Employability in the Rail Sector in Light of Digitalisation and Automation (EDA rail)

Report

EVA

wmp consult

CER
The Voice of European Railways

ETF

Imprint

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Foreword

Ladies and Gentlemen,
Dear Colleagues,

We are pleased to present you with the final report for the CER and ETF EU social partner project, EDA Rail. This report draws central, forward-facing conclusions on the topic of maintaining employability, which is highly relevant for our rail sector in the rapidly changing environment we face today.

We are also quite proud that our two organisations were able to bring this project to a successful conclusion together, despite the difficulties and delays caused by the COVID-19 pandemic, most notably in organising the workshops. Our respect and heartfelt thanks go to all those involved in the EDA Rail project.

With the completion of this project, CER and ETF are living up to our responsibility as EU social partners to ensure the future viability of employment in our sector and to provide important impetus. Rail workers do outstanding work every day, especially in these difficult times, and it is thanks to their efforts that the European rail sector can thrive. We wish to recognise the important contribution they make to the daily lives of customers and to the success of the European Green Deal.

The EDA Rail project identifies the key drivers of current and future employment for the wide array of professions in our sector. However, success can only be achieved with motivated, qualified, and socially protected employees who are well prepared for the future. The section of the report focussing on examples of good practice provides an overview of what national social partners, employee representatives, and companies are already doing to find answers to the developments caused by digitalisation, automation, and other factors such as demographic change, health, and diversity. These developments offer opportunities for our sector. Nevertheless, employees must be actively involved in the change process and their concerns taken seriously – a point that is addressed in the final section of the report, which outlines measures to support employment and formulates recommendations on employability based on the EDA Rail project's most important findings.

We expect the European Commission, politicians, and technical experts to take up these results and recommendations and adequately account for them when managing future developments. There is also a need for the Commission to provide financial and content-related support for the qualifications necessary to keep the rail sector fit for the future.

We would like to thank everyone involved in this highly relevant project: all members of the CER and the ETF who served on the steering committee, the advisory team from wmp consult and the EVA Akademie, as well as all colleagues who took part in national workshops.

We will fold EDA Rail recommendations into our work on the EU Social Dialogue for the rail sector and continue to develop them there.

For sustainable employment, for colleagues, and for a strong rail sector in Europe!

Best regards,

Giorgio Tuti (ETF)
President

Matthias Rohrmann (CER)
Vice President

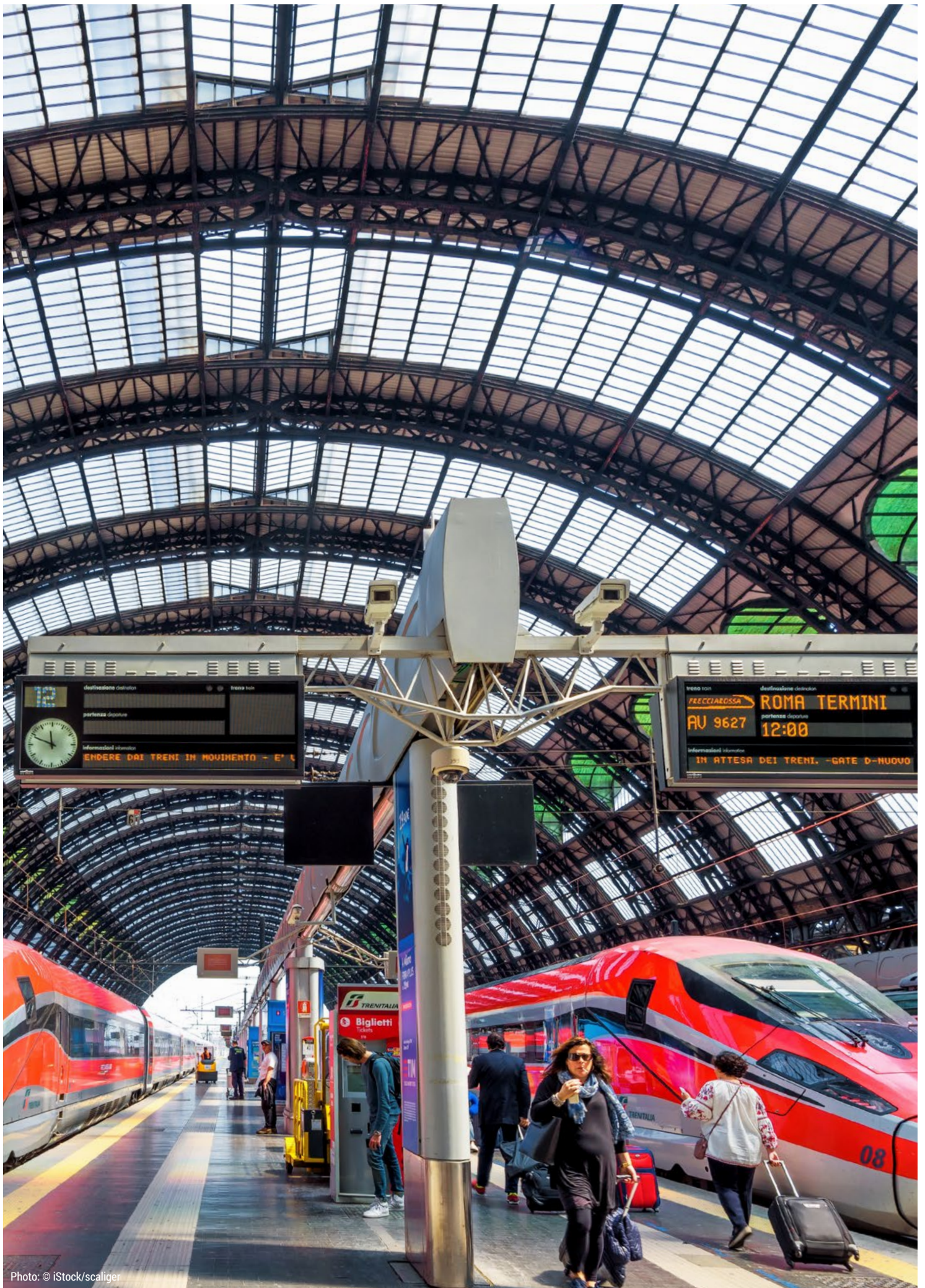EU Sectoral Social Dialogue Committee Railways

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Executive Summary

Railways as the backbone of the smart and sustainable mobility of the future

The rail sector is currently of great and growing importance due to a range of environmental, economic, societal, technological, and other factors. Being by far the most environmentally friendly mode of transport, railways must be significantly strengthened and expanded to fulfil the commitments of the European Green Deal. If we are to achieve a 90 % reduction in transport-related carbon emissions by 2050, the share of rail in passenger and freight transport must increase substantially. According to the targets set by the EU Commission's **Sustainable and Smart Mobility Strategy**, high-speed rail traffic across Europe should double by 2030 and rail freight transport should double by 2050. Furthermore,

by 2050, a fully operational, multimodal Trans-European Transport Network for sustainable and smart transport with high-speed connectivity should be in place.

To achieve these goals, the Commission is focussing on **digitalisation and automation as a means of fostering innovation, efficiency, and productivity**. It has identified developing connected and automated multimodal mobility through the large-scale deployment of automated transport by 2030 and achieving a connected and automated multimodal Trans-European Transport Network with high-speed connectivity by 2050 as key steps in this process.

The EU strategy for railway digitalisation and automation largely neglects social aspects

Whilst high-level partnerships between the EU and key stakeholders in railway operation, infrastructure, and rail supply industries (including the Shift2Rail Joint Undertaking, now Europe's Rail) have been established to harness the potential of digitalisation and automation and to develop and deliver technical solutions, architectures, and standards on a European scale, there is quite a striking gap in these and other activities to promote digitalisation and automation: the human factor. Indeed, **the needs and challenges facing the rail sector's workforce have been largely neglected** so far.[1]

In view of this, the European Social Partners for rail – the **European Community of Railway and Infrastructure Companies** (CER) and the **European Transport Workers' Federation** (ETF) – have launched a uniquely important initiative aiming to address the issue of employability in the rail sector in light of digitalisation and automation. This two-year project included elements of focussed research, as well as collaborative activities and discussions of good practices and key principles.

The EDA Rail project is important because a multitude of **drivers and challenges**, including but not restricted to digitalisation and automation, are set to radically transform the rail sector's workforce in coming years. For example, in many countries, up to 50 % of the current workforce will have retired by 2030, whilst the sector continues to face significant labour shortages in core occupations, namely train drivers and staff running traffic control centres or maintenance workshops. Therefore, the sector must become more attractive to younger people, not only in the occupations traditionally linked to rail, but also in areas where it competes with other branches, particularly IT, sales, or research and development. As a result, the **future workforce and working conditions of the rail sector** will be quite different to those of the past and even those of the present: the gender balance will change, workers will come from more diverse backgrounds, and they will generally be better educated and trained.

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1 For example, activities and needs linked to innovation strategies for the development of human resources in the rail sector are totally absent from the 2022 – 2024 Europe's Rail Partnership work programme, including from the activities planned for the two main pillars and seven 'flagship areas'. See: https://rail-research.europa.eu/wp-content/uploads/2022/03/AWP_2022_2024_Final_Published.pdf

A modernised concept of employability

The **desk research, interviews** and **four regional workshops** with social partners at company and sector level carried out in the context of the EDA Rail project enabled us to identify opportunities and risks related to digitalisation and automation, new requirements on part of both workers and employers, as well as good practices in maintaining and strengthening employability in the rail sector's main areas of activity (railway operation, maintenance, traffic control and management, and customer services and relations).

On this basis, we have developed a **taxonomy of a modernised conception of employability**, which accounts for the main dimensions of employability from the perspective of the individual worker,[2] as well as important **framework conditions and context factors** at national level, context factors linked to the rail sector and the rail market, and company-specific factors and practices.

A modernised concept of employability in the railway sector

Railway sector context
- Operational environment
- Labour market situation
- Infrastructure
- Investments

Employer/Company policies and practices
- Health and safety policy
- Training and learning
- Work-life-balance
- Workers' participation
- Gender equality
- Career opportunities
- Professional mobility
- Corporate culture
- Leadership

Individual workers dimension
- Values, attitudes, motivation
- Skills, competences, learning
- Work, working conditions, work organisation
- Health and functional capacities

Society	Culture	Social dialogue, collective bargaining	Legislation	Social security	Education

Good practices, Key principles, policies and measures

The EDA Rail project identified **30 cases of good practices** throughout Europe. These cases ranged across all domains and directly addressed the multiple dimensions of employability, including attractiveness, equal opportunities, and diversity. However, many of them were related to new approaches in skills development, training, and learning. We also found that social partners had, jointly or through their own initiatives, addressed the social and employment-related impacts of automatic train operation, digital automatic coupling, predictive railway maintenance, digital rail traffic control and management, as well as the development of new digital services for customers.

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2   According to the theory of employability, these are health and functional capacity; skills, competence and learning; values, attitudes and motivation; and work, working conditions, work organisation and leadership.

The impressive number of good practices illustrates the **innovative capacity displayed by social partners and social dialogue** in responding to needs related to digitalisation in the rail sector. The lessons learned from these good practices further underline the importance of involving and consulting workers' representatives and trade unions at an early stage in the deployment of new digital tools or systems in railways, as this allows companies to identify risks and avoid situations in which a transformation process fails because its social impacts were not (sufficiently) considered.

Reflecting on this experience of good practice, the project was able to identify several **key principles** necessary to the planning and development of digital transformation projects:

(1) People are key in delivering the potential benefits of digitalisation and automation

(2) Digitalisation and automation should contribute to better working conditions and employability

(3) Transparency and openness as regards opportunities, risks, and social impacts are necessary

(4) Nobody should be left behind

(5) Addressing and shaping digitalisation and automation in the rail sector should be the social partners' shared responsibility

(6) Social dialogue should be an integral part of the process at all stages and levels

Based on these principles, the project identified a non-exhaustive list of policies at company and sector level that should be implemented to strengthen employability. These policies should also be linked to concrete measures tailored to the specific needs and requirements of the rail sector and associated undertakings in different national contexts.

As a result, the EDA Rail project has developed a basis to make employability operable and measure both progress and existing gaps and deficiencies.

Photo: © SNCF

1 Introduction and methodology

1.1 Background and context

> **"Instead of worrying about what could happen due to automation (…),**
>
> **we should focus on what should happen"**
>
> Michel Servoz: AI – The future of work? Work of the future!, 2019

In 2021, the European Year of Rail was celebrated under contradictory conditions. On one hand, railway function was heavily impacted by the COVID-19 pandemic. Rail workers continued to ensure the transport of goods and passengers under difficult circumstances where many of them risked their health and some even lost their life. Companies were concomitantly confronted with massive slumps in the number of passengers due to lockdowns, restrictions in cross-border transport, and new challenges regarding the health and safety of both customers and staff. On the other hand, major, rail-focussed initiatives were launched or accelerated in hopes of achieving a smarter, more sustainable system of mobility – not only at regional or national level, but also to transport passengers across borders and longer distances, thereby providing attractive alternatives to air travel.

Digitalisation and automation are regarded as key enablers in making railways fit for such purposes. According to the EU Commission's Communication on Sustainable and Smart Mobility published at the end of 2020:

> Digitalisation will become an indispensable driver for the modernisation of the entire system, making it seamless and more efficient. Europe also needs to use digitalisation and automation to further increase the levels of safety, security, reliability, and comfort, thereby maintaining the EU's leadership in transport equipment manufacturing and services and improving our global competitiveness through efficient and resilient logistics chains.[3]

Similarly, the European Rail Research Advisory Council (ERRAC) has described an ambitious vision of the European rail system in 2030:

> The 2030 rail system will interact with other transport modes and with local, regional, national and European economic activities in transformational societal changes and trends. Safe, reliable, comfortable and efficient rail services will influence and benefit many different areas, such as lifestyle, spatial planning, people's everyday experience, health and a better general standard of living.[4]

To achieve this vision, ERRAC has recommended a set of research, development and innovation-oriented measures that focus strongly on digitalisation and automation in all domains of the rail sector. As a result, European railway companies are facing many expectations in terms of modernisation, green and digital transition processes, efficiency, and attractiveness. At the same time, as described by the EU Commission:

> The sector's most valuable asset by far is its people and the sustainable and smart transition will not be possible without the support and buy-in of transport workers.[5]

Given this context, the joint project led by the European social partners for rail on employability in light of digitalisation and automation is both timely and highly relevant.

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3   EU Commission 2020: Sustainable and Smart Mobility Strategy – putting European transport on track for the future. Brussels, 9.12.2020 COM(2020) 789 final, p.2.

4   ERRAC 2020: Rail 2030. Research and innovation priorities. The European Rail Research Advisory Council, p.7.

5   EU Commission 2020: Sustainable and Smart Mobility Strategy – putting European transport on track for the future. Brussels, 9.12.2020 COM(2020) 789 final, p.22.

1.2   Research objectives

Generally speaking, this research study aimed to support a review of the joint recommendations on employability developed more than a decade ago, in 2007, by the social partners for rail and to support CER and ETF in formulating a modernised conception of employability.

More concretely, the following research objectives were agreed upon:

- To identify and analyse the main drivers of change related to digitalisation and automation as well as other main trends and challenges in the future development of the rail sector

- To analyse how employability is affected by such drivers and changes in different fields or contexts within the rail sector
- To map and analyse the needs of employers and employees as they manage and implement these changes and to collect examples of good practices demonstrated by railway undertakings, employees, and trade unions
- To establish the key elements of a modernised conception of employability in the rail sector, including recommendations for further action and social dialogue needs

1.3   Methodology

This research study used a mixed methodological approach consisting of desk research, stakeholder interviews, and collaborative events/workshops to validate and complement research findings. Research tasks were carried out between spring 2020 and spring 2022. During this period, several meetings were held with the clients and a steering committee (see list of steering committee members in the annex) to discuss interim findings.

1.3.1   DESK RESEARCH AND LITERATURE REVIEW

A comprehensive analysis of existing literature allowed for an initial mapping of the context factors involved in the development, challenges, measures, and policies to be carried out in the rail sector. Both comparative studies and national sources were considered. Whilst the social and employment-related impacts of digitalisation and automation on the rail sector constituted the main focus of this analysis, sector-specific challenges and needs, such as the gender and age balance, were also considered.

1.3.2   INTERVIEWS

To consolidate and complement these preliminary findings and gain additional insight into drivers of change, challenges, and needs from the perspective of railway undertakings and rail sector employees, more than 40 interviews were carried out with management and employer representatives, works councils, and trade union organisations. These interviews took place between August 2020 and September 2021 in the following countries: Austria, Denmark, France, Germany, Hungary, and Italy, i.e., those countries that were represented in the project's steering committee. Interview partners were identified with the help of the respective steering committee members. Interviews were carried out using a semi-structured interview guideline.

1.3.3   GOOD PRACTICE EXAMPLES

A key objective for the interviews was to identify good practices linked to maintaining and supporting employability in light of digitalisation, automation, and other drivers and needs at company or sectoral level.

Practical measures designed to address the different dimensions of employability were reported by social partners during the interviews and, in more depth, during the four workshops. However, it should be noted that not all practices reported in the context of this project should be regarded as examples of collaboration or as having been validated by both trade unions and employers. In fact, rather a minority of practices reported during interviews and workshops were presented

Photo: © DNB/René Strandbygaard

as the outcome of joint activities. This illustrates that trade unions and employer organisations hold different assessments of the challenges and needs arising from digitalisation and other drivers of employability.

1.3.4 WORKSHOPS WITH NATIONAL LEVEL STAKEHOLDERS

In the context of this ETF-CER project, four participatory workshops were organised in close cooperation with national social partners in Copenhagen (September 2021), Frankfurt a.M. (November 2021), Lille (March 2022) and Prague (April 2022).

Workshops were attended by social partners from a total of 16 countries.[6] They presented a good opportunity to validate and refine interim research results, to gather additional information on the impact of digitalisation and automation in different parts of the rail sector, and to discuss (in working groups) employability requirements.

1.3.5 REPORT STRUCTURE

This report is divided into four main parts: Chapter 2 presents an overview of the current situation, as well as the main past and future employment trends in the EU rail sector, including available forecast scenarios. However, the true focus of this chapter are the drivers that impact employment in the rail sector. As such, it describes both the different aspects and impacts of digitalisation, automation and other drivers.

Chapter 3 introduces the concept of employability and discusses how the previously identified drivers may impact needs and challenges relating to employability in the rail sector, drawing on the perspectives of both sectoral trade unions and employer organisations.

Chapter 4 summarises innovative measures and examples of good practice used by social partners at company and sector level to address the needs and challenges inherent to maintaining and improving employability. The practices described are varied and include both joint and independent initiatives carried out by trade unions and employer organisations, as well as outcomes of social dialogue at company and sector level.

The final chapter draws conclusions and – in light of the 2007 Joint Memorandum on employability issued by the social partners for rail – sketches the cornerstones of a modernised conception of employability, including key principles, dimensions, and potential policies and measures. Chapter 5 also includes ideas for follow-up activities to monitor and measure development and progress in the field of employability.

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6   Besides the six countries directly involved in the EDA Rail project (Austria, Denmark, France, Germany, Hungary and Italy) the workshops were attended by national, sectoral, and company level representatives from Belgium, Bulgaria, the Czech Republic, Luxembourg, the Netherlands, Poland, Slovakia, Slovenia, Spain and Sweden.

