.

"New Learning" within professional driver qualification

When it comes to professional driver training in Austria, e-learning programmes are available, although they are not offered systematically and most of them are not accredited either. As mentioned before, the only accredited provider for e-learning programmes is a Tyrolean training provider who offers three out of the five periodic training modules in an e-learning format. The topics are "vehicle technology" (Fahrzeugtechnik), "social regulations" (Sozialvorschriften) and "work environment" (Arbeitsumfeld). Meanwhile, this provider cooperates with other training providers so these three e-learning modules can be accessed all over Austria.

Since in Directive 2003/59/EC and in the Austrian implementation of the Directive (BGBl. II N. 139/2008) the requirements for offering e-learning and computer-based training (CBT) were very vague, the Austrian Ministry of Transport, Innovation and Technology issued a "clarification document"[31] that specified that e-learning can only be used as a teaching method if the identity of the professional trainee can be determined and if it can be ensured that the trainee is doing the whole amount of training hours of a module. Furthermore, the document recommends a combination of e-learning with blended learning.

In the apprenticeship training for professional drivers, CBT is not conducted. It was already mentioned that in article 7 of the amended Directive (EU) 2018/645 which is not implemented into Austrian law, yet, it is suggested that periodic training should be a combination of classroom teaching, practical training and training by using ICT tools or "top-of-the-range simulators". At the same time, new CBT training formats like virtual reality (VR) trainings, augmented reality (AR) trainings and serious gaming are entering the training market that are not even mentioned in the current and amended EU Directive, yet.

[31] https://www.wko.at/branchen/ooe/gewerbe-handwerk/fahrzeugtechnik/GZ._BMVIT-167.533-0040-II-ST5-2010_-_Fragen_der_Bundeslaende.pdf (08.08.2019).

In Austria, VR training tools and serious games are scarcely used for the training of professional drivers. The first national and international VR designer companies are entering the Austrian market offering their training products to driving schools and training providers. As mentioned in a brand new and yet unpublished study[32], in Austria, scepticism about these new training opportunities is still very high. Not only because of the fear of high investments and technical challenges, but also because of the phenomenon of simulator sickness or the reluctance of many older drivers. The discussion about the future of PD training is very active, but there seems to be no or hardly any connection between available research on ICT training methods and the practical work of training providers. E-learning approaches for theoretical subjects seem to be widely used in driving schools (learning apps, etc.) but apart from the Tyrolean e-learning modules for the periodic training, all other training tools are not officially accredited and an unofficial offer to the customers.

In 2015, during the Erasmus+ project ICT-DRV "*Preparing and keeping professional drivers qualification up-to-date for their changing job requirements with multimedia-based learning*"[33] in which 3s took part as a research partner, Austrian "quality indicators" for the implementation of ICT in professional driver training were formulated.[34] In the following, these quality indicators were adapted to the new learning training offers like VR/AR and gamification because those tools were not yet included in the study from 2015.

The first recommendation is that a definition of the circumstances under which new learning technologies can be provided (like SBT, VR/AR training tools or serious games) would be appreciated in order to reach legal certainty. Comprehensive information and counselling on the use and benefits of new learning technologies is necessary as well. This should enable learners, employers and competent bodies to decide if a new training offer meets the requirements.

Another recommendation is to have specifically trained trainers and tutors for new learning tools. The trainer training should include the characteristics of the specific new learning tool for individuals and groups, knowledge on the design and selection of the chosen scenarios and on the operation and application of the tool. When it comes to new learning within professional driver training, the application of the learning outcomes approach[35] should be implemented in order to define the knowledge, skills and competences that are taught by a new learning tool. Finally, a thorough instructional and technological interface design for new learning tools would be important combined with a continuous evaluation of new learning tools in order to adapt to changing educational needs and requirements.

