

Fitting New Needs and Requests of Transport-Related Professions: The Freight Industry and the Truck Drivers' Profession

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ABSTRACT

The Freight Industry represents a transportation sector having a major importance in our life as it represents the way to provide our needs for goods with the required frequency to ensure the desired quality in due time. However, the importance of this transport sector is not socially recognized. Nobody thinks about the long driving hours spent at the wheel day or night to provide our communities with the required goods. In this technological era, trucks are equipped with in-vehicle technology that are supposed to improve safety. However, most truck drivers, who don't feel comfortable with new technologies, are approaching their retirement, which means that new technologies represent a difficulty instead of a safety tool. Furthermore, the truck driver's profession is not attracting the new generations and the increasing shortage of truck drivers is increasing in the most industrially developed countries. Something must be done about the truck driver's working conditions and the social recognition

Keywords: Truck drivers' working conditions, Working hours and fatigue, In-vehicle technology, Safety, Truck platooning

INTRODUCTION

The nowadays society, being characterized by a fast technological development, is imposing new educational needs at all educational levels. Therefore, the human resources for a demanding labour market must: (1) be prepared for a throughout life learning, adapting each one's activity to the technological development; and (2) have digital skills, be creative, adaptable to technological advances and the related changes, as resources to anticipate, adapt, react, create, and improve in their working context.

In this era of change, the human capital needs are evolving fast, imposing new challenges and perspectives to the new generations to be qualified in the current labour market. The most advanced industries, like the Automotive and the Transport Sector, need to attract and keep a skilled and creative workforce, with the motivation and ability to learn throughout life, being comfortable with fast change and able to work on an interactive and collaborative environment to design and manage highly complex

sociotechnical systems. The new challenges of industry 4.0, in both the automotive industry and transport sectors, call for educational areas and models that optimize and value soft skills (eg: cognitive flexibility, intellectual curiosity, critical thinking, adaptability to change, initiative, creativity, and efficient communication in a digital environment). These are competencies for project management and problem solving, knowledge allowing for understanding the human-system interaction and cooperation, communication skills in multidisciplinary teamwork, adaptability to changes, and an enormous motivation to keep learning throughout life. Thus, educational areas deepening knowledge on Human Factors, developing simultaneously social skills, and enhancing their personal development, have success guarantee on an open labour market. The interdisciplinary approach imposes, both on research and practice, a need for multidisciplinary teams being now a reality.

THE TRUCK DRIVERS' WORKING CONDITIONS

As the contemporary society imposes non-stop operations, transport systems are expected to work around the clock. Furthermore, increasing mobility needs lead to frequent long-distance driving. However, there is a component of the transport system that is not prepared to carry out a continuous activity along the day: the human operator. Thus, the conflict between human capabilities and the 24h society leads to driver's fatigue and stress, which are usually the causes of several road accidents. Driving long distances, particularly in monotonous conditions and often during the night, represent constraints that are recognized to increase drivers' workload and fatigue. The balance between sleep and wakefulness is maintained through the interplay between the central nervous system and the outer environment (Landström, 2006). Wakefulness variations from optimal wakefulness to optimal drowsiness are affected by factors associated to the circadian rhythm, hours of sleep, parameters of surroundings, among others. An increased number of driving hours, night work, and monotony, lead drivers to drowsiness with the corresponding effects on road safety. Along with the evidence of a connection between drowsiness, falling asleep, and increased risk of accidents, it has been stated that the risk of one-vehicle accidents increases during the latter part of the night, when the vigilance circadian rhythm leads to a spontaneous reduction in the degree of wakefulness (Warm et al., 2012). In Transport systems, fatigue may be an important issue, even for drivers working normal daytime shifts (Friswell & Williamson, 2008), pointing to the hazards for the "wakeful-but-fatigued" driver (Matthews et al., 2012).

Further sources of fatigue are derived from the task itself. Occupational studies suggest that rather long work shifts exceeding eight hours are necessary to observe loss of productivity (Knauth, 2007). In the field of transport, fatigue may be an issue, even for drivers working normal, daytime shifts (Friswell & Williamson, 2008), pointing to the hazards for the "wakeful-but-fatigued" driver (Matthews et al., 2012). Some research carried out in laboratory addressed studies of vigilance that have been particularly important for investigating task-induced fatigue (Warm et al., 2012). In particularly

circumstances, even short-duration tasks requiring sustained attention can show rapid and operationally significant performance decrements (Temple et al., 2000).