2 Main trends and drivers that will shape future employment in railways

2.1 The evolution of employment and the sociodemographic structure of the workforce in the rail sector

2.1.1 CHANGES IN EMPLOYMENT

According to the EU Commission's latest rail market monitoring report (RMMS)[7], a little over one million workers were employed in the EU28 railway operation sector in 2018.[8]

France, Germany, the UK, Poland, and Italy were the countries with the largest national railway workforce. According to RMMS data, employment in railway undertakings between 2015 and 2018 increased most strongly in the United Kingdom and Germany[9] and more moderately in Austria, Belgium, Sweden, and Norway. The data indicated that, in most other countries, railway employment decreased (11 countries)[10] or stagnated (9 countries)[11]. However, EDA rail project partners underlined the poor quality and unreliability of available statistics on employment in the rail sector. This is attributable to several factors:

- Employment data are based on different sources and methods. Whilst RMMS data rely on information provided by railway undertakings and their national level employer organisations, data gathered by Eurostat are based on national statistics.

- The Eurostat data available at European level are incomplete. Such data, gathered by separate national statistical offices are not comparable.

- Furthermore, and as detailed elsewhere,[12] the Eurostat figures cannot accurately represent the development of employment in railway operation and infrastructure because they fail to reflect the increasing heterogeneity of the railway market. This trend, resulting from liberalisation and restructuring, has led to a more heterogeneous market structure, in which large rail companies have created separate divisions for different types of services and/or outsourced services to companies operating in other sectors.

This makes it very difficult to make any reliable assessments as regards the development and structure of employment in the rail sector and/or to compare countries.[13]

The lack of reliable data also casts doubt on any forecasts pertaining to future employment trends in the context of market developments, demographic changes, and the evolution of supply and demand in different occupational groups.

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7   EU Commission 2021: Seventh monitoring report on the development of the rail market under Article 15(4) of Directive 2012/34/EU of the European Parliament and of the Council. COM/2021/5 final.

8   The data used by the RMMS include data submitted by EU Member States, the United Kingdom and Norway, contributions from the 'EU transport in figures' statistical pocketbook, reports from the European Union Agency for Railways, Eurostat, statistics collected by various sectoral organisations, presentations, and studies.

9   In the 7th RMMS Report, France is also mentioned as a country that experienced strong growth in rail sector employment between 2015 and 2018. However, the report also states that, due to breaks in time series, the 2015 and 2018 data are not comparable. In fact, the national integrated railway company has highlighted that there was no growth in employment during that period.

10 Czech Republic, Hungary, Latvia, Croatia, Bulgaria, Finland, Netherlands, Luxembourg, Italy, Spain and Portugal.

11 Poland, Romania, Slovakia, Slovenia, Lithuania, Estonia, Denmark, Ireland and Greece.

12 Giaccone, M. and Pomposiello, F. 2019: ERTMS - a new technology for the railway sector Anticipating its Impact on Employment and Social Conditions. Final report and guidelines. AIMESC PROJECT of FILT CGIL and ETF, Brussels.

13 See also: Shift2Rail Joint Undertaking 2019: Socio-economic aspects of human capital: Assessment of the state of play in employment in the railway sector.

As highlighted in a report commissioned by ETF and FILT CGIL[14], the lack of reliable data also calls into question the assumption that rail market liberalisation has a positive impact on employment levels at both EU and national level.

2.1.2 SOCIODEMOGRAPHIC STRUCTURE OF THE RAIL SECTOR WORKFORCE

The rail sector is characterised by an ageing workforce and a predominance of male workers. However, as shown by data from the RMMS and other sources, the sociodemographic characteristics of the workforce vary significantly from one country to another.

Gender

According to RMMS data, women accounted for approximately 21 % of the EU28 rail sector workforce. The gender gap was even wider in certain occupational categories.

Estonia reported the highest proportion of women in the total workforce (51 %), followed by other Baltic and Scandinavian countries such as Latvia, Lithuania, Finland, Sweden, and Denmark. Ireland reported the lowest proportion (9 %).

RMMS data also reflected key findings from the latest annual Women in Rail (WIR) report produced by European social partners for rail, ETF and CER. According to an affiliate survey, the average share of women in the 28 reporting companies in 2018 was 21.4 %.[15] The WIR annual report stated that the share of women in the surveyed companies had increased slightly (0.5 %) compared to 2017. The highest increase rates were noted in Italy (FS, 1.1 %) and the lowest in Slovakia, whilst Hungary even showed a decline in its female employment rate.

The WIR report noted positive developments regarding the female employment rate in different occupational groups. The proportion of women in executive management, middle management and team leader positions increased by 1.1 %, 1.2 % and 0.5 % respectively between 2017 and 2018. Women occupied 22.3 % of all managerial positions in 2018. On a company basis, the highest proportions of women in top executive positions were reported in Spain (46.2 % at Adif) and Austria (27.3 % at ÖBB); comparatively high rates were also reported for Portugal, Belgium, and Hungary.

Persistently unsatisfactory female employment rates and the visible differences in company-level efforts to improve them led European social partners to start negotiating an autonomous framework agreement on gender equality in the rail sector. The agreement, which was signed at the end of 2021 after two years of negotiations,[16] is binding for rail sector companies or groups affiliated to CER.

Age

The ageing of its workforce presents a significant challenge for the rail sector. RMMS data show that the average proportion of staff employed by railway undertakings who were older than 50 was 42.4 % in the EU28 in 2018.[17] This represented an increase of 2.2 percentage points compared to 40.2 % in 2015. However, the share of younger employees (under 30 years old) working for railway undertakings also increased in the EU28 in the same period: from 8.2 % in 2015 to 10.6 % in 2018.

There were quite marked differences in the age structure of the rail sector workforce in different countries (see Figure 1). According to the RMMS, Spain, Romania, Greece, Bulgaria and Lithuania had the oldest workforces, with over 50 % being over 50 in 2018.

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14 See Giaccone/Pomposiella 2019.

15 CER and ETF 2019: 6th Annual Report on the development of women's employment in the European railway sector. Data of 2018. The WIR reporting and monitoring follows the CER-ETF "Joint Recommendations for a better participation and integration of women in the railway sector" that was signed in 2007.
See: https://www.etf-europe.org/resource/cer-etf-joint-recommendations-for-a-better-representation-and-integration-of-women-in-the-railway-sector-2007/

16 EUROPEAN SOCIAL PARTNER AGREEMENT ON WOMEN IN RAIL between the Community of European Railway and Infrastructure Companies (CER) and the European Transport Workers' Federation (ETF), 5 November 2021.

17 EU Commission 2021: Rail Market Monitoring System, 7th Report 2020.

Figure 1: Main railway undertakings' employees by age group and country, (% in 2018)

% of staff (main RUs)

Legend: over 50 | 30 to 50 | under 30
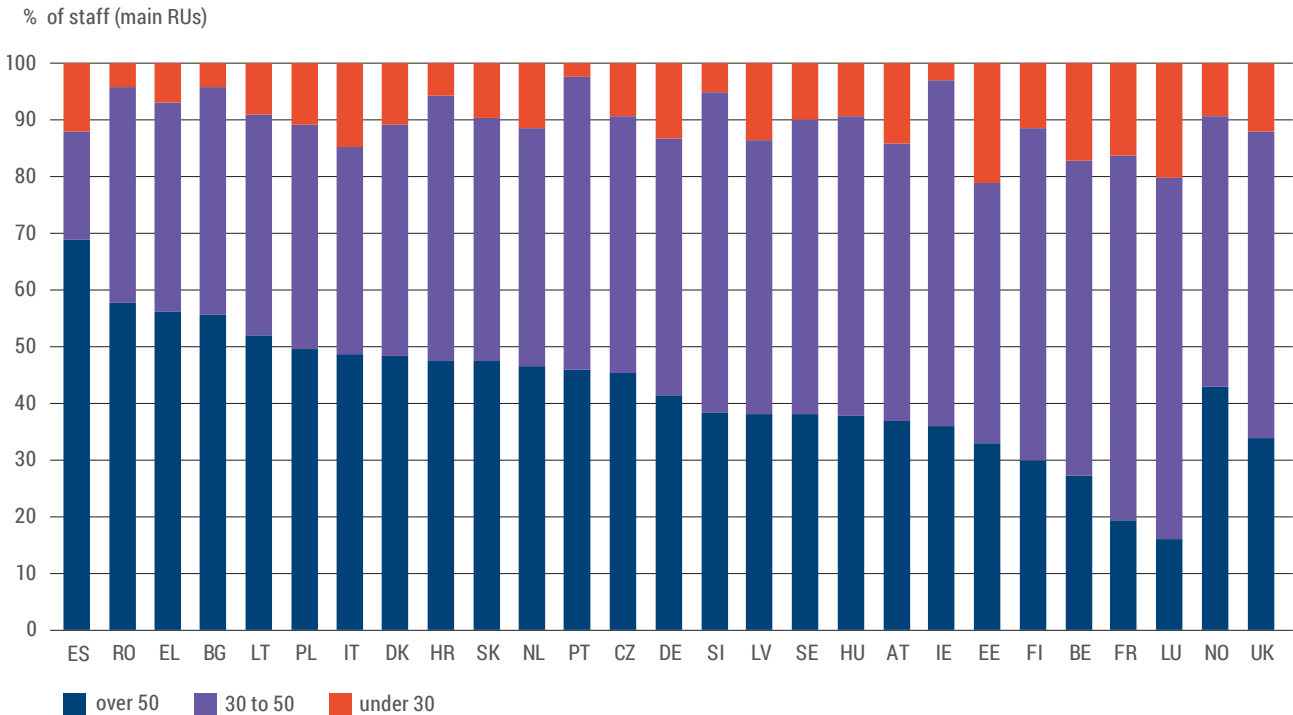
Source: EU Commission 2021: Rail Market Monitoring System, 7th Report 2020.

As regards different occupational groups, infrastructure managers tended to be older. However, the share of younger employees also increased between 2015 and 2018, from 7.9 % to 8.3 % in the EU27.

Nevertheless, rail sector social partners highlighted the challenges posed by the increasing average age of staff and the sector's lack of attractiveness for the younger generation during both the interviews and the EDA Rail workshops.

Figure 2 compares the age structure amongst dispatchers in the Hungarian rail sector in 2014 and 2021. It shows that the average age of these workers increased from 43 to 46 years. Between 2014 and 2021, the share of dispatchers who were 55 or older doubled, rising from 13 % to 26 %. By contrast, the share of those younger than 35 decreased from 21 % to only 15 %. It should also be noted that, in 2021, there was not a single dispatcher under 25 years old.

Figure 2: Hungary: Age of dispatchers in 2014 and 2021

Legend: −25 | 26−35 | 36−45 | 46−55 | 55−
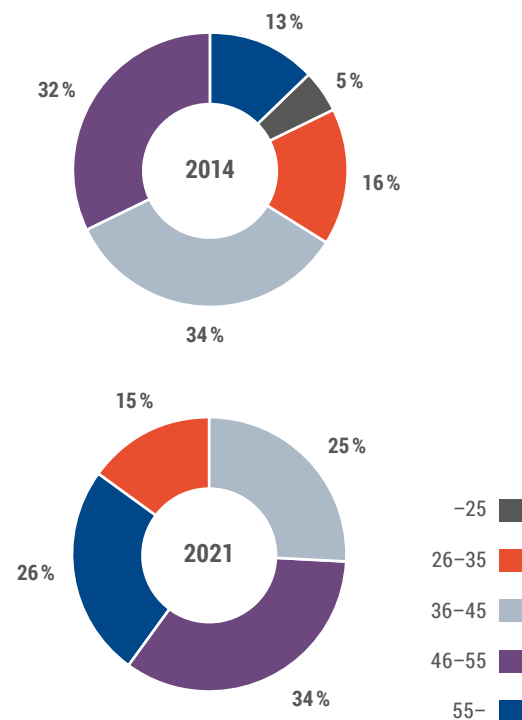
Source: Presentation of a representative of the Hungarian Railway trade union GYSEV at the EDA Rail Workshop in Prague, 21–22 April 2022.

2.1.3 RAIL TRANSPORT AND EMPLOYMENT FORECASTS

Due to the lack of reliable data on quantitative developments and the current workforce, forecasts relating to passenger and freight activities in the rail sector should be considered questionable at best. Uncertainty regarding future railway activities also results from the fact that these forecasts rely on a number of assumptions pertaining to the evolution of the modal shift and the European railway area that cannot be taken as fact. Indeed, these assumptions can unexpectedly be undermined by events such as the Covid-19 pandemic and its impact on freight transport, or the terrible war in Ukraine.

According to the 2020 EU Reference Scenario (published July 2021)[18], both freight and passenger transport will see a significant increase in activity up to 2050. Freight transport is expected to grow at a higher rate than passenger transport. Due to the significant decline in freight transport activities in 2020 due to the Covid-19 pandemic, the Commission expects a rebound between 2025 and 2030.

In terms of passenger transport, cars are expected to maintain their dominant role. However, the share of car transport is expected to decline slightly over time, whilst the share of both (intra-EU) aviation and rail is projected to increase considerably, from 8 % to 12 % and 8 % to 10 % respectively. According to the EU reference model, the modal share of passenger rail transport will mostly increase due to the expansion of high-speed railways and the completion of the core and comprehensive TEN-T networks. The Commission also expects that policies like the Fourth Railway Package will improve the competitiveness of railways and shift part of passenger road traffic to rail in the long term.

Figure 3: Passenger transport activity by mode 1995–2050
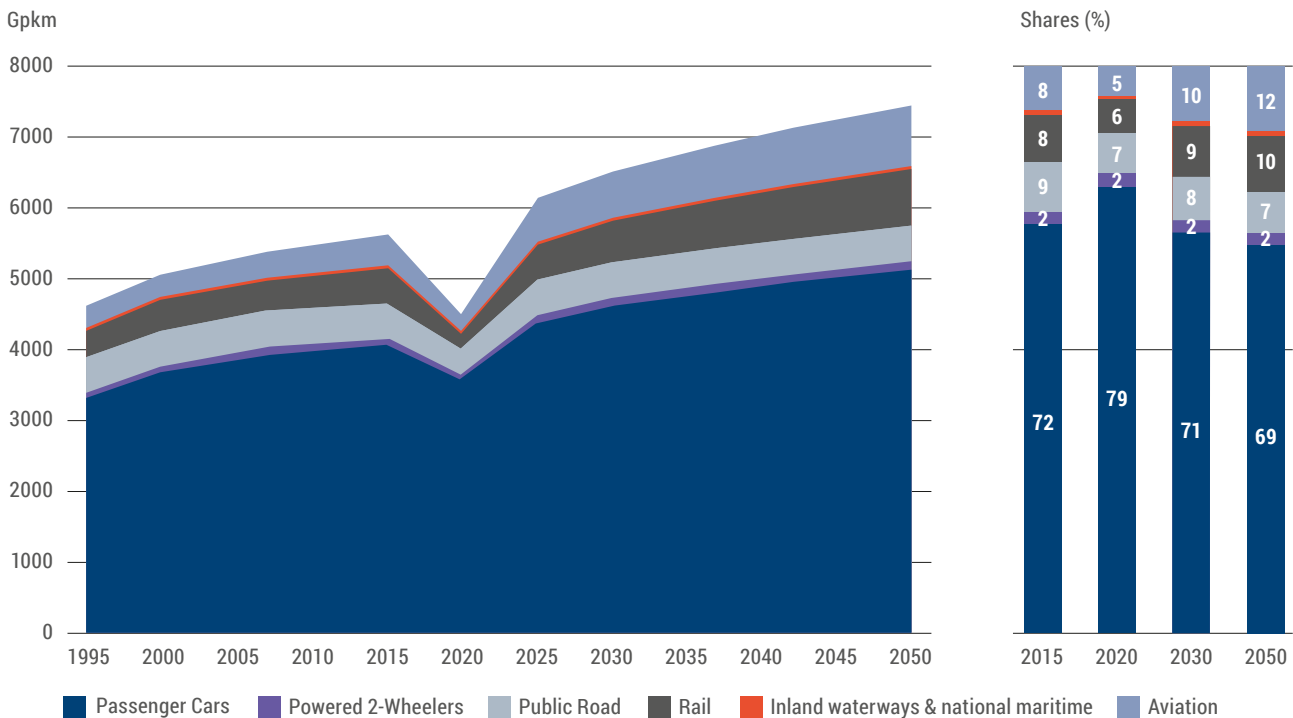
Source: EU Commission 2021: Reference Scenario 2020.

According to the reference scenario, freight transport activity is expected to grow significantly in the 2015-2050 period due to increased economic activity and demand for goods transport. Although road freight will remain dominant, representing 69 % of total freight transport activity by 2050, the share of rail freight is expected to increase from 17 % in 2015 to 20 % in 2050.

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18 EU Commission 2021: EU Reference Scenario 2020: Energy, transport and GHG emissions – Trends to 2050.

Figure 4: Freight transport activity by mode 1995−2050
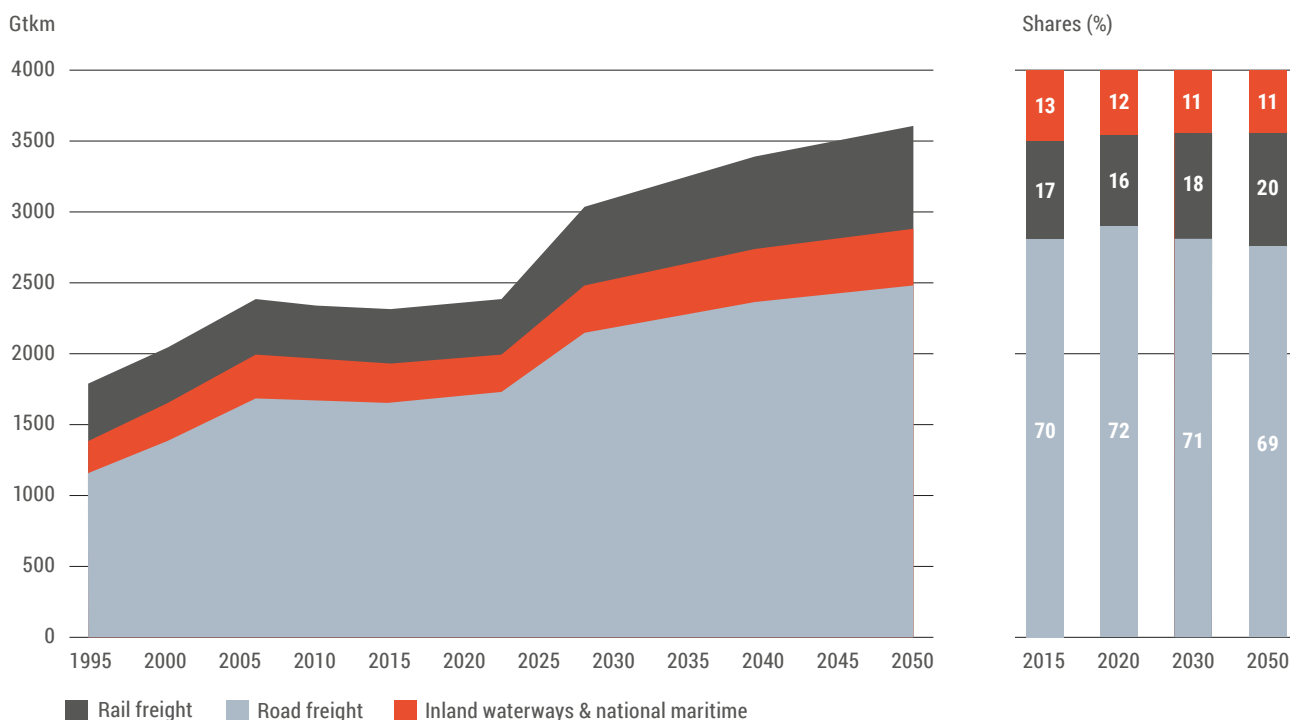
Source: EU Commission 2021: Reference Scenario 2020.