The final recommendation is to intensify the research on new learning tools for PD training combined with sharing and networking on the current realisation of their use. The implementation of new learning tools like VR/AR and seriouse games or SBT training needs a continuous dialogue and cooperation between education providers, developers as well as researchers. Therefore continuous

[32] The Erasmus + projcet „ICT-INEX" investigates the use of e-learning, ICT, VR and serious gaming tools in professional driver training in serveral EU countries including Austria. The final project results will be published by the end of September 2019 on the ICT-INEX website. Online: https://www.ict-inex.com/ (08.08.2019).
[33] Project duration 2012-2015. Online: https://www.project-ictdrv.eu (08.08.2019).
[34] Bacher, T. (2015b).
[35] Cf. https://www.cedefop.europa.eu/en/events-and-projects/projects/learning-outcomes (25.07.2019).

sharing, networking and joined research activities need to take place in order to further work on the improvement of the integration of advanced 3D visualisation technologies & gamification mechanisms with other professional driver candidate training methods.

Teachers, trainers and tutors within professional driver qualification

EU Directive 2003/59 only states that professional driver training providers must offer regular staff training and adequate learning facilities. In terms of professional competences of the training staff, no concrete guidelines are given. In the Austrian implementation of the Directive (BGBl. II N. 139/2008), certain occupations with a certain professional background are defined as "adequate".[36] This solution is not satisfactory because there is a lack of guidelines on these occupations. Experts criticise that there is not even a hint on how to handle this topic.

The requirements formulated in the Directive are difficult to apply: it is stated that a person should at least be a driving instructor or have specific experience. At the same time, a professional driving training instructor must not necessarily possess the relevant knowledge on load safety but can offer the training. Therefore, it is counterproductive that an instructor is not required to own a specific qualification. Within the Austrian provinces (Länder), it is not even clear how much practical experience has to be proved because the provinces regulate this matter differently. In one province, for example, an instructor is approved and authorised to carry out a training while in another province the same instructor is not approved. Experts recommend that it is necessary to have a standardised national procedure what requirements professional driver instructors have to have in order to be approved and authorised to conduct trainings. Asked about qualification requirements for trainers in Austria, experts state that a clear curriculum indicating educational steps for trainers is missing. Requirements such as the minimum age for conducting training are not pointed out clearly. Another proposal is that instructors/trainers should have truck driving experience of at least one year.

When applying to be accredited as an official professional driver training provider, information on the number of available trainers, their qualification and the field of activity of the trainer (including information on the necessary skills and the description of the didactical and pedagogical knowledge) has to be submitted. In Austria, the following persons are allowed to conduct CPC trainings: a) Lecturers teaching the apprenticeship "professional driving", b) Driving school instructors for C and D licences; c) Persons that can prove sufficient knowledge of the CPC exam subjects regulated in Annex 1 of the Austrian implementation of the Directive (BGBl. Nr. II Nr. 139/2008, §13). But these persons are not tested or regularly monitored in any way.

Since in Austria, different forms of new learning are not offered systematically, there are no guidelines about the training requirements trainers/instructors conducting new forms of learning like CBT, VR/AR, SBT or gamification. As mentioned before, the new amendment (EU) 2018/645 only

[36] According to the professional driver apprenticeship act (Berufskraftfahrer/Berufskraftfahrerin-Ausbildungsordnung, BGBl. II Nr. 190/2007 in its current version).

suggests to mix classroom training with CBT or high-end simulator-based training but does not define any requirements when it comes to trainers or tutors.

Some training providers offer theoretical modules of periodic training that can be conducted via CBT, depending on the training provider and the trainer. The e-learning programme offered within the periodic CPC training by the Tyrolean professional training provider (EasyDriverExperts), does not include any kind of human instructor.

During the three-year FutureDRV project, it became quite clear that in Austria, most of the professional driver training providers only offer the training they are obliged to by law and are not very much interested to investigate new forms of teaching and learning. This also applies to ministerial educational bodies and stakeholders like the chamber of commerce department for freight transport/bus drivers or driving schools. Only very few persons from the professional driver training sector took an active interest in the future of professional driver education. Instead, a more passive attitude seems to be present.