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As above referred, truck drivers’ working conditions are heavy and involve additional risks, such as the kind of the transported load and the associated risks resulting from its poor accommodation in the vehicle box.

Results From a Survey Carried Out in France

Addressing truck drivers from eight European countries crossing the Europe to deliver their goods (Simoes; Delhomme et al., 2020), a questionnaire was developed and translated into seven languages to be administered at four highway rest areas in France. The collected data were analyzed by means of multiple correspondence analysis, which pointed out new links between working conditions, driving behaviors, perceptions of the road environment, job skills, and risk factors. The practical implications of the results are being used for improving the safety of the infrastructure used by truck drivers and ensuring their well-being.

Important risk factors already documented in the literature were found, such as, a poor quality of sleep as a cause of daytime sleepiness, which in turn increases the probability of occurrence of near crashes related to fatigue, near crashes in general, and/or crashes. Furthermore, a poor health state along with tobacco habits and unbalanced diet have been reported. These results are in line with prior knowledge in the domain. The reported truck drivers’ risk taking behind the wheel, road risks, and sleep quality, seem to be linked to distress at work, the latter being especially triggered by certain working conditions. The reported risk exposure is associated with poor skills at maneuvering, anticipation of danger, keeping safe distance with the vehicle in front, driving downhill, coping with fatigue, and with dangers on the road, with underestimation of the difficulties linked to blind spots in the mirrors, braking while driving downhill, handling sharp bends, driving in the rain, snow, or strong winds, coupled with a lack of a desire to develop one’s skills during mandatory training. Such picture requires urgent solution representing a positive evolution for the sector and truck drivers.

THE TECHNOLOGY DEVELOPMENT AND THE AUTOMATION ERA

Automated driving is changing our lives and travel patterns but, so far, few is known about the impacts of human-automation interaction on mobility and particularly, on road safety. Automation represents a major technological advancement influencing and shaping the future of mobility. However, automation won’t replace human activity but instead, it will impose new coordination demands to the human driver or user. It is expected that vehicles with some level of automation will share the road environment with conventional ones, which are driven by a great variety of human drivers.

A continuous and intensive technological development requires research on human factors issues, as well as specific actions towards public awareness on new risks introduced by automated vehicles on the shared road. Furthermore, together with training towards the appropriate use of automation, the prevention of risky behaviours and avoidance of misuse and disuse are required. The automotive industry is also targeting the freight transport and innovative solutions for decarbonization, road safety improvement, and health issues related to professional truck drivers, their working conditions, and related constraints. Thus, automation appears as an appropriate solution to improve truck drivers' working conditions, particularly with the introduction of truck platooning, for efficiency improvement in the European freight transport market. However, this is totally new and requires deep research to avoid compromising road safety by the introduction of new and unexpected risks.

In this era of change, the human capital needs are evolving quickly, imposing new challenges and perspectives to the new generation of students to be qualified in the current labour market. The most advanced industries, like the Automotive and the Transport Sector, need to attract and keep a skilled and creative workforce, with the motivation and ability to learn throughout life, being comfortable with fast change and able to work on an interactive and collaborative environment to design and manage highly complex sociotechnical systems. The new challenges of industry 4.0, in both the automotive industry and transport sectors, call for educational areas and models that optimize and value soft skills, which are personal attributes that enable someone to interact effectively (eg: cognitive flexibility, intellectual curiosity, critical thinking, adaptability to change, initiative, creativity, and efficient communication in a digital environment). These are competencies today required for project management and problem solving, allowing for understanding the human-system interaction and cooperation, communication skills in multidisciplinary teamwork, adaptability to changes, and a great motivation to keep learning throughout life. Thus, technical courses deepening knowledge on Human Factors, developing simultaneously social skills, and enhancing each one's personal development, have success guarantee on an open labor market. The interdisciplinary approach imposes, both on research and practice, a need for multidisciplinary teams, which are now a reality.

With the technological advances and economic recovery, the demands of the labour market are also different. In addition, demographic projections point out to an extension of the working life duration, which requires, more than ever, a change in the management of human resources, to promote people's motivation through the updating of skills by means of training throughout life, stimulating creativity, listening, and providing the opportunity to express opinions, and assign responsibilities as a way of expressing trust; in short, valuing people. It is, therefore, an important change in attitudes and behaviors, in parallel with the development of new skills and new knowledge throughout life.