As stated previously, these forecasts are not realistic because the European Commission is being overly optimistic regarding the impact of rail market liberalisation. According to the ETF, there is no evidence that the opening of the EU market and competition strategy alone have led to the promised revival of the railways in Europe, with increased rail freight or better service for passengers, or that they will do so in the future. Indeed, an ETF position paper states that the assumed positive effects of this liberalisation over the last 30 years have failed to materialise.[19] Looking at the facts, it is clear that the modal share of rail has not grown significantly and that services have not improved. In addition, rail sector jobs have become more precarious and working conditions have deteriorated in the same timeframe, according to ETF.

As regards employment, the most recent forecast of labour supply and demand was published in 2014 by the EU Commissions' Joint Research Centre.[20] Accord-

ing to this document, employment in the rail sector will experience robust and continuous growth until 2030. In terms of the different occupational groups, job numbers are mainly set to decrease amongst administrative staff by a further 23 % (from 322,000 in 2010 to 290,000 in 2030). As a result, this group would represent just 30.3 % of total staff by 2030, compared to 41.2 % in 2010. On the other hand, numbers of mobile and technical staff are expected to grow, in line with the increase in demand, as shown by Table 1.

It should be noted that the employment forecasts published in 2014 are based on full-time equivalents. However, even accounting for this, the most recent RMMS figures for 2018 already outnumbered these estimates, showing that over 1 million workers were employed in railway operation and infrastructure management.

19 ETF 2021: Lessons learned from three decades of liberalisation in the railway sector. Brussels.
    https://www.etf-europe.org/wp-content/uploads/2021/06/Lessons-learned-from-three-decades-of-unbundling.pdf

20 EU Commission 2014: Future Employment in Transport – analysis of labour supply and Demand, Joint Research Centre, JRC.

Table 1: Estimates of evolution of employment in rail transport per occupational group (FTE)

	1990	2000	2010	2020	2030
Total	912,745	900,381	900,650	924,672	957,894
Mobile	306,612	311,281	320,199	337,800	359,322
Technical	230,150	242,671	258,386	281,337	308,082
Administrative	375,982	346,429	322,065	305,535	290,490

Source: EU Commission 2014: Future employment in transport – analysis of labour supply and demand, Joint Research Centre, JRC.

2.1.4   LABOUR SHORTAGES AND ATTRACTIVENESS FOR YOUNGER GENERATIONS OF WORKERS

According to both trade unions and employer and management representatives, the rail sector across Europe faces significant labour shortages across different occupational fields. This is partly due to a lack of attractiveness for younger generations of workers.

Rail companies in several countries reported that they saw labour shortage as a major challenge in the coming years, as they were seeing greater outflows due to the age structure of their current workforce, combined with a lacklustre applicant situation. Many railway undertakings were hampered in their efforts to recruit new personnel because working conditions – particularly in jobs requiring shift work and work during unsocial hours – had a negative impact on attractiveness. This

issue is set to worsen if wages and other financial and non-financial incentives (such as job security) fail to compare favourably with those in other economic sectors.

Social partners involved in the EDA Rail project reported that digitalisation and the move towards sustainability and 'smart railways' are regarded as having the potential to make railways more attractive to both customers, be they for passenger or freight transport, and workers.

Furthermore, digitalisation and automation are also perceived to decrease recruitment pressure for certain rail sector jobs as they increase productivity and reduce staffing needs.

2.2 Digitalisation and automation in the rail sector

2.2.1 OVERALL RELEVANCE

As highlighted in a recent study on the digital transformation of railways,[21] digitalisation will not only substantially affect operational processes and customer relations but will also result in new emerging business models and market areas in the field of future mobility.

Although rail sector professionals such as signallers or control centre staff and, in the longer-term, couplers and train drivers will be strongly affected by automation and digitalisation, recent studies expect adjustments in staff numbers to happen quite smoothly due to retirement and the possibility for workers to move into other positions on platforms, on board trains, or in other areas.[22]

However, this does not mean that jobs (or rather tasks) are not currently being substituted by machine work or will not be automated in the future.[23] Trade union experts in particular have highlighted that this has already happened in the past and will continue to happen, as is the case in administration, ticket sales, travel information and, increasingly, in operation, maintenance and repairs.

Interview partners stated that routine administrative tasks such as accounting, payrolling and other HR functions were the first to be replaced by machine work and/or automated processes. With the emergence of digital tools (and the required infrastructure) tasks relating to ticket sales and inspection were also automated. Due to automation, artificial intelligence, and machine learning, digitalisation is now increasingly affecting more complex technological tasks in operation, maintenance of rolling stock, and infrastructure development and maintenance. According to EDA rail stakeholders, the tasks affected or at risk of substitution relate to wagon inspection, break tests, coupling, and traffic management and control.

All companies, trade unions, and employer organisations that participated in the EDA rail study stressed that digitalisation and automation have already impacted – and will increasingly continue to impact – railway operations, infrastructure management, and related fields such as customer relations, traffic management and control, operations, and maintenance. Many interviewees also highlighted that – compared to past waves of technological change – new digital technologies and automation not only required adjustment and the acquisition of new skills but also changes in education and learning practices and cultures, work organisation, managerial functions, and corporate culture.

The following sections will briefly describe the key technologies related to digitalisation and automation in the rail sector, highlighting the close interlinkages and mutual dependencies caused by the digitalisation of railways.

Roadmap for Digital Railways

Published collaboratively by CER, CIT, EIM and UIC in March 2016, the 'Roadmap for Digital Railways' specifies that digital technologies should be deployed in rail transport to: offer connected railways by providing reliable connectivity for safe, efficient, and attractive railways; enhance customer experience by offering better and added value for customers; and increase capacity by enhancing reliability, efficiency and punctuality. These market-driven and technological trends are already massively affecting the workforce and future requirements as regards employability in the rail sector.

Source: CER, CIT, EIM and UIC: Roadmap for Digital Railways, April 2016.

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21 Pieriegud, J. 2018: Digital Transformation of Railways. Department of Transport. SGH Warsaw School of Economics.

22 See EU Commission 2018: Automation in transport: How does it affect the labour force? A similar assessment was made in a study on the impact of digitalisation and automation on railways in Switzerland that was commissioned by the Swiss railway social partners and SBB. See: PwC 2019: Summary of the study "SBB Work Environment of the Future 2025-2035" A study initiated by the SBB Digitalisation Fund.

23 See also the report on digitalisation and automation in transport sectors that was commissioned by ETF: Fulton, L. 2022: Automation and Digitalisation Toolkit. European Transport Workers Federation, Brussels.

2.2.2 AUTOMATIC RAILWAY OPERATION

One of the most important technological trends that are currently being developed for rail transport is Automatic Train Operation (ATO). Rail transport is well suited to automation, as there is a limited number of routes and the vehicles involved are already on a strict schedule. Compare this to road transport, where the number of possible routes is much higher and no rigid infrastructure planning exists, and one can see why rail transport is better suited to the introduction of autonomous vehicles. ATO will dramatically change the interaction between infrastructure, traffic management systems, and an increasingly intelligent on-board unit.[24]

Within the transport sector, automation has already been developed and applied in several modes of transport (for example metros and airport shuttle services). For other modes – road transport, for example – the development of automation has picked up in recent years. As of today, the level of technological maturity and deployment of automated train operations is relatively low.[25]

According to industry providers and high-level EU railway research bodies such as ERRAC, ATO is believed to have multiple benefits, including better predictability and fewer delays.[26] Due to this increased predictability, it would be possible to operate more trains on the same route and thereby increase the capacity of existing rail infrastructure.[27]

This would be particularly beneficial in coping with higher numbers of passengers and increased traffic frequency. A relevant example was reported and discussed in an EDA Rail Workshop: the introduction of new technology supporting assisted train driving and traffic supervision for SNCF rail traffic in the Ile-de-France area where a 25 % increase in the number of passengers has been observed over the last ten years. Here, and especially in very congested areas such as central Paris where the development of additional infrastructure is not an option, digitalisation and automation are regarded as the only realistic option to increase line capacity.

Figure 5: Paris Area: NExTEO system will increase capacity to alleviate overcrowding on congested East-West and North-South lines
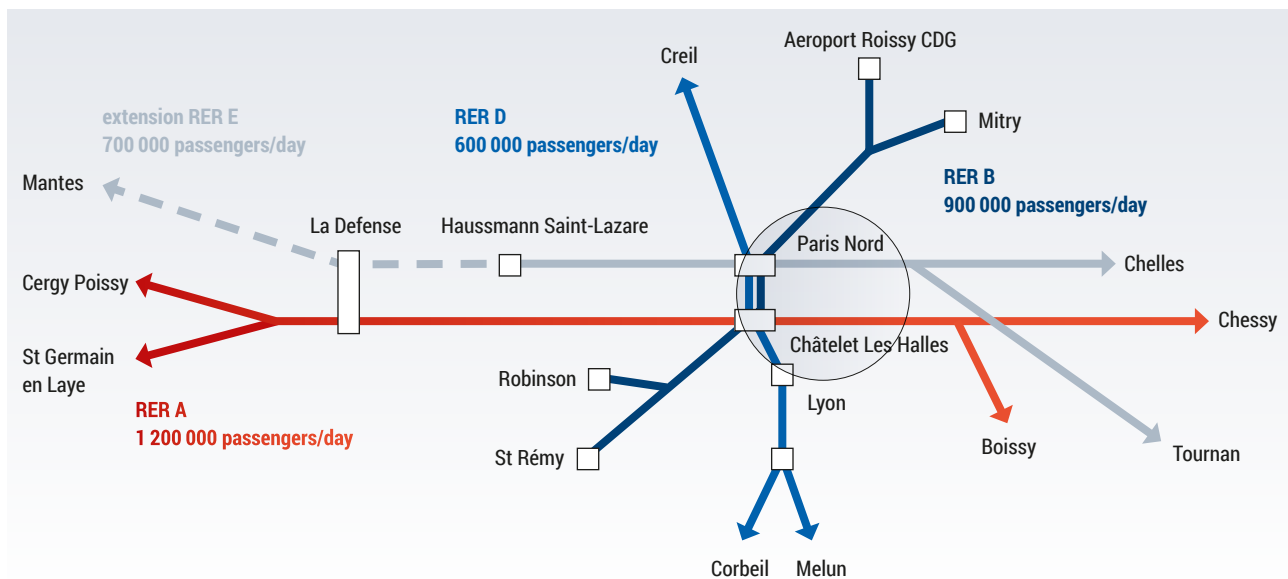
Source: Presention of a SNCF representative at the EDA Rail workshop in Paris, March 2022..

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24   Smartrail 4.0 2018: Background information on Automatic Train Operation (ATO) and Grades of Automation (GoA) for Smartrail 4.0.

25   Pieriegud, J. 2018: Digital Transformation of Railways, SGH Warsaw School of Economics and Siemens Sp. z o.o.

26   It should be noted, however, that no research studies or quantitative evidence currently exists regarding the correlation between automation and punctuality or a higher number of trains on the same route. This lack of evidence was also highlighted by trade union representatives interviewed in the context of the EDA rail project.

27   See for example ERRAC 2019: Rail 2030. Research and Innovation Priorities. European Rail Research Advisory Council.

In addition to increasing line capacities by introducing the digitally-controlled moving block system, which adapts in real time to operational conditions and train speed, the literature has identified further benefits linked to automated train operation, such as enhanced safety through automated and computerized failure detection and response. Energy optimisation would be yet another advantage, as machine learning makes it possible to continuously optimize the driving patterns of trains, thus making them more energy efficient.[28]

The levels of automatic train operation (ATO) implemented in rail transport vary from on-site train operation (GoA[29] 0) to unattended train operation (UTO), where starting and stopping, operating the doors, and handling emergencies are fully automatic processes (GoA 4). It was highlighted during interviews and presentations at EDA Rail workshops that ATO and GoA levels differ in terms of the level of supervision, the role of traffic control, and the tasks carried out by the train driver (see Table 2).

Currently, state-of-the-art ATO would correspond to GoA level 1 and 2 in most EU countries. At these levels, at least parts of the network are equipped with ETCS and – at GoA 2 level – automatic operation is in place for departures after stops, driving, and stopping at stations. The train driver is irreplaceable at both levels, be it as a driver or as an on-board specialist in case of incidents.

However, at higher GoA and automation levels, the role of the train driver changes or can even be replaced by automatic operation at GoA level 4 as illustrated in the figure.

Table 2: Automatic Train Operation at different grades of automation (GoA)

GoA level	Operation	Traffic control and supervision	Closing doors	Departure	Driving and stops	Expert in case of an incident
GoA 1	With driver	PZB / LZB	Driver	Driver	Driver	Driver
GoA 2	With driver	PZB/LZB/ETCS	Driver	Driver	Automatic	Driver
				Automatic		
GoA 3	Without driver	PZB/LZB/ETCS (DTO)	Train attendant	Train attendant	Automatic	Train attendant
			Automatic	Automatic		
GoA 4	Unattended	PZB/LZB/ETCS (UTO)	Automatic	Automatic	Automatic	Trouble-shooter

GoA: grade of automation; DTO: driverless operation; UTO: unattended operation; PZB: punctual train control, LZB: linear train control, ETCS: European Train Control System

Source: based on vida trade union presentation at EDA Rail Workshop Lille, 23–24 March 2022

28   TNO 2018: Automatic train operation. Driving the future of rail transport.

29   Grade of Automation.

Photo: © DB AG/Max Lautenschläger

Several countries are testing, demonstrating, and implementing ATO at different levels of automation in passenger and freight transport. However, it is unclear when GoA levels 3 and 4 would feasibly be reached. Indeed, ATO requires on-board technology, trackside equipment, the introduction of an ETCS system that allows for movable block control, and advanced digital communication systems (moving from current GSM-R to the Future Radio Mobile Communication System, FRMCS, based on 5G technology) providing high stability and bandwidth.

Fall-back solutions – in cases of communication failure, for example – present a further challenge. Currently, the driver is the key expert and technician on board and, even in a future where unattended train operation is the norm, it will be necessary to have troubleshooting protocols in place, which realistically cannot also be carried out by automated systems. According to a trade union presentation on the impact of ATO and different GoA levels, a representative of the Austrian trade union vida highlighted the following impacts and requirements[30]:

- At GoA level 1 and 2, train drivers remain indispensible because they are the only technician and expert on the train. Due to the introduction of assisted driving and digital traffic control and management, the skills required by train drivers will become more complex because they will need to understand and handle different train control and operation systems.

- At GoA level 3 and 4, the train can theoretically run without a driver. However, in case of incidents there will still be a need for an agent able to manually operate or remote control the train and possessing a high level of expertise and knowledge, as well as robust troubleshooting skills. Therefore, it is likely that the profile of the train driver will change significantly in the future – they may need to become a comprehensive expert on the entire train – but the occupation as such will still be needed due to security requirements.

According to both trade unions and employer organisations the idea that, in the future, train driving will become less complex and will require less knowledge and fewer skills is a dangerous illusion. In fact, the opposite is true. Due to the complexity of the rail system and the fact that multiple trains will be running on the same line, the drivers will need a high level of expertise and skill to rapidly handle and resolve technical problems.

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30   vida presentation "Requirements for train drivers regarding to ETCS and autonomous train operation", EDA Rail Workshop Lille, March 2022.

2.2.3 THE EUROPEAN RAIL TRAFFIC MANAGEMENT SYSTEM AND THE ETCS

The basis for automatic rail operation is the second generation of the train control system ETCS (European Train Control System). It is intended to complement and replace railway safety and control technologies.

Discussions about harmonising national security and control systems and introducing a single European rail traffic management system (ERTMS) have been ongoing for almost 40 years. In recent years, the deployment of the ETCS system and the Future Railway Mobile Communication System based on digital communication with high data transfer capacity (GSM-R 5G) has been fostered by digitalisation and rapid technological development.

Whilst smaller countries such as Luxembourg or Switzerland are quite advanced in the process of ETCS deployment, the progress at EU level – and particularly in the larger countries – is slower than planned, be it on the main cross-border corridors and high-speed rail tracks or the conventional lines. In some cases, ERTMS deployment was accelerated to allow for the modernisation of obsolete and older signalling systems (Denmark, see textbox below) or the development of new lines and high-speed services in countries like Italy and Spain.

Photo: © DB AG/Frank Kniestedt

ERTMS in Denmark, Italy and Spain

In **Denmark**, faced with the significant challenge of operating many different systems, all of them very old, insufficient capacity, a lack of knowledgeable staff to maintain the existing systems, and a monopolistic supply situation, the Danish government made the decision to install the state-of-the-art European signalling system, ERTMS level 2, in January 2012.[31]

The decision to totally renew/replace the life-expired and obsolete signalling systems deployed on Danish soil – some of which dated back to the 1930s, making it increasingly difficult and expensive to source spares – and to support and maintain the Danish ATC stemmed from the urgent need to overcome network signalling problems, which accounted for more than 50 % of train delays. Indeed, with a system slated to life-expire by 2020, the urgency became evident, and Banedanmark, the state-owned rail network infrastructure manager in Denmark, committed

to an ambitious and radical planned upgrade of the entirety of its main line network. This is the first time that a national Infrastructure Manager has decided to modernise its entire network (currently amounting to over 2,287 track-km, 3,245 route-km, 307 stations and 750 level crossings). The modernization project, which should be completed by 2030, involves removing signals and replacing them with onboard ERTMS cab signalling. This decision was facilitated by the Danish Parliament in January 2009.

In **Italy**, the decision was made to install ERTMS Level 2 as the only signalling system on the new high-speed lines, without an additional fallback system. This has allowed considerable cost savings since trackside equipment needed to be carefully designed to be fit for purpose. Therefore, any ongoing or associated trackside maintenance costs are avoided.[32]

With over 2,900 km of lines already in service and an additional 2,000 km of lines planned or already in construction, **Spain** is a worldwide reference and leader in ERTMS deployment. This has contributed to the attractiveness of the Spanish high-speed AVE lines that are gradually replacing aviation as the transport mode of choice (e.g., on the route from Barcelona to Madrid). The Spanish experience is also a showcase for the effective interoperability of ERTMS, with no less than six companies involved in various projects on the Spanish network.[33]

Source: www.ertms.net (as per June 2021)

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31   Source: https://www.ertms.net/wp-content/uploads/2021/06/20.-ERTMS-in-Denmark.pdf (as per June 2021)

32   https://www.ertms.net/wp-content/uploads/2021/06/4.-ERTMS-in-Italy_SIRTI.pdf

33   https://www.ertms.net/wp-content/uploads/2021/06/5.-ERTMS-in-Spain_CAF.pdf

During workshops and interviews, employee representatives and trade unions highlighted the challenges and increasing complexity that currently result from the operation of different systems of train control such as ETCS level 1 and level 2 systems and national systems such as LZB, PZB and GNT.

This will require complex system knowledge, know-how regarding hard- and software, and the expertise and skills needed to deal with emergency situations or incidents throughout the transition period.

2.2.4 DIGITALISED RAIL TRAFFIC MANAGEMENT AND CONTROL

Digitalisation and ERTMS/ETCS deployment are causing important developments in infrastructure and network management across Europe. The establishment of centralised and remote digital traffic management centres is a central component of this transformation. This topic and its impact on rail sector employment, working conditions, and new skill requirements for dispatchers were discussed in the context of the EDA rail project, namely in one of the four workshops (Prague, April 2022).

Input from both employers and trade unions regarding the introduction of centralised digital traffic control and management in the Czech Republic and Hungary underlined the added value of digital rail traffic control and the associated risk factors that should be considered. Employers and trade union representatives also stressed the need to invest in training and qualifications and put in place a robust system of change management that includes the early involvement of workers and trade unions.