If the culture of learning is changing and if more modular structures are the answer to future professional driver training, the requirements of future trainers have to change as well. They also have to be able to adjust their trainer know-how to changing learning requirements (less classroom trainings, more forms of blended learning including individual e-learning tools, VR/AR, SBT and gamification tools). Future trainers not only should be obliged to prove their qualifications but should also have to take part in continuous further training on new teaching methods and teaching technologies.

Validation of learning and career beyond driving

Since Austria has chosen the test-only option for the CPC, there are no real assessment and validation procedures available. The only obligation is to answer the multiple-choice questions correctly. When it comes to the periodic CPC training, there are no validation and assessment criteria either because there is no certificate issued (only a certificate of attendance). Some training providers might ask participants for an evaluation of the course but the effect of the periodic training and the actual abilities of the individual professional driver are not evaluated in any way. As mentioned before, this could be changed by formulating a learning outcomes based description of the periodic training modules. This would include the development of assessment and validation criteria for finding out whether the expected learning outcomes were reached during the periodic training. Another valuable addition could be a self-assessment tool for professional drivers for checking what knowledge, skills and competences they already possess and for facilitating the recognition of PD trainings (initial/periodic) done in other Member States. To implement these measures in Austria, it would be necessary to better define the requirements for periodic training on a national level because so far each province and training provider is implementing periodic training differently. Last but not least, validation criteria on the efficiency of periodic professional driver training in Austria are urgently needed.

When it comes to the future of professional driver training and the long-term employability of professional drivers in a coming age of automation, the following recommendations could be helpful:

- recognition of informal and non-formal learning competences for potential new professional drivers
- As mentioned before, offering a modular initial and periodic training system that is able to quickly adapt to technological changes and new competence requirements (e.g. less concentration on teaching driving or loading/unloading skills, more concentration on teaching new future competence requirements like IT-skills, communication skills and service skills).
- Open educational VET system with many possibilities for CVET

Attracting, recruiting and retaining professional drivers

In 2016, 199.300 persons (without part-time workers) were employed within the Austrian mobility sector. Most of them (67.099) worked in freight transport (Güterbeförderungsgewerbe) followed by 44.658 persons working for rail operators and on third place 24.287 persons were employed by freight forwarders (Spediteure). With regard to unemployment, on average a total of 14.245 persons were registered as unemployed in transport occupations in 2016, corresponding to 4.1% of all registered unemployed persons.[37]

The following table reflects a study by the Joint Research Centre (JRC) of the European Commission on the future of employment in the European transport sector where employment figures within the Austrian transport sector (from 1990 to 2030) are given including employment predictions until 2030[38]:

Transport Sector	1990	1995	2000	2005	2010	2015	2020	2025	2030
Employees Freight / Road	25.453	34.826	47.650	57.576	51.012	55.793	58.734	60.213	61.611
Employees public transport	47.791	51.174	52.747	51.894	53.400	57.739	61.524	64.592	66.955
Rail transport	65.000	60.352	52.554	15.897	12.468	12.957	13.479	13.877	14.300
Air traffic	4.560	6.279	8.646	9.311	8.786	10.727	12.834	14.671	16.048
Total	**142.804**	**152.631**	**161.597**	**134.678**	**125.666**	**137.216**	**146.571**	**153.353**	**158.914**

[37] [37] AIT Austrian Institute of Technology (2018), p.37. (14.08.2019).

[38] Christidis P., Navajas E., Brons M., Schade B., Mongeli I., Soria A. (2014). Future employment in transport. Analysis of labour supply and demand. JRC Technical Reports, Report EUR 26978 EN. Online: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC93302/move%20jobs%20%20jrc%20final%20report%20final%20020150113.pdf (14.08.2019).