Automation in the Freight Industry

Driving automation represents a major technological advance influencing and shaping the future of mobility. Under a Human Factors Perspective, it addresses a range of issues related to vehicle automation, covering mental workload, attentional resources, its effects on driver performance, in-vehicle interface design, driver monitoring, reaction to automation failure, and human-centered automation. So far and for long years, it is expected that vehicles with some level of automation will share the road with conventional ones, which are driven by a great variety of human drivers. Together with a continuous and intensive technological development, this requires research on human factors, as well as specific actions towards public awareness on new risks introduced by automated vehicles on the shared road, together with new regulations and education towards the appropriate use of automation, the prevention of risky behaviors, and avoidance of misuse and disuse.

The industry is also targeting the freight transport and innovative solutions for decarbonization, road safety improvement, and health issues related to professional truck drivers, their working conditions, and related constraints. Thus, automation appears as an appropriate solution, particularly regarding the introduction of truck platooning for efficiency improvement in the freight transport market. However, this is totally new and requires deep research to avoid compromising road safety by the introduction of new and unexpected risks.

In the case of the freight industry, the existing companies offering international transport are using new vehicles equipped with new in-vehicle technology to assist the driver in different situations, such as the ADAS (Advanced Driver Assistance Systems). The ACC (Adaptive Cruise Control) is a technology to assist the driver, requiring a previous configuration of both the driving speed and the safe distance to the vehicle in front, to be kept along the trip. Thus, the ACC keeps automatically the pre-defined speed and, in case of approaching the vehicle in front if its driver slows down, the ACC keeps the pre-defined distance by slowing down automatically until keeping both the pre-defined distance and speed.

The ACC is not appreciated by truck drivers, particularly the older ones, who claim about the system autonomy to operate over the speed to keep both the configured elements. Then, most older drivers use to disconnect the ACC and manage alone both safe speed and distances towards a safe trip. Whilst older drivers who don't want to use most in-vehicle technologies and are approaching their retirement, there are young people looking for a profession and a job that they may appreciate and apply with pleasure, offering experience in dealing with new technology, and expressing a strong motivation to learn more about it.

Truck Platooning

The platooning technology allows for two or more trucks running in convoy at a pre-defined distance between each other, being virtually connected by means of connectivity technology and automated driving support systems. Two categories of drivers compose each platoon team: the leader, who is

responsible for the driving task in the front vehicle, and the followers, who, depending on the level of automation required by the job, may or may not have responsibilities in the driving task. This means that the vehicles following the leader have some level of automation, easing the short distances between the vehicles composing the platoon. These vehicles keep the distances using automated driving technology being supported by a Cooperative Adaptive Cruise Control system (CACC) (Bhoopalama et al., 2018); (ACEA, 2017; Janssen et al., 2015; PPMC, 2019). This means that the driver in the leading truck remains responsible for the traditional driving task, but the followers in the platoon leave some of their work in the hands of the in-vehicle automation system.

These vehicles maintain the distance using automated driving technology, radar-based collision avoidance system, and connectivity technology with wireless vehicle-to-vehicle communication (Janssen et al., 2015; Willemsen et al., 2022). According to ERTRAC (2019) and for highly automated trucks, the gap between vehicles can be as low as 0.2 seconds, which at 80 km/h represents a distance around 6 or 7 meters. However, for lower automation levels, a distance between 15 and 30 meters is recommended for safety requests (Kuhn et al., 2017; Zhang et al., 2020).

The inclusion of V2V communications enable cooperative adaptive cruise control (CACC) for enhanced stability and responsiveness of truck platooning operations. Furthermore, the CACC allows trucks to travel at short distance on a safer way, controlling the time gap between trucks more smoothly, exchanging information between trucks and automatically adjusting engine and brakes in real time as conditions vary. To mitigate a lack of confidence and decrease the feeling of fear, it is important that infrastructures enable the exchange of information through vehicle-to-infrastructure (V2I) technology, allowing for faster communications between vehicles and the road equipment to increase road safety (Teague, 2021).

Truck platooning use automated driving and different communication systems, such as V2V (vehicle-to-vehicle). This highlights the importance of human-to-human communication and the multiple human-system interactions towards the perfect coordination of actions. However, during the transition to full automation, the driver will still be kept “in the loop” or “on the loop”, as he/she will still be responsible for the driving task or, at least, for its supervision. Due to a strong dependence on different types of communications required by this system, recent studies mention the need for a new categorization for the automation levels proposed by the SAE. Thus, the ENSEMBLE Project (a co-funded project by the European Commission, DG Research and Innovation, in the HORIZON 2020 Programme) proposes two new systems categorizations: Platooning Support Function and Platooning Automated Function (ENSEMBLE Deliverable 2.5). For this categorization, the following were considered: time between vehicles, lateral automation, speed lane, and the required operational areas. This requires deep research to avoid compromising road safety by the introduction of new risks, together with specific training for both categories of drivers.