In terms of opportunities and added value, social partners highlighted the increase in efficiency and line capacities that are made possible by operating a uniform digital system, which enables faster, more accurate information flows and decision making. Positive impacts on working conditions, work organisation and work environments were also accentuated by both social partners. This is of particular importance because the profession of train dispatcher is less attractive, particularly for younger workers, due to the predominance of shift work and rather old-fashioned work environments. The introduction of newly built, centralised traffic control centres equipped with state-of-the art digital systems, modern and more comfortable workplaces, and better working-time regimes made the job more attractive according to the social partners. It was also reported that wages tended to be higher in these new digital control centres because skill requirements were also higher and workers needed to master both new and traditional systems (in case of incidents and emergencies).

However, risks and negative impacts were also emphasised. First and foremost, fewer dispatch staff were needed (see Table 3) even though the work intensity and the requirements in terms of digital and soft skills were increasing. Centralised traffic control centres also required employees to commute further and longer.

Table 3: Average number of employees in selected railway professions, 2013 – 2021

Year	2013	2017	2021	Change 2013 – 2021
Operational train traffic control dispatcher TCC	82	83	99	+17
Line section dispatcher TCC	79	219	337	+258
of which TCC Přerov	69	113	173	(+104)
of which TCC Prague	0	41	64	(+64)
Passenger information system operator at the TCC	35	88	136	+101
of which TCC Přerov	35	47	72	(+37)
of which TCC Prague	0	41	64	(+64)
Train dispatcher at the railway station (RS)	4 326	3 819	3 532	−794
Passenger information system operator at the RS	297	233	198	−81
Station signalman at the RS	1 919	1 535	1 217	−702
Station switchman at the RS	127	76	52	−75
Total	6 847	6 053	5 571	−1 276

Source: Presentation of Czech railways trade union OSZ at the EDA Rail workshop in Prague, April 2022.

2.2.5   PREDICTIVE MAINTENANCE

Automatic train operation and the digitalisation of rail traffic management and control have a direct impact on maintenance and repair works.
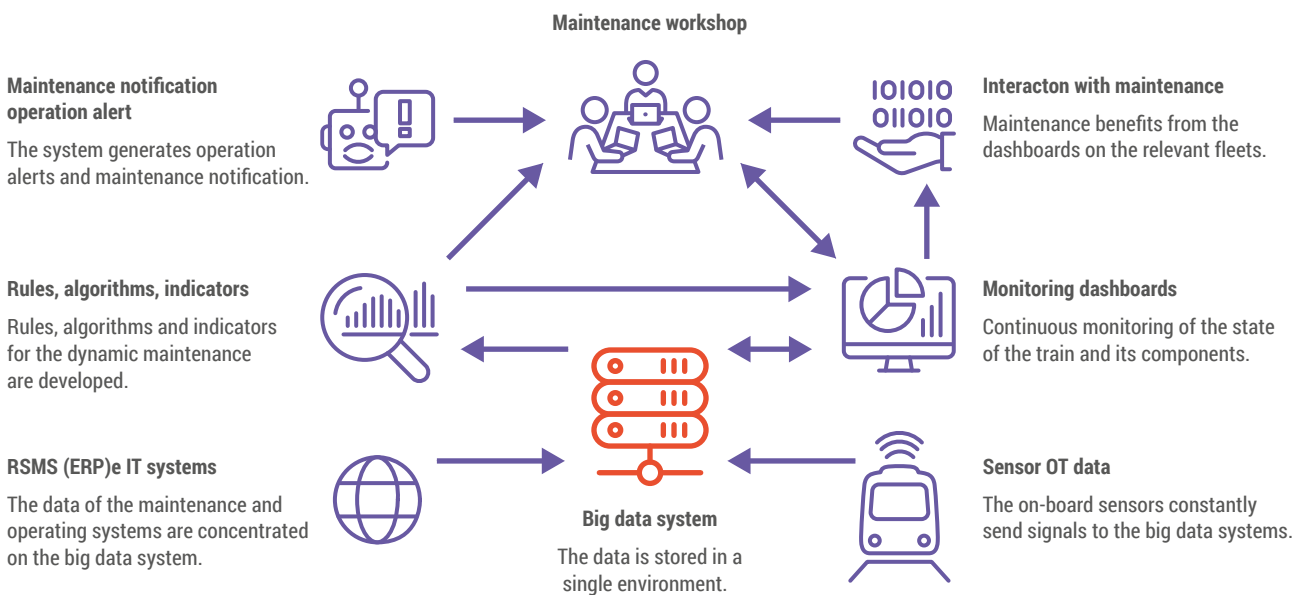
Maintenance and repair work are traditionally labour-intensive activities. The increasing possibilities and decreasing costs of Internet-of-Things devices (sensors, transmitters, etc.) make it possible to connect assets (e.g. trains) and infrastructure (e.g. overhead power-lines) to a monitoring system. This allows for the early detection of technical failures or other maintenance requirements. Pre-failure detection and maintenance serves to reduce downtime, accidents, and delays.

The following quote drawn from an interview illustrates the important change stemming from the introduction of new technologies and digitalisation in maintenance and repairs works and from the transition to smart, sensor-based and remote maintenance and repair activities.

"Already, defaults in air conditioning on trains can be diagnosed remotely and there are now mobile maintenance teams. Predictive and remote maintenance become more and more important. While occupations do not disappear, they undergo important changes. Drones are used now to identify defects of the rails. Before, maintenance staff had to walk the rails to identify missing or faulty parts." (Railway undertaking, France)

According to interview partners and experts, maintenance and infrastructure management will, in the future, essentially rely on new technologies and result in the creation of huge amounts of data. Therefore, the analysis, handling and evaluation of big data will become increasingly important. According to a presentation on the impact of digitalisation on maintenance, several new technologies, tools and new digital processes have been integrated into a Dynamic Maintenance Management System (DMMS), which results in profound change to the organisation of maintenance and repairs.

Figure 6: The Dynamic Maintenance Management System (DMMS)

Maintenance notification operation alert

The system generates operation alerts and maintenance notification.

Rules, algorithms, indicators

Rules, algorithms and indicators for the dynamic maintenance are developed.

RSMS (ERP)e IT systems

The data of the maintenance and operating systems are concentrated on the big data system.

Maintenance workshop

Big data system

The data is stored in a single environment.

Interacton with maintenance

Maintenance benefits from the dashboards on the relevant fleets.

Monitoring dashboards

Continuous monitoring of the state of the train and its components.

Sensor OT data

The on-board sensors constantly send signals to the big data systems.

Source: Presentation of a representative of FS Italy, EDA Rail Workshop Lille, March 2022.

Photo: © DB AG/Marek Knopp

From a human resources perspective, DMMS and the related changes in maintenance causes significant changes to occupational profiles:

- There will be more and more interfaces between manual work and digital technologies and tools.
- The interaction between maintenance and other domains of the railway company (operation, network, infrastructure) will become more intensive.
- New requirements will emerge in terms of technological skills, higher digital skills, and learning skills.
- New occupational profiles and professions will emerge in the field of mechatronics, Internet of Things, Big Data handling and analytics, and artificial intelligence.

During interviews, workshop discussions, and exchanges with the social partners in the rail sector, trade unions raised specific concerns about subcontracting in maintenance and repair works. In many countries most of these activities are nowadays part of contracts with suppliers and/or outsourced to subcontractors. Trade unions are concerned that this trend might be accelerated by digitalisation and the associated new knowledge and skill requirements and might result in such knowledge and skills being lost within railway undertakings. According to unions, this presents several risks, including decreased efficiency in case of incidents, safety-related issues, and a deterioration of working conditions.[34]

In this context, trade unions considered sectoral collective agreements regulating minimum standards for the whole rail sector – like the one that exists in Italy, for example – to be good practice.

Union representatives also reported that, due to financial considerations and the fact that contracts with subcontractors or suppliers for the maintenance of mobile rolling stock often entail hidden costs, such activities should be carried out by existing staff.

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34   It was reported that maintenance and repair activities are often outsourced because of tendering and financial considerations. However, lower prices are, in most cases, only possible on the basis of lower wages.

2.2.6 OTHER DIGITAL TECHNOLOGIES THAT WILL IMPACT FUTURE RAILWAYS

The literature posits that other emerging digital technologies will impact the rail sector in the future due to their potential for wide implementation, which, in turn, is linked to their capacity to significantly improve efficiency and performance. For example, interview partners and workshop participants highlighted the role that Artificial Intelligence (AI) solutions could play in different domains such as traffic planning and dispatch, or cross-border communication between traffic control centres and train drivers.

It is also expected that biometric technologies will be used to streamline the boarding process, ensure 'guaranteed seats' in unreserved trains, and avert potential fraud or criminal activity in the future.[35] As regards

decarbonisation, stakeholders emphasised the need to develop new, more efficient power supply systems. We should note here that major EU-funded research and development programmes are addressing this issue.[36]

In terms of infrastructure supervision and maintenance, stakeholders and experts reported technological innovations and changes, visible in the deployment of drones for the inspection of railway tracks, switching points and rail catenary lines, for example. Interview partners at company and sector level also highlighted digital automatic coupling (DAC) as an important innovation that could enhance efficiency and productivity in rail freight transport.

2.2.7 DIGITAL AUTOMATIC COUPLING

During one of the EDA Rail Workshops, representatives of the European DAC Delivery Programme (EDDP)[37] and Austrian railway ÖBB stated that the ambitious targets of increasing rail freight transport by 50 % by 2030 and by 100 % by 2050[38] set out in the European Commission's Sustainable and Smart Mobility Strategy could only be achieved if new technological solutions were introduced to increase the efficiency of rail freight transport in terms of capacity, productivity and quality and if new and improved offers were developed for customers (e.g. single wagonload rail freight transport).

According to the members of the EDDP, the deployment of DAC would already constitute a game-changing transformation of Europe's rail freight system: manual coupling and uncoupling processes would become obsolete, trains equipped with DAC could be longer and heavier and run slightly faster due to improved longitudinal train forces, new vehicle designs enabled by a central coupler could offer higher payloads. However, automatic coupler initiatives from the 20th century had already submitted quotes aiming to further automate other operational procedures during shunting, train preparation and train run and offering to replace all manual steps and visual inspections – not just simplify-

ing or shortening these individual operations. This was seen as key in boosting the competitiveness of the rail freight sector.

The further value of DAC becomes evident when we consider that these new functionalities can be applied to freight trains as a whole. The DAC, supplying energy to all wagons and guaranteeing secure data communication throughout the train, forms the indispensable basis to bring about Europe-wide, interoperable, efficient, fully digital freight operations and a substantial capacity increase on the rail network. This new digital connection between the train's wagons unlocks the possibility to integrate further digital solutions and implement the additional required functionalities and benefits (digital brake tests, visual inspections, etc.) as shown in Figure 7.

As such, any automation roadmap for the EU rail sector would need to include automatic coupling, for obvious efficiency-related and financial reasons. The success of DAC deployment depends on its different stages: demonstrating the benefits of the available prototypes, assessing DAC prototypes and defining the European DAC open standard,[39] establishing a feasible migration

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35   See, for example, on a pilot project on Eurostar routes:
     https://www.railtech.com/digitalisation/2020/07/27/facial-biometric-corridor-on-eurostar-routes-to-avert-deepfakes-crime/?gdpr=accept

36   See the Shift2Rail and particularly the focus project areas within Innovation Programme 3.

37   The programme was initiated by DB, ÖBB, SBB, the sector initiative is supported by the Rail Freight Forward members (BLS Cargo, CD Cargo, CFL cargo, DB Cargo, Green Cargo, Lineas, LTE, ÖBB RCG, Ost-West Logistik, PKP Cargo, RENFE MERCANCÍAS, SBB Cargo, Fret SNCF, Mercitalia Rail, ZSSK Cargo) and by the sector associations CER, CIT, ERFA, FTE, UIC, UIP and VDV. To promote the shared vision of a high-performance rail network across Europe, Infrastructure Managers, Wagon Keepers, Railway Undertakings and other sector players were invited to join a Memorandum of Understanding that was signed in July 2020. The EU DAC Delivery Programme was set up under the umbrella of the Shift2Rail Joint Undertaking (now Europe's Rail Joint Undertaking). See: https://shift2rail.org/.

38   EU Commission 2020: Sustainable and Smart Mobility Strategy – putting European transport on track for the future. COM(2020) 789 final. Brussels, 9.12.2020.

39   On 21 September 2021, the European DAC Delivery Programme took an important decision on a European-wide standardised coupler head design for European rail freight

programme, and identifying the relevant funding model to enable, accelerate, and bridge the transition process until deployment is completed. Signatories will need to commit to the EU-wide deployment of DAC in the rail freight sector by 2030, subject to a sound migration plan and strong financial and technical support from the European Commission and Member States. Only thus can this goal be achieved whilst including all stakeholders. Whilst trade unions at European and national level agree that a well-prepared introduction of DAC, following a short transition period, will increase the efficiency of rail operations and have a positive effect on health and safety conditions, they have also highlighted the need for certain framework conditions relating to employment, skills and working conditions to be put in place before DAC deployment.

In a position paper published by ETF in December 2020,[40] ETF stressed that the introduction of DAC would have a major impact on rail sector workers, particularly shunting staff, wagon masters (technical inspection employees), and train drivers. According to ETF esti-mates, the introduction of DAC would substitute 25 to 30 % of the current workforce in shunting operations.[41] The staff groups mentioned above will need to be trained, and those workers who may face unemployment will be need to be retrained.

Therefore, ETF demands that accompanying measures targeting the workers affected by DAC be established and implemented by the rail sector, including

- Investments in qualification and further training for those workers who want to be retrained;
- The right to maintain at least an adequate job in the company.

The European railway trade unions also highlighted that, although the introduction of DAC will make the process of coupling and uncoupling much less strenuous and dangerous, these activities will still bear health and safety risks.[42] Therefore, risk-related impact assessments should be carried out to ensure the highest level of health and safety.

Figure 7: Digital Automatic Coupling as an enabler of digital freight operation
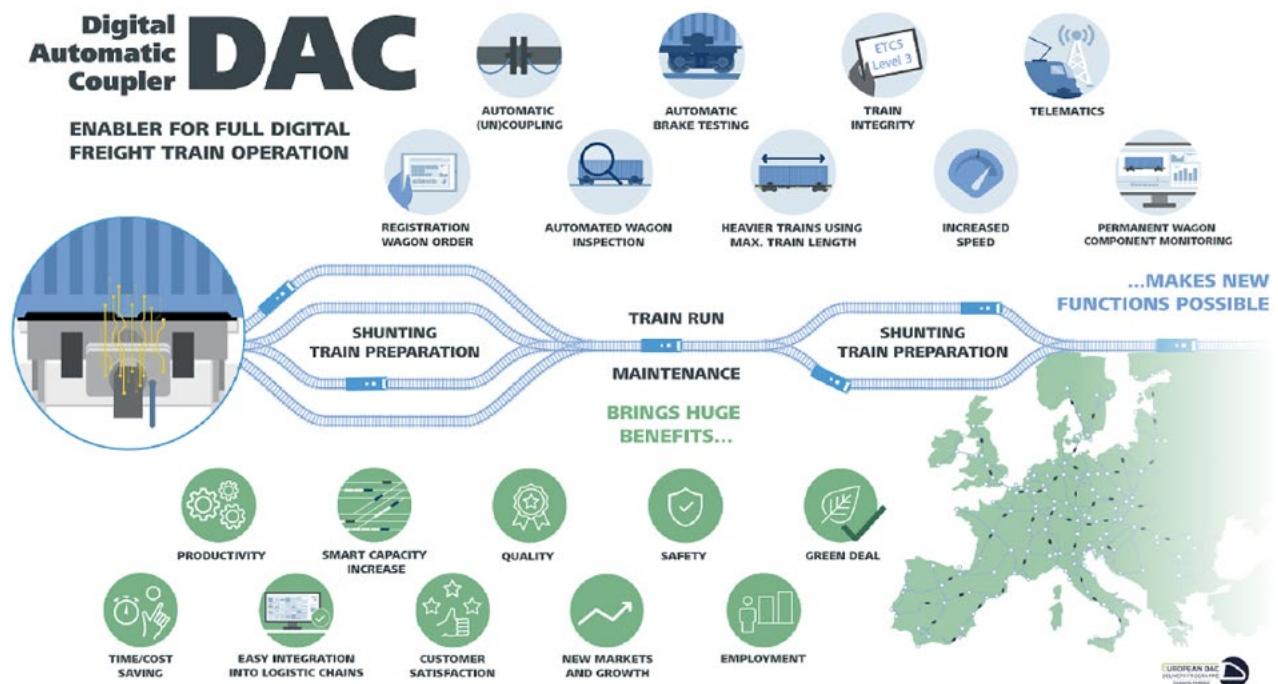
Source: Presentation of representatives of the European DAC Delivery Programme and ÖBB management, EDA Rail Workshop Prague, April 2022.

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traffic after an intensive test phase of almost one year. See: https://shift2rail.org/press-releases/european-digital-automatic-coupler-first-step-towards-one-type-selection/

40   ETF 2020: Digital Automatic Coupling (DAC) in European Rail Freight. ETF Position. https://www.etf-europe.org/wp-content/uploads/2020/12/ETF-DAC-position-paper.pdf

41   This, of course, does not account for future workforce needs that may result from an increase in transport volumes or from demographic change.

42   According to the input of an Austrian vida trade union DAC expert, these risks are, for example, possible electric shocks on voltage carrying parts, noise emission due to the air discharge when uncoupling, or risk of injury due to bumping during manual uncoupling or other malfunctions.

Photo: © DSB/Christoffer Regild

2.2.8 DIGITALISATION IN RELATION TO CUSTOMERS AND MOBILITY SERVICES

As highlighted in the outline of Shift2Rail's (now Europe's Rail Joint Undertaking)[43] innovation programme strand "IT Solutions for attractive railway services", rail must respond to customer needs to become more attractive. That means supporting anytime, anywhere, door-to-door, intermodal journeys encompassing distinct modes of transportation.

According to company representatives, customers (of both passenger and freight transport) expect to have relevant information at their fingertips in a few clicks, through a wide variety of data channels offering real-time and personalised information. To achieve a full seamless multimodal travel experience, customers must be able to easily plan and purchase door-to-door journeys. Ticketless or multi-application solutions that guarantee interconnectivity no matter where the traveller roams should become the norm.

Therefore, improved information technology, management and exploitation, and cross-industry collaboration must help to provide passengers with smart and personalised services for journey information and ticket purchase, together with entertainment and communication services.

As a response to these drivers and customer expectations, an increasing number of rail operators have launched internet multimedia portals, in the form of web pages or mobile apps that provide travel information and new on-board services.[44]

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43   https://shift2rail.org/research-development/

44   For the vision of online cross-border ticketing and other services, see the CER Ticketing Roadmap:
     https://www.cer.be/sites/default/files/publication/210920_CER_Position%20Paper_Ticketing%20Roadmap.pdf.

2.3 Further drivers of change

2.3.1 SOCIODEMOGRAPHIC DRIVERS

As previously established in section 2.1.2, several social and demographic features are already impacting the rail sector workforce. This is the case of the gender imbalance, for example, as well as the ageing workforce, which may cause the need to renew approximately half of rail sector staff within the next 10 years in certain countries. At the same time, new trends are emerging related to our increasingly diverse societies and the pluralisation of customer needs and expectations.