For Austria, the JRC report concludes that between 1990 and 2030 the number of employees in the freight/road and public transport sector will increase by 76%.

Austria like the rest of the EU Member States is currently confronted with an enormous lack of professional drivers. A 2018 survey[39] from the Austrian Chamber of Commerce (Department Transport & Traffic) showed that already 75% of Austrian freight transport and bus companies are affected by a lack of drivers. Per company, on average 3,1 drivers within freight transport and 4,2 drivers within the bus sector are missing. More than two thirds of all truck drivers are over 40; one third is already between 51 and 60 years old. Within the bus sector, more than 43% of all drivers are older than 50. Small and medium-sized enterprises are particularly affected by the lack of drivers. Proposed solutions for this problem were attracting more young people for the CPC and improving the possibilities for career changers to enter the profession. These proposed solutions collide with the current bad image of professional drivers because of exhausting working hours/conditions and poor pay.

When taking into consideration the FutureDRV scenarios, there is the danger that automation will decrease the need for long-distance truck drivers dramatically. On level 4, when drivers still have to be present in a truck, they might not have to drive any more or do loading/unloading, maintenance or the planning of driving routes/times. This can lead to a drastic decrease of competence requirements combined with a further deterioration of the image and income of long-distance truck drivers. At the same time, the requirements of short-distance truck drivers might increase when it comes to the need for new or better communication skills, customer services, conflict management or negotiation skills which might improve their employability.

Potential measures for attracting, recruiting and retaining professional drivers in the future:

- The improvement of the professional driver image can only be reached by improving the working conditions and the income situation. This is a huge challenge when looking at Eastern European countries that play a bigger and bigger part in the long-distance freight sector in Europe with their lower wages and their looser labour laws. Austria is massively affected by Eastern competitors which already lead to the fact that many Austrian transport companies are "outflagging" and opening up subsidiary companies in Rumania, Bulgaria, Slovakia or the Czech Republic where they can recruit drivers with a cheaper labour contract who are driving through Austria getting the payment of the respective Eastern country. So far, all attempts of the European Union to improve the situation by trying to protect the Austrian drivers against the cheaper competitors from Eastern countries failed because of the veto of these states and because of the European "principle of equality" (Gleichheitsgrundsatz).
- Improved recognition of foreign vocational qualifications and non-EU driving licences.
- Promotion of driving licences for lateral entrants (QuereinsteigerInnen) through education vouchers and tax incentives

[39] Traktuell (2018): „Zahlreiche Lkw-Fahrer steuern Pensionierung entgegen". Online: https://traktuell.at/a/zahlreiche-lkw-fahrer-steuern-pensionierung-entgegen (14.08.2019).

- National image campaign on professional driving that stresses the fact that advancing digitalisation is changing the demands on the driver's profession where technological progress offers new job opportunities within the PD sector
- Inclusion of the PD occupation into the Austrian "shortage list of occupations" (Mangelberufe)[40] to improve the chances for migrants and asylum seekers for getting a residence permit and work permit in Austria.
- Improve the work conditions of professional drivers (road infrastructure, more and safer parking places for trucks/buses, better construction site management, expansion of digital information systems, controls on legal compliance with rest periods).
- As mentioned before, a more flexible modular training system that can adjust to new competence requirements much faster and offer the necessary skills.

Fields of specialised transports requiring specially trained drivers

The FutureDRV research on the future competence requirements for professional drivers do not and did never include specific transport sectors like the transport of hazardous goods (regulated in the European ADR[41] and the Austrian "Dangerous Goods Transport Act"- Gefahrgutbeförderungsgesetz[42] and "Dangerous Goods Transport Regulation"-Gefahrgutbeförderungsverordnung[43]). This includes the transport of explosives, gases, flammable liquids and substances, flammable oxidising substances, toxic/infectious substances, radioactive and corrosive substances and oversize goods. The transport of these goods/substances requires additional know-how from professional drivers.