The platooning system could be introduced into the Portuguese freight companies having regular transport across Europe, which would have a positive effect on the nowadays truck drivers' working conditions.

THE TRUCK DRIVERS' PROFESSION AND ITS FUTURE

In the present times, Road Transport in European Societies is very much important and necessary, having a great impact on each country's economy and the population life. Thus, road transport is essential in providing people with transport to drive them to targeted destinations, and to provide goods, all in due time. However, some negative effects should be studied and understood to be eradicated.

The main problem related to road transport is the high rate of accidents and related fatalities. Some countermeasures have been implemented, like Education, Engineering, and Law Enforcement, but the effects were not the desired ones. The technological development provides some important solutions, mainly at the automotive industry level, with the development of in-vehicle technologies to alert the driver, the vehicle control, the driver's anticipation, and the automation of some functions. However, the technological level of the in-vehicle technology requires drivers with a high level of digital skills being familiarized with new technology.

A study has been developed in 2019 focusing on data from the American Trucking Association (ATA), which is an organization representing companies that are central players in the freight industry (retrieved from <https://www.trucking.org>). ATA has consistently argued since 2005 that trucking companies face a shortage of truck drivers. The state of the job market for truck drivers was examined using publicly available, nationally representative data collected by U.S. government agencies on employment, earnings, and occupational mobility. The shortage of truck drivers in Europe and Canada is leading to the disruption and reconfiguration of the local and regional supply chains (as ships are diverted from one port to another delaying supplies arrivals). This has become one of the most immediate issues to resolve. The number of open positions in the trucking industry virtually doubled in the UK since the beginning of 2021. It can be concluded that something is necessary and urgent to change this picture.

The access to the truck driver's profession imposed for many years just a driving license for heavy vehicles and an elementary scholar education level. Meanwhile, there has been an important social development and the educational mandatory level for every citizen is 12 years in EU. Furthermore, the younger generations are familiar with the technology and are frequent users since very early ages. Thus, whilst older truck drivers, most of them approaching their retirement, are not familiar with most in-vehicle technology and don't feel safe when using it, younger people are familiar with the technology in general and dream for a job offering the opportunity to use it.

According to the IRU's 202¹, there is in Europe a shortage of 600.000 drivers. Thus, the European Commission issued in March 2023 a revision of

¹IRU is the world road transport organisation representing the entire industry (bus, coach, truck, and taxi), and drive the sustainable mobility of people and goods across the planet.

the EU Driving License Directive. The industry has been in suspense awaiting for concrete solutions to one of the biggest threats to road transport operations: driver shortages. With the new regulation, it is expected to reach almost 2 million by 2026. It happens that today, only 6% of professional drivers across the EU, are below 25 years old.

CONCLUSION

The main change in the new regulation of the revised truck driver's driving license is the recommended age to start the profession at 18 years old. It is also recommended that the young candidates could start at 17 years old to get some education and training to the truck driver's profession. Considering that the truck drivers' profession requires more maturity than such age expresses and is proved on the road traffic accidents data. Such age should be considered appropriate to acquire relevant knowledge about the technology and the vehicles. Such opportunities should be created, developed, and applied. Some European countries created Truck Driving Academies offering courses providing theoretical knowledge and practical application to prepare young truck drivers that will be competent, skilled as required, and safe. Independently on the name like Academy, Institute, or School, the truck driver profession requires much more than just a driving license. Driving a platooning has some complexity, which requires education and training, as well as a heavy automated vehicle requires.

Theoretical and practical knowledge, as a background to support expertise in the profession, combined with both teaching and learning quality, will explain and justify the claim for higher salary in the truck driver profession than the one that is the nowadays practice to the older generation of truck drivers. This is based on the duration of the education system until the high education level. Such perspective represents much more than what was required 30 or 40 years ago. Thus, this generation is much different from the previous ones once they accompany the technological development and are attracted by the related innovation.

How to meet younger people's interest for the new technologies offering education and professional training for the truck driver profession? Some European countries adopted the creation of an Academy to educate and train young candidates to the profession. This is probably a good solution for the desired future of truck drivers and their working conditions towards appropriate salaries.

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The identification of older drivers' negative attitudes regarding the use of in-vehicle technologies was the trigger to analyze any effects on their working activity and the impacts on the truck drivers' labor market. This shared work and inherent discussions led the authors to a new focus on present and future research.

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