As regards the age structure, the EU population is projected to dramatically change in the coming decades due to the interplay of fertility, life expectancy and migration rates. Within the next 50 years, the population of certain countries is projected to decrease significantly, whilst others are projected to increase. Most eastern European countries, Germany, and Italy will see a significant drop in their population. Most other European countries will experience population growth.[45]

Whilst the share of young people is projected to remain constant, the working age of the population is expected to decrease substantially as a relatively large age cohort retires and is replaced by a smaller number of younger workers. This means that the proportion of the population over 65 will see a significant increase.[46]

In addition to this challenge and the need to intensify the recruitment of young workers, the rail sector needs to attract more women (see also section 2.1.2) and better reflect societal diversity in terms of multi-cultural and ethnic backgrounds.

The rail sector is traditionally male-dominated, although this holds true for freight more than passenger transport. Participants in the EDA Rail project highlighted the need for gender diversification in rail sector companies and initiatives to foster diversity in the workforce. Several participants also stated that increasing the share of female workers and more diverse groups in their companies had positive effects.

2.3.2 DECARBONISATION AND SUSTAINABLE TRANSPORT

Transport amounts to over 30 % of greenhouse gas emissions in Europe. The carbon footprint for rail transport is significantly smaller than that of most other modes of transport. Although it provides 8 % of passenger transport and 19 % of freight transport across Europe, rail transport is only responsible for 0.4 % of transport-related CO_2 emissions.[47] Therefore, completing a modal shift from carbon-intensive modes of transport to rail is the most effective way to decarbonise the transport sector and meet the ambitious goal set by the European Union to achieve at least a 55 % reduction of greenhouse gas emissions by 2030.

However, climate change – including higher temperatures, the increased frequency of extreme temperatures, changes in precipitation patterns, and the occurrence of extreme weather events – also creates new challenges for the rail sector. Indeed, these phenomena can cause rail buckling, increased material fatigue, changes in periods for infrastructure maintenance and repair, negative impacts on track geometry, and damage to structures (bridges, embankments) and equipment. Ensuring that rail transport and its associated infrastructure are more resilient to these effects requires investments, knowledge, and skills.

Rail transport is sustainable because it produces low levels of atmospheric emissions compared to road and air transport, involves the widespread use of electric traction, benefits from low energy consumption, uses relatively little land for associated infrastructure, improves the accessibility of city centres, and facilitates the efficient movement of large numbers of people and goods over long distances.

The EU Commission presented its Sustainable and Smart Mobility Strategy in December 2020 as part of the European Green Deal. This strategy outlines the EU's goals for the transport sector in the coming decades: making mobility green, smart and resilient. As regards the rail sector, the strategy calls for a doubling of high-speed rail by 2030 in the EU.

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45   EU Commission 2021: The 2021 Ageing Report. Institutional Paper 148. European Economy May 2021.

46   EU Commission 2021: Ageing Report 2021.

47   CER 2021: Already Green Deal compliant – Rail welcomes "Fit for 55" legislative proposals. CER press release, 14 July 2021.

In June 2021, the European Council of transport ministers welcomed the Commission's strategy and subscribed to its ambitious vision for the transport sector and its contribution to sustainability over the coming years and decades.[48]

In December 2021, the Commission detailed its Sustainable and Smart Mobility Strategy for international rail passenger traffic.[49]

2.3.3 LIBERALISATION AND FOSTERING A SINGLE EUROPEAN RAIL MARKET

In light of the current acceleration of digital and green transition processes and the ambitious goals to make national and cross-border rail transport for both passengers and freight more attractive to individuals and corporate customers, rail operators and infrastructure managers are facing new demands and challenges in areas such as business reorganisation and reorientation, investments, and cross-border cooperation.

At the same time, national competition within the rail market is likely to continue to have significant effects, with a strong element of Europeanisation of railway policies.[50]

The rail sector has undergone important changes over the course of the past 20 years due to significant restructuring. European-level regulation has led to restructuring at national level. The process of liberalisation was initiated by Directive 91/440/EEC on the development of European railways, which led to the denationalisation of many national railway undertakings. The main aim of the Directive was to increase the competitiveness of rail transport and it caused the rail sector to split into companies, which are run like commercial companies subject to market rules.

Between 2001 and 2016, four of these legislative packages were adopted at the EU level. The most recent is the 2016 Fourth Railway Package, which contains the latest EU-level policies relating to the rail sector. This Package consists of six legislative texts that aim to "revitalise the rail sector and make it more competitive vis-à-vis other modes of transport"[51] and continue the development of the Single European Railway Area (SERA).

The liberalisation of the rail sector during the past 30 years, which culminated in the implementation of the Fourth Railway Package, has transformed it. Instead of being characterised by national monopolies, the rail sector is now made up a series of different companies, including holding companies, infrastructure management companies, and separate passenger and freight companies.[52]

Using the railway packages, as well as more recent initiatives such as the EU Commission's Sustainable and Smart Mobility Strategy[53] smart mobility or the Action plan to boost long distance and cross-border passenger railways of December 2021,[54] the EU Commission is trying to increase interoperability, harmonisation and competition in order to provide benefits for passengers, railway undertakings and taxpayers alike: better quality of service, greater choice, innovation, cost-effectiveness, and customer-orientation.

However, as previously highlighted in this report,[55] not all rail sector stakeholders believe that liberalisation will automatically result in the benefits described above. Interview partners from different countries stressed that railway undertakings are currently faced with a whole bundle of expectations, the implementation of which requires considerable efforts in terms of both investment and human resources.

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48 https://www.consilium.europa.eu/en/press/press-releases/2021/06/03/sustainable-and-smart-mobility-strategy-council-adopts-conclusions/

49 https://transport.ec.europa.eu/news/action-plan-boost-passenger-rail-2021-12-14_en

50 See ETF 2021: Lessons learned from three decades of unbundling ETF response to the Portuguese Presidency's questions on the liberalisation of the railway sector, Brussel. See also the opinion of the European Economic and Social Council on the issue: EESC (2021). Opinion TEN/727: The Single European Railway area: https://www.eesc.europa.eu/en/our-work/opinions-information-reports/opinions/single-european-railway-area-0

51 EU Commission 2016: Fourth Railway package.

52 See: Van De Velde, D.M. 2018: Changing Trains: Railway Reform and the Role of Competition: The Experience of Six Countries. Routledge.

53 EU Commission 2020: Sustainable and Smart Mobility Strategy – putting European transport on track for the future. COM(2020) 789 final. Brussels, 9.12.2020.

54 EU Commission 2021: Action plan to boost long distance and cross-border passenger rail (COM(2021) 810). Strasbourg, 14.12.2021

55 ETF 2021: Lessons learned from three decades of liberalisation in the railway sector. Brussels.

3 Impacts of main trends and drivers on employability

3.1 The concept of employability: different understandings and perspectives

As noted previously, 'employability' is a complex and nebulous concept that has evolved over time to suit a variety of different purposes. Furthermore, since no clear conceptual model of employability exists, "there are as many measurements as researchers of the topic."[56]

In recent literature and research, employability is mainly examined at the individual level, i.e. the ability to join the world of work ("get a job"), remain in employment ("stay in a job"), and have the opportunity to develop further and obtain a new position, either within or without the organisation ("make a career").[57] This perspective is replicated in the definition of employability used by EU institutions such as the European Foundation for the Improvement of Living and Working Conditions (Eurofound) or the European Centre for the Development of Vocational Training (Cedefop), which define it as: "A combination of factors (such as job-specific skills and soft skills) which enable individuals to progress towards or enter into employment, stay in employment and progress during their careers."[58]

However, employability is not only important from the perspective of the individual worker in terms of getting a job, remaining in a job and progressing throughout their working life. It is an important concept at company level, as staff employability is a key indicator of a company's economic performance, productivity, and innovation capacity. Employability is also relevant at society level, as the employability of the workers and employees in a country (or region, or sector) has a strong

impact on employment and unemployment, innovation, competitiveness, and growth.

Therefore, we must adopt a collective approach and regard employability not only as the responsibility of the individual but also as an obligation for public educational and vocational training institutions and companies to invest in the skills of employees and workers. Using this lens, companies, labour market institutions, and social partners bear a certain responsibility in supporting the employability of the workforce.[59]

Furthermore, employability cannot be considered to be the sole responsibility of the individual looking to secure their own future. Companies should ensure that staff can retain their positions even if a difficult economic climate is cause for restructuring or redundancies.

To best benefit individual workers, their interest representation bodies, and companies, employability policies at company level must also consider workplace-related and other factors that impact employability. In this context, the concept of sustainable work has recently gained traction.[60] Sustainable work aims to achieve living and working conditions that support people in engaging and remaining in work throughout an extended working life. Work must be transformed to eliminate the factors that discourage or hinder workers from staying in or entering the workforce. However, individual circumstances are also important. Availability for work differs from one person to the next and is likely

56 Forrier, A. and Sels, L. 2003: The concept employability: a complex mosaic. Int. J. Human Resources Development and Management, Vol. 3, No. 2, 2003, p. 102–124.

57 See for example: Nickson, D., Warhurst, C., Commander, J., Hurrell, S. A., and Cullen, A. M. (2012). Soft skills and employability. Economic and Industrial Democracy, 33(1), 65–84.

58 According to the CEDEFOP Skills Panorama Glossary, https://skillspanorama.cedefop.europa.eu/en/glossary/e. This definition is also applied by Eurofound's 'Industrial Relations Dictionary: https://www.eurofound.europa.eu/observatories/eurwork/industrial-relations-dictionary/employability

59 Sánchez-Manjavacas, A.; Saorín-Iborra, C.M. and Willoughby, M. (2014): Internal Employability as a Strategy for Key Employee Retention, innovar vol. 24, núm. 53.

60 See Eurofound 2015: Sustainable work over the life-course. Concept Paper.

to change over the course of their life. The challenge is to match the needs and abilities of the individual to the quality of jobs on offer.

Employability is also a topic that has become more prominent in the context of active labour market policy and social dialogue at national and company level as well as in sectoral collective bargaining, as demonstrated by the following two examples:

- In France, employability is a key concept that was already introduced in 2005 by the GPEC (gestion prévisionnelle des emplois et des competences) scheme for mandatory strategic workforce planning. According to this scheme's legal provisions,

which have been frequently adjusted since its establishment, employers have the obligation to negotiate regarding their corporate strategy as it pertains to foreseeable effects on employment with trade unions every three years.[61]

- In Germany, employability has been a key concept in collective bargaining agreements across different sectors since the 1990s with the aim of providing specific support for older workers to stay in employment. In the context of digitalisation and automation, employability featured prominently in a landmark agreement signed in 2016 between the railway workers trade union EVG and the Deutsche Bahn.[62]

3.2 The "House of Employability"

To determine the impacts of the main drivers and trends of employability, this research project gathered assessments and suggestions from interviewees and workshop participants on the topic of employability or 'work ability' – a term developed by the Finnish sociologist Juhani Ilmarinen who has described employability as the extent to which employees are able to carry out their work given their work demands, health and mental resources.[63]

Two components determine employability:

- the individual resources of the workers (physical, mental, social skills, health, competence, values)
- the work (work content, work organisation, social work environment, leadership)

Work ability refers to the extent to which these two components match.

To illustrate this idea, Ilmarinen uses the model of a house that consists of 4 levels or floors that, together with further dimensions related to the individual (family, social networks), affect work ability.

The **ground floor** of the house of employability consists of health and physical resources. These form the essential basis for good working capacity. This floor includes

physical, mental, and spiritual-mental health, which are the prerequisites for a certain level of performance in working life. An individual worker's well-being is also closely linked to family relations and social networks.

The ground floor can only bear the demands of work if there is adequate job-specific competence on the **1st floor**. This includes sufficient professional and social knowledge, skills, and abilities. These qualities must be continuously developed throughout the employee's working life ("lifelong learning"). The importance of this floor is increasing in the rapidly changing world of work.

The **2nd floor** stands for the social and moral values of the employees and the company as a whole. These values contribute significantly to the company's work culture. Here, for example, we count dignity, respect, recognition, and justice, but also an employee's attachment to the institution, their motivation and commitment. Each employee will develop their personal concept of involvement in working life. This also affects their ability and willingness to continue learning and achieving further qualifications (1st floor).

The **3rd floor** encompasses all aspects of work content and demands (physical, mental and social), the working environment, and work organisation and leadership. Leadership occupies a particularly important position,

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61 See for example: Grimand, A. Malaquin, M. Oiry, O. 'Accords GPEC: de la loi aux pratiques – Leçons tirées de 12 études de cas', Groupe Alpha-CEREGE, October 2012.
    See also the Eurofound web-article: France: Employer's obligation to provide skill development plans or training.
    https://www.eurofound.europa.eu/observatories/emcc/erm/legislation/france-employers-obligation-to-provide-skill-development-plans-or-training

62 See https://www.evg-online.org/arbeit-40/news/tv-arbeit-40-wir-gestalten-die-zukunft/ See also the English publication EVG 2018: Work 4.0. Good working conditions in the digital world of work.

63 See Ilmarinen, J. 2019: From Work Ability Research to Implementation. International Journal of Environmental Research and Public Health 2019, 16, 2882.
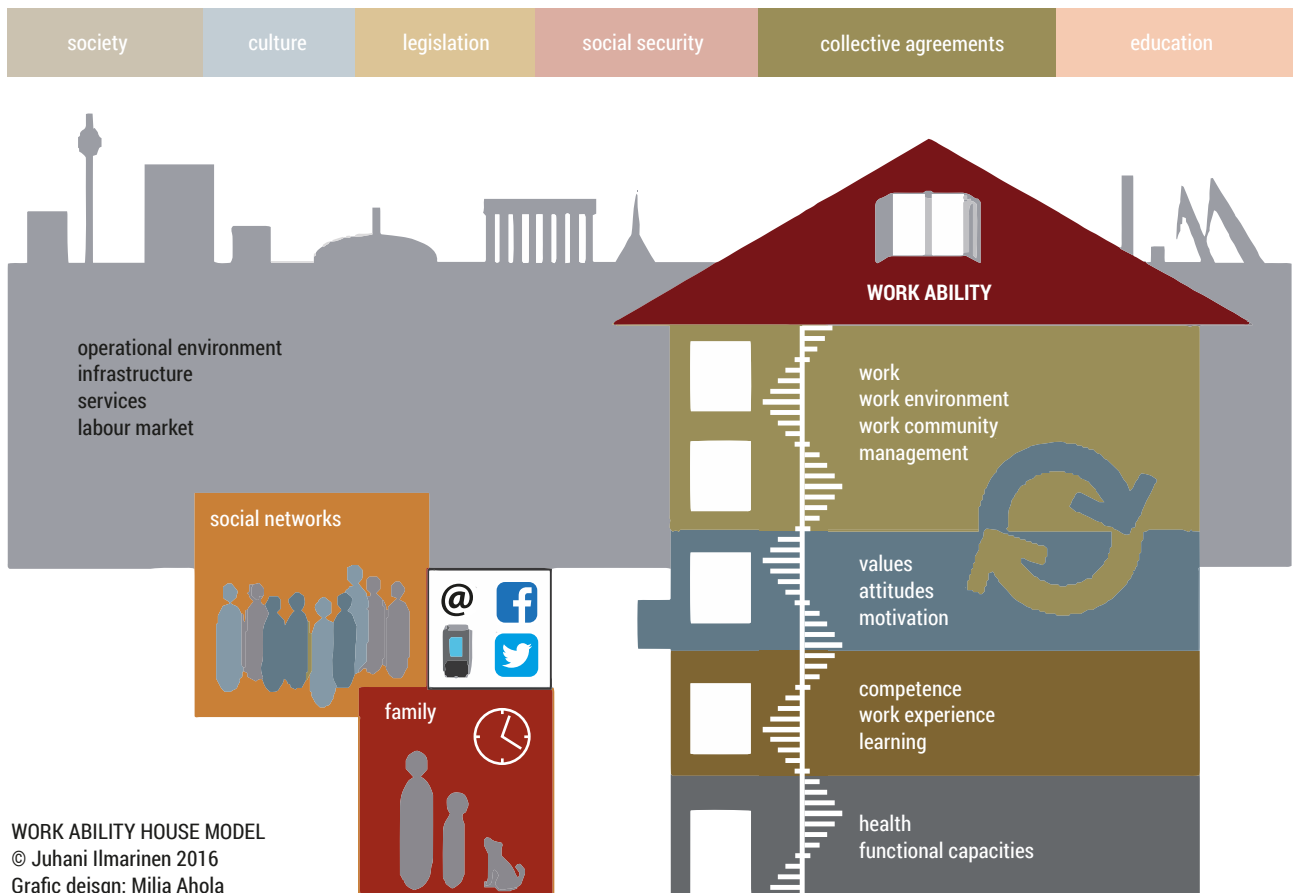
Photo: © SNCF/Maxime Huriez

as leadership behaviour can significantly influence an employee's ability to work. Other central factors that can impact workers' health and ability to work are the possibility to use their skills meaningfully and the extent to which they can influence their work processes.

Besides these core elements of employability, other individual, societal, and context factors should be taken into account: individual factors include family and social networks; company and sector-specific context factors include operational environment, infrastructure or labour market conditions, societal and cultural patterns, the characteristics of the social security and education systems, and industrial relations, including social dialogue and collective bargaining.

Figure 8: The "House of Employability" and main framework conditions

| society | culture | legislation | social security | collective agreements | education |

operational environment
infrastructure
services
labour market

WORK ABILITY

work
work environment
work community
management

values
attitudes
motivation

competence
work experience
learning

health
functional capacities

social networks

family

WORK ABILITY HOUSE MODEL
© Juhani Ilmarinen 2016
Grafic deisgn: Milja Ahola

Source: Frevel, A. 2018: Die Methode "Haus der Arbeitsfähigkeit". Präsentation auf einem ver.di Workshop in Düsseldorf, 25.09.2018.

3.3 Employability assessments and needs from the perspective of rail sector social partners

During workshops, rail sector social partners were asked their opinion of the concept of employability as illustrated by the multi-storey house. Interviewees were asked whether any aspects were missing from this model.

3.3.1 OVERALL ASSESSMENT

Whilst interviewees generally agreed that the house model reflected all main dimensions related to the individual worker, many stressed that employability should be understood as a broader concept, affected by social, cultural and legislative factors, as well as social security and education systems, and social dialogue/collective bargaining.

When asked about needs related to digitalisation and automation, both workers' and management representatives highlighted that the dimension of competence, learning and skills was crucial to cope with new needs and requirements.

A broad consensus also applied to the idea that health-related issues were very important and remained insufficiently accounted for. Many interviewees, trade unions representatives in particular, referred to the need to add aspects related to job and employment security.

Trade union representatives also highlighted that values (attitudes and motivation) were closely linked to working and employment conditions and general corporate policies – good working conditions and a good work environment being the preconditions for any motivation to learn and be open to change.

Differences were found in the role of individual and collective dimensions of employability: what interviewees were missing were aspects linked to framework conditions (e.g. social dialogue, collective bargaining, legal provisions) as well as the responsibility that employers, leaders/senior managers, and employee representation bodies bore as regards employability.

A small number of interviewees also questioned the model because they disliked the use of a multi-storey house, which included a relation of growing importance between the different storeys. They considered that a better illustration would be a building with different rooms located on just one floor

In general, management representatives had a similar interpretation of employability to workers representatives and trade unions. Whilst conceding that employers were responsible for supporting individual workers by offering further training and other support measures, they also highlighted that workers needed to be open to change, continuous and life-long learning, and self-motivation.

By contrast, trade union perspectives seemed to differ quite significantly between countries. A high level of reciprocal understanding was found in countries such as Germany or Denmark, where there is a tradition of co-determination and strong workplace involvement through works councils and agreements at workplace level, especially regarding issues like health and safety or training in the workplace. Activities and reported (good) practices were based on a strong joint understanding (at least in the current economic situation of growing employment).