According to §8.2 ADR[44], drivers of vehicles carrying dangerous goods require appropriate training. If no exemption can be claimed, the driver must carry a valid ADR training certificate with him[45]. The Viennese Business Promotion Institute (WIFI) for example offers a "Dangerous goods driver training: Basic course with advanced tank course" with the following subjects:

- Provisions of the European Agreement on the International Carriage of Dangerous Goods (ADR) and the relevant EU Directives and those of the Dangerous Goods Transport Act (GGBG)
- Road tunnel regulation
- General regulations
- Duties and sanctions
- Classification of dangerous substances and hazardous properties
- Behaviour in the event of accidents
- Inscriptions and labelling

[40] https://www.migration.gv.at/fileadmin/user_upload/Liste_der_Mangelberufe_2019.pdf (14.08.2019).
[41] https://www.bmvit.gv.at/verkehr/gesamtverkehr/gefahrgut/recht/aut/downloads/ADR_Ausg_2017_06.pdf (14.08.2019).
[42]https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10012852 (14.08.2019).
[43] https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10012891 (14.08.2019).
[44] Ibid.
[45] List of questions for the Austrian ADR certificate: https://www.bmvit.gv.at/verkehr/gesamtverkehr/gefahrgut/recht/aut/downloads/LENKER_FK-V_2018_01.pdf (14.08.2019).

- Equipment and loading
- Transport documents and other accompanying documents
- Types of vehicles and means of transport
- Transport of dangerous goods in tankers.

With these additional skills and competences, it seems that in the future, the employability of professional ADR drivers might be better than the situation for ordinary truck drivers. On the other hand, the current and increasing lack of drivers might also affect this specific sector, where less and less persons might be available for taking the ADR certificate. This could lead to the same problems as within the ordinary freight and passenger transport sector which asks for similar solutions as mentioned in the last chapter: the need to attract more personnel by improving the working conditions (better image by better work-life-balance and better wages, although the wages of ADR-drivers are slightly higher, as seen in a "Wage Table- Transport of Goods 2018[46]). The biggest challenge seems to be able to interest new groups of young or older persons for the driving profession and to offer a more modular training that can react to new competence requirements much faster.

Summary

One of the most important key requirements for the future of the professional driver workforce within the mobility sector is that Austria needs a fundamental vision and an overall strategy for automated and digitalised mobility. The society is changing, system boundaries in the area of mobility are changing, e.g. traffic, production, logistics, IT. Digitalisation and automation are the driving factors of this change offering chances and risks at the same time. Automation and digitalisation must be actively shaped and designed and is a long-term process that needs basic structures to evade risks and facilitate supporting framework conditions. This asks for an active steering process and strategic planning of the public sector for enabling automation and digitalisation in the best possible way. A mission statement with long-term objectives should be drawn up that works across provinces and sectors and takes account of developments at a European level.

When it comes to the key requirements for change in order to prepare the professional driver workforce for future developments, the following recommendations summarise this Austrian case study putting a special focus on the tasks of the relevant stakeholders which includes policy & administration, social partners, experts and employers. Most of these recommendations come from the 2018 AIT/3s study on the future of the mobility sector in Austria and were adapted for professional driving.[47]

Labour market Policy & Social Policy

[46] Chamber of Commerce – Department for the Transport of Goods. Online: https://www.wko.at/service/kollektivvertrag/gueterbefoerderung-lohntafel-arb-2018.pdf (16.08.2019.
[47] AIT Austrian Institute of Technology (2018).