In other countries, digitalisation and automation were met with more scepticism. Trade unions and employee representatives in Austria and France, for example, raised concerns regarding an imbalance between the potential economic and cost-related effects of digitalisation and automation on one hand, and the social costs associated with investments in training, skills upgrading and other practices designed to support individual employees and workers in the transition process on the other. They also stated that the health and safety impacts of the digital working environment (including COVID-19 related telework) were often neglected.

A good example to illustrate this divide is the issue of education, training, and qualification in the context of digitalisation. Whilst in the first group of companies/countries there exists a joint understanding regarding the need to find the right balance between physical/classroom-based learning and new, virtual techniques for (self-)learning, including the use of digital tools such as VR-glasses or simulators, the second group of employee and company representatives focussed on the idea that digital and virtual learning methods were mostly used by management to reduce associated costs (learning outside working time, shifting the responsibility to the employee/worker, reducing the length of training programmes, etc.).

Photo: © iStock/alvarez

Trade unions were also concerned that too much pressure was being put on the individual workers, with no reference to the responsibility borne by the employers to provide workers with the opportunities for further training and learning they need to advance their career. The following quote from a member of the EDA Rail steering committee and representative of the CGT trade union illustrates the issue well:

"We are in favour of employees who wish to have the opportunity throughout their career to follow training to carry out a professional project or access a new job. This is why we are in favour of the company putting as many training facilities as possible. On the other hand, we are not in favour of setting up a training program for employees that would be added to their work, with a view to increasing their ability to find a job in the event that their position is abolished."

(Comment received from the EDA Rail Steering Group Member and CGT trade union representative)

Photo: © ÖBB

As regards rating the different dimensions of employability, most interviewees considered all aspects mentioned to be important. However, broad discrepancies were observed in the scoring of each of the aspects.

Whereas both trade unions and employers considered the first two aspects to be very important (job security/ stable jobs; qualification, skills and competences), there were strong differences in the assessment made by the interviewees of the other aspects, whether they represented trade unions or company management.

Whilst most interviewees stated that all mentioned aspects should be addressed, others considered issues such as work organisation, motivation/engagement/ identification, job contents or requirements to be effects or results of other aspects.

A broad variance was also noted in the responses to the question regarding further domains or aspects needing to be addressed. Here, interviewees referred to specific and salient issues such as onboarding practices, career prospects, intergenerational practices, maintaining railway knowledge, promoting female employment and diversity in the rail sector, or corporate/leadership culture.

3.3.2 NATIONAL AND COMPANY-SPECIFIC VARIATIONS

Responses to company-specific or sector-wide measures and good practices were quite different. Whilst some interviewees highlighted internal good practice examples that they wished to share and present in the context of the project, many interview partners (particularly those from trade union organisations) preferred to focus on topics or measures that they hoped to address in their respective contexts during the exchange of experience, thereby learning from each other.

This reflects differences in company-specific framework conditions in the different countries included in the study, as well as national framework conditions (in particular railway-related policies), rather than the professional background of the respondents and interview partners (HR or VET, senior managers, experts, trade union leaders, works councils, etc.).

Assessments and needs were also driven and influenced by factors such as the size of the company, available financial and personnel resources in the field of HR and VET, and the urgency posed by specific challenges in the national context, such as ageing, wage levels, and attractiveness of rail sector jobs, etc.

Therefore, there **cannot be a one-size-fits-all solution** when it comes to measures fostering and promoting employability in the rail sector. What is needed instead is a multi-faceted approach adapted to different framework conditions and requirements.

3.3.3 DIGITALISATION AND AUTOMATION – ASSESSMENT AND NEEDS

All interview partners agreed that digitalisation and automation are currently the most important drivers for change in the rail sector, affecting all business areas (operation, infrastructure/network, services) as well as passenger and freight transport.

As regards opportunities and risks related to digitalisation and automation in the rail sector, employer and management representatives considered the digital transformation process to be essential in improving effectiveness and performance and achieving ambitious European and national goals relating to capacity, attractiveness, and model shift. Whilst trade unions and employee representatives at company level agreed with this sentiment in principle, they also raised concerns that parts of the workforce (older employees, employees with tasks that face the risk of being substituted by machines/automation – female employees in particular – or employees with low qualification levels) would be left behind.

Whilst both workers and management representatives conceded during interviews that digitalisation and automation are not new phenomena and reflect the general process of applying technological innovation and new technologies with a view to increase efficiency and productivity, they also highlighted a number of "disruptive" technologies that will have a significant impact on the workforce in the future. These disruptive technologies included artificial intelligence (AI) and (automatic) big data (analytics), which will impact the rail sector as a whole through the digitalisation of traffic control, digital automatic coupling, or virtual reality applications.

According to both trade union and management representatives, automatic train operation (ATO) in regional, medium and long-distance railways will only become relevant in a medium- and longer-term perspective, i.e. after 2030, as its implementation will require certain infrastructure-related preconditions and heavy investment in traffic control, infrastructure, and rolling stock.

Impact of digitalisation and automation on skill requirements for train drivers

It was decided to introduce ETCS on the Danish network and undertake a complete modernisation of the fleet of Danish railway undertaking, DSB. As a result, DSB management had to adjust the locomotive drivers' training to respond to new skills and competence requirements and to address challenges related to the quality of this training, such as making it more efficient and attractive for new drivers and integrating new digital formats (simulator training, distance learning). According to HR management, this transformation requires a new culture of learning and training.

Whilst the Danish Railway Union, DJF, welcomes digital transformation in rail sector and the new opportunities it provides for both railway undertakings and workers, it also stressed that digitalisation and streamlining should under no circumstances impair the quality of training and the high safety levels, but rather improve them. Furthermore, and most importantly, DJF considered that digital education and training should focus on the individual employee and their skills and aim to balance business needs with employee well-being. Employees and their representatives must be actively involved in the process of the digitalisation of training.

Sources: Presentations by representatives of Danish State Railways DSB and the Danish trade union DJF at the EDA Rail Workshop in Copenhagen, September 2021.

New skill and competence requirements for train drivers in the context of automatic train driving and ETCS

In view of national plans to equip large parts of the rail network in Austria with ETCS level 2, the transport trade union vida summarised the main skill-related challenges facing the involved staff (train drivers, traffic management and control staff). The digitalisation and automation of train driving, safety control and traffic management results in high levels of complexity during the transition period, as legacy control systems (PZB and LZB) and ETCS level 1 are in use alongside ETCS2. Different hard and software systems are also operating simultaneously. As a result, involved staff and train drivers must maintain and gain comprehensive technical knowledge.

Source: Presentation of a vida representative at the EDA Rail Workshop in Lille, March 2022

Changing job profiles in digitalised traffic control and management

Both employers and trade union representatives highlighted that, in the domain of traffic control, work in digitalised control centres will change significantly. There will also be the need to retrain existing staff and develop new hard and soft skills, such as the ability to work under pressure, the ability to work independently, the ability to work with digital tools like simulators to train for emergency situations, for example. In addition, work organisation and management are changing: new positions are being defined and new professional development paths established.

Source: Presentation of trade union and employer representatives at the EDA Rail Workshop in Prague, April 2022

Impact of COVID-19 on apprenticeship training

Worrying results emerged from a large survey of apprentices (in all sectors, not limited to railways) regarding the impact of the COVID-19 pandemic on their working conditions and the experience of remote learning. Around one third of the apprentices who participated in the survey (commissioned by the DGB trade union conference) noted that their employers had not provided them with the necessary hard and software. Apprentices also reported that they often found it difficult to directly contact trainers to discuss problems and questions. And nearly half of all apprentices found that the quality of remote/home-based virtual education and training has suffered.

Source: Presentation of the DB Youth Representative at the EDA Rail Workshop in Copenhagen 2021.

However, this does not mean that train driving is not currently undergoing digitalisation. Examples presented during the EDA Rail workshops showed that the modernisation of existing lines and the introduction of ETCS level 2 is providing the basis for the transition from manual to assisted driving.

Trade unions and employers largely agreed that the impact of digitalisation and automation on some occupations was fundamental, as certain tasks were undergoing significant changes or even disappearing completely. This has happened and will continue to happen in all key areas of the rail sector (e.g. automatic processes/AI in administration/HR, digitalisation of ticket sales/travel information services, digital signal boxes, traffic control in network and infrastructure, the implementation of digital coupling and automatic train operations, etc.).

Furthermore, and in contrast with past technological innovations, all jobs will be affected due to the fact that basic digital skills will be required across the board and that there will be a generalised need for upskilling – that is to say that occupations currently requiring basic digital skills (e.g. train drivers, traffic control centre staff, mechanics) will require medium digital skills, and occupations currently requiring medium digital skills will require advanced digital skills in the future.

Interviewees also agreed that digitalisation and automation in the rail sector presented an opportunity in terms of offering new mobility services and developing new business models (e.g. micro-mobility, door-to-door mobility, mobility apps that integrate public and private local transport services, etc.).

Similarly to other sectors, digitalisation and automation in railways are opening the door to new market entrants, particularly global digital giant companies and digital platforms. Such companies act as competitors in certain segments (e.g. travel apps) but also offer services to railway companies that result in new dependencies, namely as regards cloud computing.

Whilst workers and management representatives agreed during interviews that the COVID-19 pandemic has accelerated digitalisation and automation in different domains of the rail sector – namely booking via apps, boarding, remote working, virtual learning, self-learning, online recruiting, etc. – the conclusions that both groups drew regarding this trend and its impact on future work were quite different. Trade union and works council representatives raised concerns regarding working conditions, the quality of training and learning, and the risk of blurring boundaries between working and private life.

Photo: © SNCF

3.3.4 ASSESSMENTS OF OTHER DRIVERS OF CHANGE

Besides digitalisation and automation, interviewees and stakeholders participating in the EDA rail workshops referred to a broad range of further factors that will shape the rail sector in the future and need to be taken into account when considering employability. Many of these factors related to social and demographic issues and the need for railway undertakings to become more attractive to the younger generation, women, and specific occupational groups, particularly IT specialists.

As regards demographic change, interviewees from several companies and countries noted that the average age of staff is quite high and that large segments of the workforce will retire in the coming years. In some companies, the issue is exacerbated by past phases of workforce reduction (or hiring freezes), which has resulted in the current age structure being characterised by a missing "parent generation" (between 30 and 50 years old). HR representatives (in most analysed countries but not all) stressed that companies needed to become more attractive for young people, promote female staff in technical and managerial positions, and promote a more diverse workforce in general.

Given the significant quantitative and qualitative changes in the railway workforce that are expected in next the 5 to 10 years, interviewees highlighted the need to maintain existing railway-specific knowledge and foster "railway system thinking" amongst the younger generation of employees. This was regarded as a challenge because the younger generation often held different perceptions of work and the work-life balance over their lifecycle than the older generation.

Finally, many interviewees also referred to market conditions and the current competitive environment that will become more demanding in the future due to increased competition, new entrants, and totally new actors such as digital platforms and service providers, all of which will impact the rail market.

4 Measures and good practices in different rail sector domains

During both interviews and the four regional workshops, social partners presented measures and good practices aimed at accompanying digitalisation and automation and promoting employability across different domains in the rail sector.

This chapter provides an overview of the measures presented and discussed in the context of the project. In total, 30 practice examples were highlighted in the following thematic areas and rail sector domains:

- Anticipation of change and employability
- New skills, training and learning
- Attractiveness, equal opportunities and diversity
- Automatic train operation
- Railway maintenance
- Rail traffic control and management
- Customer relations, digital services and IT management

The measures presented in the following sections illustrate that social dialogue and collective bargaining at different levels play an crucial role in shaping the process of rail sector digitalisation and automation in a way that accounts for the interests of workers and employers alike. It is also important to point out that the importance of social dialogue and workers' involvement and participation in digital change was highlighted by employer representatives across Europe, including in Central and Eastern Europe.

It should be noted that these practice examples do not only include joint initiatives and social dialogue outcomes, such as agreements at company and sector level. Unilateral measures undertaken by trade unions, employer organisations, or companies have also been included as they were considered to be highly relevant for employability.[64]

4.1 Anticipation of change and employability

Good practices identified by fieldwork and reported during the EDA rail workshops encompass a broad range of activities that also reflect the differences in social dialogue frameworks and industrial relations systems.

> "The SNCF Solidarity Employment Programme, launched in January 2020, aims to put the human element and solidarity at the highest level of the company and ensures that each employee builds his or her professional future with the help of the company."
>
> Source: SNCF presentation at the EDA Rail Workshop in Frankfurt a.M., November 2021

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[64] These initiatives correspond to a broad variety of measures that reflect the variety of industrial relations at national level. Social dialogue, for example, could involve information and consultation practices and joint social partner initiatives, programmes, and projects, whilst collective bargaining could include agreements reached between trade unions and employers at enterprise, company, sector, regional, or national level. In the case of Germany, some of the agreements listed here are agreements between works councils and management at company level. Good practices also cover unilateral initiatives and practices carried out by either trade unions or employer organisations.

As Table 4 shows, social dialogue practices and outcomes include company level and sectoral collective agreements, as well as shop stewards, trade union committees, or works councils being consulted about or participating in company initiatives addressing digital change and employability.

Table 4: Measures and good practices in anticipating change and employability

Measure / Good practice	Type of measure	Country	Main parties involved	Railway domain
Digitalisation Fund	Social Dialogue	CH	SBB and SEV	All domains
NEXT Academy / Digital Forums	Social dialogue	LU	CFL and SYPROLUX	All domains
Agreement on social unity and the development of social dialogue	Collective agreement	FR	SNCF and trade unions	All domains
Agreement on Work 4.0	Collective agreement	DE	EVG and DB	All domains
Solidarity Employment Programme / Territorial Social dialogue	Social dialogue	FR	SNCF and local trade unions	All domains

Source: wmp consult

4.2 New rail sector skills, training and learning

Training and education are at the heart of discussions on the social impact of automation and digitalisation. The trend towards greater automation and digitalisation in EU job markets, including in the transport sector, highlights the need for relevant educational and training programmes, as well as in initial training activities such as apprenticeship training. These programmes need to adequately prepare workers for the challenges of future work, since it is expected that automation and digitalisation will cause a mismatch between skills demand and supply.

Good practices reported in interviews and presented during EDA rail workshops covered a range of measures, including the anticipation of new skill requirements through the adjustment of vocational training programmes or the development of new occupational profiles.

A further central element of these good practices was the development of new forms and methods of education and learning, such as blended learning or the use of VR and simulators as complementary learning tools.

Table 5: Measures and good practices for rail sector skills, training and learning

Measure / Good practice	Type of measure	Country	Main parties involved	Railway domain
Implementing new contents in apprenticeship training	Social dialogue	AT	ÖBB and apprentices	
Digital tools and learning in apprenticeship training	Social dialogue	DE	DB and EVG	
FutureLab@DB	Unilateral	DE	DB	
Service for new occupational profiles in rail transport and mobility	Social dialogue	AT	ÖBB and vida	
Digital reskilling for future jobs	Social dialogue	FR	SNCF	
Blended learning	Works agreement	DE	DB and works council	Railway skills, training and learning
Integrating virtual reality and simulation in railway training	Employer initiative	SE	SJ	
Modernisation of train drivers training	Social dialogue	DK	DSB and DJF	
Modernisation of apprenticeship training in maintenance	Employer initiative	AT	ÖBB	
Railway Competence Fund	Public Fund	IT	FS	
National committee for the profession of train drivers	Social dialogue	FR	SNCF and trade unions	

Source: wmp consult

Photo: © SNCF

It should also be noted that social partners made use of EU funds to finance innovations and improvements in rail sector training. Italy, for example, established a 'New Competence Fund', which also applies to the rail sector and is funded by the EU "Next Generation" recovery plan.

Figure 9: The "New Competence Fund" (Fondo Nuove Competence) in Italy

Normative references
Article 88 of d.l. n. 34/2020, as amended by article 4 of d.l n. 104/2020 and article 8 of d.l.n. 228/2021
Validity
Years: 2020–2022 • next generation EU – recovery plan measure

HOW
rescheduling employees' working hours by providing training paths

Goals
• Satisfy employers' needs of new competences linked to technological innovations and organisational review
• Satisfy employers' need in reskilling employees
• Offering employees the opportunity to acquire or increase skills to face the new challenges of digitalisation
• Training workers in digital skills to fill the roles of the future (automation, big data, artificial intelligence)
• Promote professional mobility process

Activation modes – Collective agreement with national trade unions
• Organisational, technological or service innovations responding to the changed production needs of the company
• Hours of work devoted to training (max 250 hours)
• Employers' needs in terms of new or increased skills as a result of the above innovations
• Training adaptation necessary to qualify and retrain the worker in relation to the identified needs
• Forecast of training projects
• Number of workers involved in the agreement
• Demonstration of capacity to carry out the training project

Benefits for employers
FNC finances the working hours dedicated to training (including social security and welfare contributions, accruals for thirteenth and fourteenth monthly payments and TFR are not included).

Source: Presentation of a representative of FS Italy, EDA Rail Workshop Lille, March 2022.

Photo: © SNCF

4.3 Attractiveness, equal opportunities and diversity

As previous sections of this report have shown, labour shortages in the rail sector present a huge challenge across all EU countries. Indeed, the sector is characterised by workers with high average ages and by unattractive working conditions in main operational areas due to shift work and continuous services. In view of this, all companies have developed measures to increase their attractiveness to both younger workers and women. The transport sector is traditionally male-dominated. Moreover, the workforce is ageing, and there is a

shortage of workers in certain areas. Young, female, and disabled workers are underrepresented due to both strenuous working conditions – including physical labour, shift work, days away from home, and difficulties in achieving a good work-life balance – and unattractive working environments. Interviewees also reported that rail companies are seen as old-fashioned employers by young people, regardless of gender, which makes it difficult to recruit young professionals in certain areas, like STEM jobs, for example.

> **"Diversity management goes beyond the principle of equal opportunities. It uses the diversity of employees for the benefit of all stakeholders and the company."**
>
> Source: Interview with the Diversity Officer of the ÖBB Group, Austria

The introduction of automation and digitalisation provides an opportunity to change and improve working conditions in the rail sector and, consequently, offers opportunities to create a more diverse workforce, including ethnic and cultural diversity.

It should be noted that the European Social Dialogue for rail has been promoting gender equality and the participation of women in railways very actively for over ten years. In November 2021, "The European Social Partner Agreement Women in Rail" was officially signed by representatives of CER and ETF.[65] This binding agreement

is the first of its kind in the European Sectoral Social Dialogue and builds on intensive activities carried out previously, such as the joint recommendation issued in 2007 and the Women in Rail project from 2012, which was followed by annual monitoring reports.

The 2021 Agreement aims to attract more women to work in the rail sector[66] and to guarantee equal opportunities in the workplace by developing and implementing measures in the following thematic areas: attracting more women to the sector, work-life balance, promotion and career development, equal pay for women and

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65 The agreement is available here: https://www.cer.be/sites/default/files/publication/211105_CER-ETF%20Agreement_Women%20in%20Rail.pdf

66 See: http://www.cer.be/wir

men, health and safety at work, and preventing sexual harassment and sexism. Companies in the rail sector now have 12 months to develop an equality and diversity policy and 24 months to implement it.

The examples presented in Table 6 were emphasised by trade unions and employer organisations during the project. In addition to the landmark WIR agreement, the initiatives launched by ÖBB, SNCF and DB and summarised below should be regarded as exemplary measures, similar versions of which also exist in other railway undertakings across Europe.

Table 6: Measures and good practices for attractiveness, equal opportunities and diversity

Measure / Good practice	Type of measure	Country	Main parties involved	Railway domain
Women in Rail (WIR) agreement	Framework Agreement	EU	ETF and CER	Equal opportunities and diversity
Promotion of diversity	Employer initiative	AT	ÖBB	Equal opportunities and diversity
Promotion of diversity	Employer initiative	DE	DB	Equal opportunities and diversity
Agreement on gender diversity and gender equality	Collective Agreement and several employer initiatives	FR	SNCF and trade unions	Equal opportunities and diversity

Source: wmp consult

4.4 Automatic train operation

Social dialogue at EU and national level has addressed automatic train operation through various measures and initiatives. SNCF, in consultation with company-level trade unions, is working on the introduction of automatic train operation in the Paris area. Other initiatives were taken by FS Italy to adjust and modernise train drivers training to prepare for automatic train operation.

Social partners also reported good practices, which, though not strictly focussed on ATO, related to establishing a dialogue platform in the context of the European DAC Delivery Programme or involving trade unions and works councils in DAC development and testing on the ground in Austria.

Table 7: Measures and good practices for automatic train operation

Measure / Good practice	Type of measure	Country	Main parties involved	Railway domain
Automatic Train Operation and Supervision in the Paris Area	Social Dialogue	FR	SNCF and trade unions	Automatic train Operation
Joint dialogue platform	Social dialogue	EU	EDDP and ETF	Automatic train operation
Involvement of workers in DAC development	Social dialogue	AT	ÖBB and vida	Automatic train operation
Train drivers training projects	Unilateral	IT	FS Italy	Automatic train operation / train drivers training

Source: wmp consult

The following example, which was taken from a presentation made by a trade union representative and works council member from Austria, shows that trade unions have been involved since the beginning of DAC deployment activities, including (together with other colleagues from ETF and Germany) in testing activities on the ground. According to management representatives, the involvement of railway staff who routinely undertook coupling and other relevant activities brought important added value in terms of further refining of the new technology. Indeed, their participation allowed for certain health and safety and system safety risks that had not initially been considered to be identified.

Figure 10: Trade union involvement in DAC deployment and testing in Austria

Cooperation ÖBB – Works Council –vida

- Involvement of the works council and the trade union at the beginning of the project
- Establishment of an expert group within the works council and vida to provioide support from the workers' perspective
- Visiting the first real developments at the TÜV Test Centre Görlitz at the beginning of 2021
- Evaluation and monitoring of the test train Austria 2022
- Continuous follow-up of technical developments and assessment of health & safety

Source: Presentation from a vida trade union representative, EDA Rail Workshop Prague, April 2022.

Another example of good practice was highlighted by HR management representatives from FS Italy: their training projects, in which activities revolved around "pre-employment" training, not only for train drivers but also for other technical rail sector professions. These projects aimed to develop a pool of "broadband" skills that are important for the future.

Figure 11: Modernising train drivers training in Italy

Goals
- Ensuring innovative pre-employment training for technical professions in sustainable mobility (e.g. train driver, train conductor, maintenance operator, etc.)
- Offer companies in the sector/industry a pool of "broadband" professionals (versatile professionals able to adapt to the professions of the future) with the following competences:
  - specialist/domain skills: maintenance, logistics, vehicle driving;
  - sustainability skills: sustainable mobility, sustainable infrastructure, energy management, diversity & inclusion;
  - digital skills: automation, big data, artificial intelligence;
  - social ands service skills: customer/service orientation, communication, cooperation & networking, safety

Benefits for employers
- Anticipation of training in a pre-employment phase
- Improving the quality of the recruitment process for operational profiles
- Combining technical specialisation with transversal skills (digital, service, etc.) for a sustainable mobility
- Offering students advanced training methods (robotics solutions, augmented and virtual reality, etc.)

HOW*

ITS Academy
- Funded by employers operating in technological areas of transport, mobility and logistic and public entities (regions)
- Linked to the development of smart and green mobility services
- Proved experience in technological innovation process
- Next Generation EU – recovery plan measure

Train Drivers private school
Training school set up as a joint organization of railway companies and training providers, with FS Group as promoter of this initiative

* The FS Group is currently analysing the most suitable way of implementing the train driver training project.

Source: Presentation of a FS management representative, EDA Rail Workshop Lille, March 2022.

Photo: © ÖBB

4.5 Railway maintenance

Both interview partners and workshop participants in the EDA Rail project pointed out that maintenance of railway rolling stock and infrastructure is being majorly impacted by digitalisation and automation. New technologies and the dramatic increase in the amount of data gathered by digital tools and sensors have enabled methods of predictive or remote maintenance and repair works that are expected to contribute to greater efficiency in cost and time. Digitalisation and automation across different technical professions relating to railway maintenance result in new skills and competence requirements, including upskilling digital skills and the emergence of new profiles such as big data analysts or – as noted by one interview partner – predictive maintenance specialists.

Representatives from the ETF working group on maintenance stressed that railway trade unions and company-level shop stewards and works councils are not concerned about digitalisation, but rather about how it might impact the future of work in railway maintenance and repair workshops. They reported that maintenance tasks and competences were increasingly being outsourced to the suppliers delivering new hard- and software systems in many railway undertakings. According to union representatives, this not only has a negative impact on employment but often results in an increase (rather than a reduction) of running maintenance costs. Furthermore, it causes a loss in value-added creation and competences within railway companies. Trade unions from different countries involved in the EDA rail project also reported that outsourcing maintenance to suppliers or other companies often went hand in hand with worsening pay and working conditions. Sector-wide collective agreements were highlighted as good practice to counter these risks. Such an agreement was, for example, negotiated by railway trade unions in Italy.

Table 8: Measures and good practices in railway maintenance

Measure / Good practice	Type of measure	Country	Main parties involved	Railway domain
Advisory group maintenance	Trade union initiative	EU	ETF	Railway maintenance
Single agreement for the national railway sector	National collective agreement	IT	Agens (ANCP accessed to the National Collective Agreement) and FILT-CGIL, FIT-CISL, Uiltrasporti, UGL Ferrovieri, FAST Confsal, ORSA Ferrovie	Automatic train operation

Source: wmp consult

4.6 Rail traffic management and control

The issue of the digitalisation and automation of rail traffic control and management was addressed during a regional workshop in Prague, in which there was a strong presence of social partners from Central and Eastern Europe. This workshop showed quite starkly that the deployment of digital rail traffic control and management had a huge impact on skills and competence needs for dispatchers and other staff groups, as well as on issues like work organisation, working time, attractiveness, and the evolution of career paths.

It was, therefore, quite impressive to learn that social dialogue, active involvement, and worker and trade union participation in change processes and outcomes, such as collective agreements on the reclassification of wage groups and bands, were considered by social partners to be important measures (see Table 9).

The list includes an example that relates to the re-integration of railway training for traffic management and control staff to increase the quality of training and make the profession more attractive to younger workers.

Another example is that of an agreement between the works council and the management at DB Netz AG, the German infrastructure manager. On the basis of the agreement on digitalisation between the EVG trade union and Deutsche Bahn, DB Netz AG and the central works council reached a General Works Agreement (GBV) on employability that provides for the establishment of a social and training fund. This fund is financed by the company to support workers (upon individual application) with training and health support measures.

> "Colleagues can apply for and acquire funding for their individual qualifications. If there are efficiency gains to be made from progressive digitisation, we want to benefit, for example, to fund qualification and health promotion for colleagues. This is not money for employers, but for employees, and we can and must dispense this."
>
> Source: Interview works council representative of DB Netz AG

Finally, the list below also includes a unilateral measure commissioned by the European and Italian railway trade unions: a research study on the social impacts of ERTMS. It was included because it illustrates the role of national and European unions in anticipating change and identifying needs for action in the context of digitalisation and automation.

Table 9: Measures and good practices for rail traffic management and control

Measure / Good practice	Type of measure	Country	Main parties involved	Railway domain
Social and training fund	Works agreement	DE	DB and works council	Rail traffic control and management
Adjusting wage levels of traffic control staff	Collective bargaining	CZ	OSZ and SŽCZ	Rail traffic control and management
Involvement of trade union in digital change	Social dialogue	HU	MAV and VSZ	Rail traffic control and management
Impact of ERTMS/ETCS on employability	Trade union initiative	EU	ETF and FILT CGIL	Rail traffic control and management
Reshoring of training	Employer initiative	HU	GYSEV	Rail traffic control and management

Source: wmp consult

Photo: © SNCF

4.7 Customer relations and digital services

Digital services and customer relations are also an area where railway companies need to recruit new staff and become more attractive to IT experts.

Markedly different types of good practices to this effect were discussed during interviews and EDA Rail workshops, as illustrated by the following two examples from France and Germany.

Table 10: Measures and good practices in rail traffic control and management

Measure / Good practice	Type of measure	Country	Main parties involved	Railway domain
Digital reskilling for future jobs	Social dialogue	FR	SNCF	Railway skills, training and learning / Customer and IT services
Introduction of agile work organisation in IT services	Works agreement	DE	DB and works council	Work organisation / IT services

Source: wmp consult

In the view of the increasing demand for IT jobs in railways, SNCF developed a measure designed to "reshore" or re-internalise functions and jobs that had previously been externalised or subcontracted. This was done by re-training existing SNCF staff. For this purpose, they established a competence centre for the development of web applications, which was linked to the SNCF digital department (e-sncf solutions). SNCF was in dialogue with company-level trade unions during the implementation of this measure.

This project started with a first class in November 2021 and aims to re-train a total of 300 SNCF employees for tasks and functions in web-application development by 2025, and thereby reshore about 10 % of the work that is currently carried out by external contractors.

Participants in the programme will become "Web and Mobile Developers" and receive a diploma equivalent to EQF level 5 with a school identified by SNCF. The training includes an upgrading phase and a training phase, which last 7 months and are carried out in France, plus a 4-month internship in a company. It also includes the possibility to acquire complementary Microsoft certificates in low coding.

Developing internal IT resources and rebuilding competences and innovation capacities in the field of customer relations and digital services was also the main driver behind the introduction of a new work organisation at DB Systel. In this case also, the measures taken were developed through close collaboration between management and workers representatives (the DB Systel Works Council), and the change process was framed by an agreement between the group works council and DB Systel management.

In 2015, the company went through a significant crisis due to the inefficient handling of projects that either failed or had very limited success. Furthermore, the company was not associated with any innovation potential – rather the opposite. The company's work council agreed that DB Systel needed to undergo fundamental change in order to become a competent partner in the DB Group and shape the digital transformation process. The works council did not only want to accompany this reorganisation, but rather actively shape it to fit the interests of the employees.

Therefore, the employees and their representatives were active proponents of a radical change and transformation process in the corporate culture and work organisation. Based on the principles of "agile working" (self-organised work in project-related teams, with new roles and processes organised in units and clusters), which has been quite successful in the software development sector, DB Systel adopted a new work organisation. Agile working at DB Systel was organised by a detailed set of rules described and agreed upon in the "General Works Agreement Transformation" ("GBV Trafo").

GBV Trafo is a framework agreement. It was proactively developed by the works council and regulates working in a self-organised working world. In addition to basic principles (self-organisation, self-management, self-regulation), the agreement also contains the description of bodies and roles involved in the transformation (e.g. agility master) and regulations concerning the establishment of teams and the works council's participation rights. GBV Trafo is special due to its iterative adaptation process. The agreement is regularly revised in line with experience drawn from its application and developments in the company. This means that the provisions of the GBV Trafo are not fixed in stone; they can be adapted and supplemented subject to situational requirements and agreement from both sides. It consists of a continuous learning process, where experience leads to new changes. It did not seem feasible to draw up comprehensive regulations for the process in advance. This led to the idea of an open, self-learning company agreement. In practice, this means that the company agreement is continuously developed.
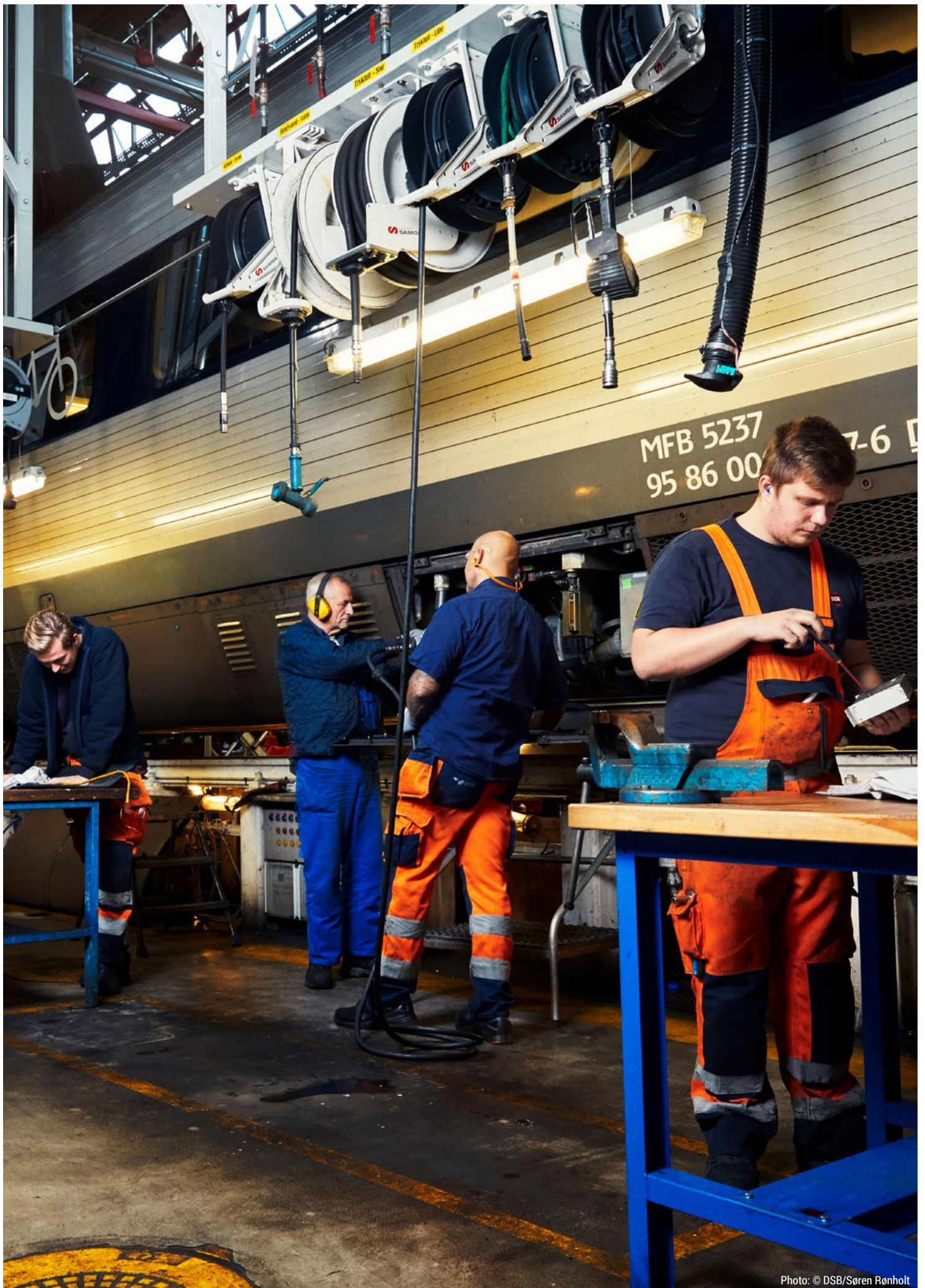
Photo: © DSB/Søren Rønholt

5 Conclusions and recommendations for a modernised concept of employability in the rail sector

5.1 Conclusions and reflections on the 2007 Memorandum on Employability

The research activities and the collaborative workshops carried out in the context of the EDA Rail project provided an opportunity to study the impacts of digitalisation and automation, as well as other important drivers (the transition towards greener and more sustainable mobility, demographic, social and societal change, new customer needs, and growing diversity), by adopting the birds-eye perspective of academic research and comparing existing results with concrete practices.

The EDA Rail project was also carried out at the right time. In the last two years, several important initiatives have been launched at EU level: the ambitious goals contained in the Smart and Sustainable Mobility Strategy (2020); a bundle of initiatives to foster rail freight transport, high-speed railways, night train connections published during the 2021 Year of Rail; and the Action plan to boost long-distance and cross-border passenger rail published in December 2021. After two years of negotiations, the social partners for rail also concluded the first autonomous framework agreement to promote women in railways. Since the beginning of 2020, the COVID-19 pandemic has accelerated technological change in the rail sector, namely in customer services, on-bord services, or teleworking and flexible mobile working for white collar staff groups.

In addition, the project and the accompanying research draw interesting conclusions regarding digitalisation and automation. It has been decisively demonstrated that digitalisation and automation are not new phenomena – all companies involved in the project have established preliminary learning curves for the introduction of new technology and digital processes and tools across all main domains of activity. However, these changes have gained momentum quite rapidly, not just in areas such as customer relations and new mobility services but also in operation and maintenance, which raises questions pertaining to automatic train operation, digitalisation of maintenance, and the emergence of Dynamic Maintenance Management Systems (DMMS). The research and practice reports carried out during the project have shown that change has accelerated quite dramatically in this field in recent years and will continue do so in the coming years due to important technology-related decisions and agreements on digital automatic coupling, for example, or the publication of a new generation of technical specifications for interoperability later in 2022.

The research, interviews with social partners and experts in different areas of railway operation and infrastructure, and collaborative workshops have shown that digitalisation and automation is affecting all domains within the rail sector, and is likely to do so even more strongly in the future. These effects go beyond what has been caused by technological change in the

Photo: © ÖBB

past (e.g. electrification, computerisation). They not only result in the need for employees and workers (as well as trainers and management personnel) to acquire new skills, knowledge and competences but also affect the modes and organisation of work, working conditions and working environments, corporate "cultures" and "mindsets", and the role of education, training and (continuous) learning within organisations.

HR services have recently taken to labelling the change induced by digitalisation, automation and other drivers with new terms such as "new work",[67] focussing very much on trends such as more flexible working time (organisation), self-organisation, or flat hierarchies. However, it seems doubtful that these new concepts provide any additional analytical value compared to more mature concepts such as employability, which is rooted both in the tradition of HR practice and in the field of industrial sociology and occupational health research.

The concept of employability retains its analytical strength so long as it is understood as more complex than simple employment. It represents a balance of individual resources and capacities on one hand and the (company and sector-specific) requirements, demands and needs involved in getting a job, retaining a job and having access to professional career development on the other.

Such basic assumptions regarding the concept of employability and the focus on the human factor are highly relevant when it comes to the impact of digitalisation and automation. Furthermore, the different "floors" of the "house of employability" and their interlinkages are perhaps more relevant today than in the past.

However, all these considerations were only partially taken into account in the Memorandum and Recommendations on employability in the rail sector that were agreed upon and published by CER and ETF in 2007, a time when change was less related to digitalisation and automation than it was to liberalisation, EU enlargement and restructuring in European railways.

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67   See for example the 2021 edition of the Hays HR Report: https://www.hays.de/documents/10192/118775/hays-hr-report-2021-new-work-de.pdf.

There is a need for a revised or modernised version of the 2007 Memorandum not only because the drivers of change and transformation in the rail sector have since evolved but because – although the 2007 document addressed the "what" ("creating a working environment which maintains and improves the capacity of the workers in respect to qualifications and competencies as well as health and fitness"), pointed out the crucial role of social dialogue, and the shared responsibility of companies, employees, works councils and trade unions – it remained totally silent on the topic of objectives, principles and framework conditions. The final sections of this report contain ideas to that effect.

The 2007 Memorandum and Joint Recommendations on employability in the rail sector

Over a period of several years (2000–2007) and two larger projects, ETF and CER (as well as EIM) addressed the issue of employability in railways. This work finally resulted in a joint memorandum titled "Employability: An HR strategy for shaping change in the railway sector" and signed in 2007. The memorandum also included a set of five policy recommendations regarding "The concept of employability in the railway sector."[68]

In the 2007 memorandum and recommendations, CER and ETF considered employability to be generally useful as a "strategic concept" to provide new orientations in HR policy. Employability as a concept was also regarded as valuable because it understood the issue of change to be permanent ("change is the norm").