- Society is in the midst of a digitisation process, with new rules of the game and social policy having to be shaped in the context of this digitalisation. The system boundaries in the field of mobility are becoming increasingly blurred (IT, mobility, production, logistics) and it must be prevented that society is split into winners and losers of digitisation.
- Making positive role models for women more visible in order to present women as being successful in the STEM sector.
- Early support for vulnerable groups at risk of being overwhelmed by technological change (low and unskilled, unemployed, migrants, elderly). These people must be able to participate in a digitised and automated mobility sector, which will require labour and social policies. (specific education and training, re-qualification, training for older people in digital technologies).
- Concrete framework conditions for flexible working time models due to digitalisation and automation. The boundaries between private and working life should not become even more blurred.
- The growing service orientation in the entire mobility sector must already be taken into account during training (e.g. orientation towards communication, team orientation, cross-sector cooperation, customer orientation, etc.).

Education Policy

- Collaboration of all involved stakeholders (social partners, transport companies, employees, educational providers, technological developers) when it comes to defining new occupational profiles combined with new or adapted educational opportunities for the transport sector. This should go together with an increased coverage of basic IT knowledge on primary and secondary school level for reaching digital literacy which will be needed in all labour market sectors and is a prerequisite for developing new or adapting present occupational profiles in professional driving/the mobility sector.
- Joint definition of framework conditions for raising the interest of young and older people/career changers in the professional driving sector. This includes increasing the attractiveness of the transport/driving sector and of its professional profiles which will have to go along with better working conditions and wages.
- Development of new basic trainings for the professional driving sector where interdisciplinarity, service orientation and social skills play an important part and offer new job opportunities and the chance to specialise in a certain direction (e.g. by continuous vocational training or learning phases on the job). Ideally, these new occupational profiles should have an international perspective so they can get international recognition. Specific experts could be appointed who are able to anticipate necessary competence profiles in a fast and flexible way in order to trigger new developments in the vocational education and training sector.
- Education policy measures for getting more women into the driving sector (e.g. offering more interesting role models and individual support for female pupils in schools).
- Continuous vocational training within professional driving will need to offer flexible specialisations for a specific occupational profile (broad basic training, dynamic definition of the professional driver profile and dynamic continuing training concepts). Upskilling

possibilities towards new future areas within the driving/mobility sector for employed and unemployed persons require the modularisation of training measures where training providers offer coordinated modules. This has to go along with a permeability of educational measures.

- IT specific upskilling of professional drivers organised by the transport companies/training providers for facilitating them the access to rapidly changing technical fundamentals within the transport sector.
- Financial support for re-training measures by the public authorities with the aim to unify the funding landscape in Austria because there are still big differences between the provinces (Länder).

Enterprises

- In the future, enterprises will have to develop new technology-based applications and solutions that focus on customer orientation because digitalisation and automation offer new possibilities to answer transport/mobility needs. This asks for new forms of cooperations between companies for being able to develop new transport offers and new transport services. When it comes to new digital solutions, user-interface and user-experience will play an important part.
- Transport companies are facing the challenge to start innovation processes and improve their innovation management. So far, many transport companies are not very successful when it comes to developing new products and services, therefore, a new culture of innovation is needed which specifically asks for the commitment of the management.
- Automation and digitalisation enable and often require the development of new business models (e.g. sharing-models) which confronts transport companies with large challenges (e.g. when following established routines). When it comes to developing innovative products, services and business models, cooperations between start-ups and established transport companies seem to be a promising strategy.
- New service, support and assistance offerings require a coordinated approach between all actors of the transport sector including improved enterprise cooperations which also asks for new data and cyber security solutions and data and security standards.
- Qualified employees and the creation of a modern working environment are key factors for a successful digital transformation and securing the competitiveness of companies. Higher qualification and empowerment of employees are to be anchored as guiding principles of company training and work organisation. In particular, company training measures must include the following areas: network thinking, creativity, the ability to work in a team, IT skills, interdisciplinary knowledge, technical understanding and social competence. Companies are called upon to play an active role in defining the requirements for professional drivers when organising training and further training.
- Companies should work on innovative working time models that offer more flexibility and more choices for professional drivers.

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