However, in 2007, social partners highlighted difficulties and shortcomings relating to both the concept and its application. Chief amongst them was the lack of a clear definition: "The increasingly diffuse way in which the term "employability" is used also caused problems for the study group"

Furthermore, the authors of the memorandum highlighted the differences between the needs and challenges linked to employability in railway companies in the "old" and "new" member states.

The 2007 recommendations included a definition of employability[69] and recommendations on how railway companies could use the concept and highlighted the accompanying role of social dialogue at national/local and European level:

• "The rail companies in Europe should use the strategy of employability (…) as a central theme for human resources policies and thereby package the various instruments for personnel and organisation development into an integrated approach."
• "Aims, principles and framework conditions for the implementation of the strategy (…) should be agreed on the basis of social dialogue between the social partners in order to allow the benefit of the approach to be effective for both parties …"
• "The European social dialogue on railways will promote and accompany the process (…) and carry out interim assessments from time to time. This can occur through various instruments …" (conferences, exchange of experiences, monitoring, case studies of good practice, basic guides, exemplary agreements …)

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68 https://www.etf-europe.org/resource/joint-recommendations-the-concept-of-employability-in-the-railway-sector-october-2007/

69 "Employability as a strategic concept is based on prevention and aims to create a working environment which maintains and improves the capacity of the workers in respect of qualifications and competences as well as health and fitness in order to be 'employable' in general terms. The responsibility is a shared responsibility of the company, the employees, works councils and trade unions."
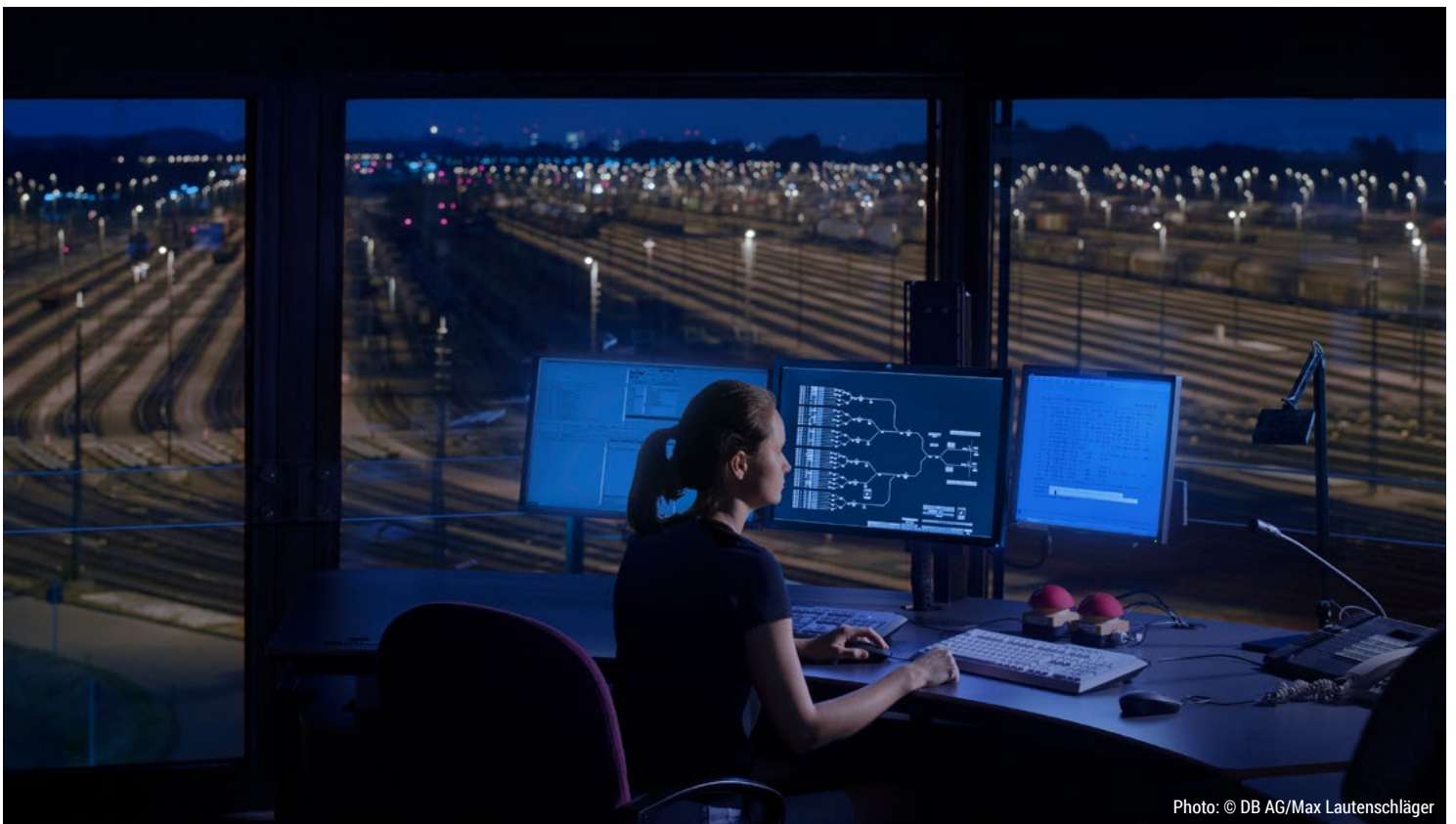
5.2 The main dimensions of employability in light of challenges and new requirements related to digitalisation, automation and other drivers

The four dimensions of employability described in section 3.2 are still highly relevant. However, they also need to be updated and modernised to address the new requirements and challenges arising from digitalisation, automation and other trends and drivers.

In the following, key aspects and issues that would require further consideration when developing company-level policies and/or sectoral frameworks are highlighted for each of the four dimensions.

5.2.1 HEALTH, SAFETY AND FUNCTIONAL CAPACITY

According to the assessments of experts and various stakeholders, the impact that digitalisation and automation in the workplace has on workers' health, safety and well-being is too often neglected or downplayed because digital workplaces and work environments tend to be pictured as cleaner and safer.

As a result, new emerging risks and challenges have not sufficiently been addressed. These risks include the impact of increased work intensity, task-overload and multi-tasking, extensive screen time, lack of (physical) social interaction and isolation, constant (online) availability, etc.

The boundaries between private and working life are becoming increasingly blurred for many groups of employees. This highlights the need to find a good balance between professional and family life in order to avoid work-overload and related health risks.

5.2.2 SKILLS, COMPETENCES AND LEARNING

Social partners strongly highlighted skills, competences and learning as a key element of employability. The main objective is to equip our current and future workforce and enterprises with the appropriate skills through continuous learning, skill development, and further training. In addition to new technical and hard skills, stakeholders involved in the EDA Rail project also stressed the increasing importance of soft skills such as problem solving, communication skills, self-learning skills, creativity, and collaboration skills.

Other aspects were highlighted beyond the individual workers' skills and competence development and learning. They were: developing a motivating culture of learning within the organisation, department and/or workplace and redefining learning as a combination of traditional classroom learning, workplace learning, self-learning, and elements of virtual learning (simulators, virtual and augmented reality, etc.).

Finally, the issues of remuneration and/or benefits of learning, skills and competence development must be addressed (e.g. in the context of self-learning, the acquisition of knowledge about new digital systems whilst maintaining knowledge of older systems and technologies that continue to exist throughout the transition period, etc.)

5.2.3 VALUES, ATTITUDES AND MOTIVATION

Against a background of accelerated change and uncertainty linked to the future of professions and business strategies, the dimension of employability that relates to individual values, attitudes and motivation should be regarded as a key area to address and develop. This is also because awareness of future needs, openness to change and the motivation to invest in internal knowledge, skills and qualifications should not be taken for granted. Instead, it should be purposefully framed as a valued individual work contribution and as presenting the possibility of receiving an added value in terms of quality of work, career opportunities and job security.

5.2.4 WORK, WORKING CONDITIONS, WORK ORGANI-SATION AND LEADERSHIP

The dimension of work, working conditions, work organisation and leadership is of crucial importance for maintaining or re-building the image of railways as attractive employers and a sector that offers meaningful, quality work and good career opportunities for all.

Besides work-contents and task requirements, digitalisation and automation as well as other trends (demographic change, diversity, etc.) have a strong impact on working conditions and work organisation. Digital tools and advanced communication infrastructure are offering new forms of "hybrid work". To promote innovation, companies in the rail sector are also testing new forms of work organisation such as laboratories, future laboratories, or project-team-based "agile" forms of work organisation that significantly impact existing hierarchies and structures and re-define traditional role models and leadership types.

Experts and employee representatives consider changes of leadership style in senior, line, and middle management positions to be a particularly important and challenging issue in the context of digital and other transformation and change processes. Dealing with more flexible work organisation, including working time patterns, participatory leadership, and delegation and decentralisation of responsibilities, has often been described as a particular challenge because the professional culture in the rail sector is characterised by a hierarchical structure resulting from high safety requirements.

Furthermore, there is a need for policies at company level and above to address the issue of the massive amounts of data being created by digitalisation and automation in operative, administrative and other work processes. Indeed, this development raises questions as regards data ownership, monitoring, surveillance and control, and other privacy issues.

5.3 A modernised concept of employability in light of digitalisation and automation as well as other challenges

This section presents the outline for a modernised conception of employability in the rail sector in light of digitalisation, automation and other transitions and changes (green, generational, social, market, etc.). It is based on the premise that a modern understanding of employability should also include the perspective of the business in question (here, the rail sector and railway undertakings). This layered contextualisation accounting for the individual, business and sector levels is present in Ilmarinen's understanding of work ability and employability:

> "Work ability is of great importance both for employees and companies as well as for society, because it forms the basis for better employability in the changing world of work: One's own competitiveness strengthens confidence in one's own abilities (one's own resources) and behaviour in the team or department. Personal perceptions of well-being (how I feel in a particular situation) and quality of life (how I feel at a particular stage in my life) are also linked to employability. For the employer, it means better quality and productivity of work, lower sick leave and work disability risks, and thus lower personnel costs. Moreover, work ability means higher employment rates and more tax revenues from work and employment (...)."
>
> Source: Ilmarinen, Juhani 2010: Arbeitsfähig in die Zukunft, in: Geisert, M. 2011: Arbeitsfähig in die Zukunft. Wilkommen im Haus der Arbeitsfähigkeit, Hamburg, p. 28. Own translation

Based on these assumptions, which still are highly relevant, the following sections suggest a modernised conception of employability in the rail sector. It includes a vision and key principles that should be agreed upon by key stakeholders, including employer organisations and companies, trade unions and workplace employee representatives. The following sections also include a description of the four main dimensions of employability in light of new requirements and needs arising from digitalisation, automation and other drivers of change. Finally, conclusions are drawn based on these four dimensions as regards to important policies and measures that should promote employability.

Figure 12: A modernised framework of employability in railways in light of digitalisation, automation and other drivers
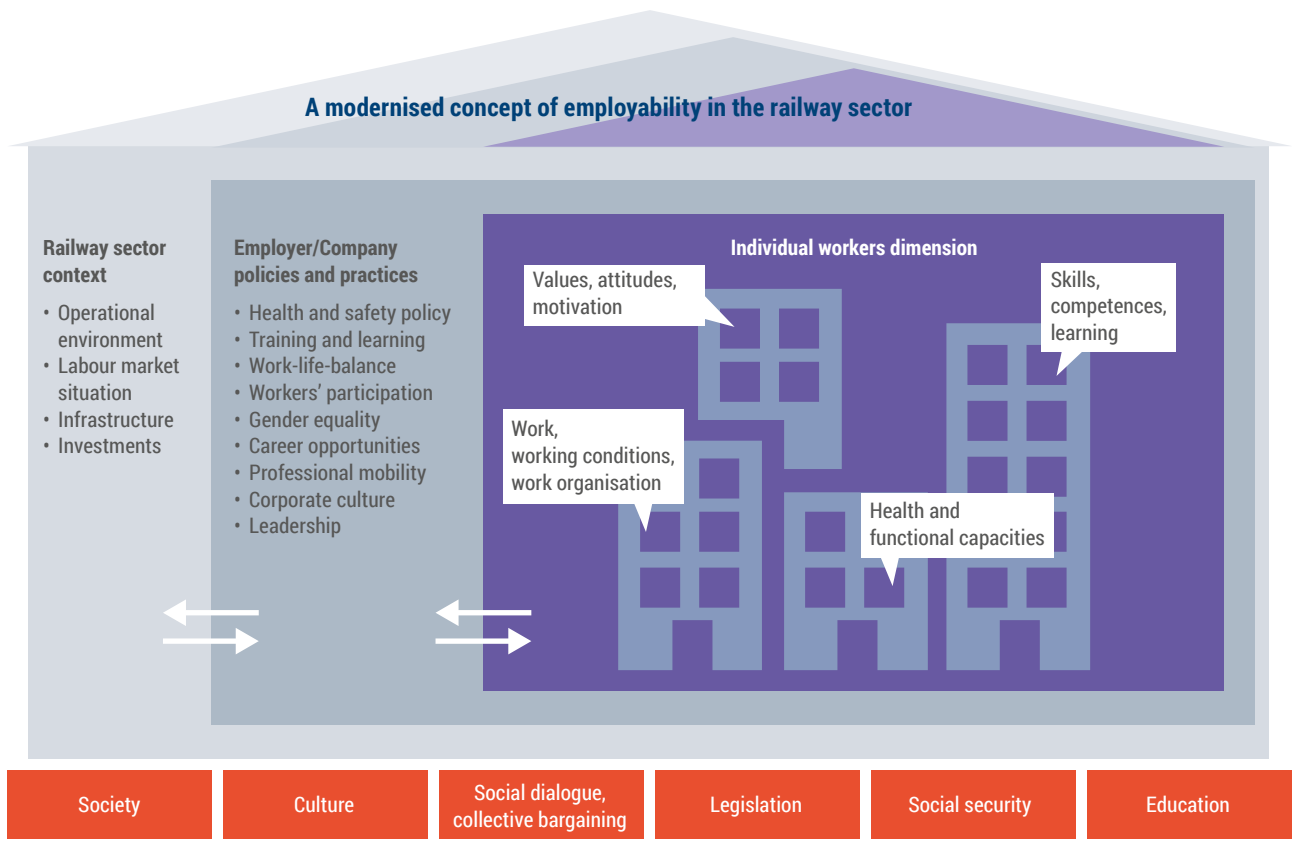
Source: wmp consult

5.3.1 VISION: RAILWAYS IN 2040

As a concept used to shape policies and concrete measures in the rail sector, this modernised employability framework should be based on a joint vision shared by social partners as regards the future of railways. Such a vision could look like the following:

By 2040, rail transport should be the backbone of mobility within European countries and beyond for both passengers and goods, meeting the needs of customers, EU citizens, and societies. Railways are also extremely well-placed to become the key, intermodal provider of "Mobility as a service" for passengers and "Delivery as a service" for goods.

The transformation of railways to achieve this vision will be based on good working conditions that match the high requirements of security and safety in the rail sector. Railway undertakings are an attractive place of work, education and training across different occupations. Workers and their representative organisations actively participate in transformation projects.

5.3.2 KEY PRINCIPLES OF EMPLOYABILITY IN LIGHT OF DIGITALISATION AND AUTOMATION

Digitalisation and automation are multifaceted topics, affecting all domains of the rail sector and presenting large implications for employment and labour, the world of work, and society at large. They are managed in a variety of ways by EU member states, sectoral social partners, and companies due to different social and economic situations, labour markets and industrial relations systems, and existing initiatives, practices and collective agreements.

However, irrespective of the existing diversity of social, economic and other context factors, a number of core principles should be taken into account when shaping the digital transformation in the rail sector to ensure that it brings clear benefits for employers, workers and jobseekers alike in terms of new job opportunities, increased productivity, improvements in working conditions, new ways of organising work, improved quality of services and products, as well as meaningful work and employability.

These principles are briefly described below.

(1) The human being is key

> "In all changes, the focus must be on the human being. The employer can't just see an increase in productivity and disregard human input. There must be adequate protection regulations and a corresponding appreciation."

Interview with a CGIL trade union representative

New technologies, digitalisation and automation should be regarded as an important enabler in providing a win-win situation for workers and business interests. However, technology and digitalisation alone do not necessarily achieve the expected results. To fulfil the potential benefits, both the human and organisational dimensions must be regarded as equally important.

Digitalisation and automation as the holistic or partial takeover of task control and process regulation has great potential to increase productivity and safety, improve the health and wellbeing of workers, and help tackle many issues in our lives and societies. However, automation in and of itself will not necessarily achieve any of those benefits. If the potential benefits of automation are to be fulfilled, the human factor must be considered. Too often automation is developed and deployed in a vacuum, without properly considering human and organisational factors. In such cases, automation may not only fail to improve the situation but even impact it negatively, wasting the investment. On the other hand, technologies that would clearly improve safety and working conditions or lighten the workers' (physical) workload deserve more attention.

(2) Digitalisation and automation should contribute to better working conditions and employability

In a win-win-situation, digitalisation and automation should not only result in increased productivity and efficiency but also better working conditions, better work environments, and enhanced employability in terms of all its main dimensions. However, this does not happen automatically. There is a need to invest in employability and provide workers with a fair share of the benefits of efficiency gains. For example, a worker undergoing upskilling and taking on increased task responsibility should see these efforts reflected in their remuneration

(3) Transparency and openness as regards opportunities and risks as well as social impacts

Any decision to invest in digitalisation and automation must be accompanied by a thorough analysis of its impact not only as regards productivity and efficiency but also in terms of social impacts, working conditions, the work environment, and health. Furthermore, the question of whether this investment would result in new and/or additional skill and competence needs must be carefully considered. In this matter, EU legislation[70] has provided workers with a right to information and consultation on decisions likely to lead to substantial changes in work organisation or in contractual relations.

(4) Nobody is left behind

Although the rail sector maintains stable or even growing employment in most EU member states, digitalisation and automation are resulting in the substitution of certain professional task and activities, which used to be carried out by humans but are now carried out by machines. This is particularly the case for routine activities and tasks often carried out by workers with a low or medium level of qualification. In view of this, workers and employees are concerned about the future of their job and need clear perspectives in terms of job and wage security. This could take the shape of offers of professional re-orientation, reskilling, and internal professional mobility, for example. Internal professional mobility must be accompanied by corresponding re-

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70   Directive 2002/14/EC of the European Parliament and of the Council of 11 March 2002 establishing a general framework for informing and consulting employees in the European Community. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02002L0014-20151009

muneration, reflecting additional skills and/or responsibilities. Companies must foster trust and transparency and should consider measures such as establishing digitalisation funds to finance such activities – a clear signal that nobody will be left behind.

(5) A shared responsibility

Managing the needs and challenges posed by digitalisation and automation in the rail sector should be a shared responsibility and should be based on a shared commitment between social partners, employers, and workers. Since the gains and positive impacts of digitalisation and automation are not automatic, the transformation and change must be shaped to ensure that the transition is mutually beneficial for employers and workers. Social partners at sector and company level have the best understanding of the situation on the ground and what measures are needed to benefit enterprises and workers. Policymakers at EU and national level also play an important role, for example when it comes to ensuring that the framework conditions allow employers and workers to seize the opportunities presented.

(6) Social dialogue at all stages and levels

When it comes to shaping digitalisation and automation processes in a way that leads to better employability, economic success, and high-quality services, employers, workers and their respective representatives have a shared interest despite their differing responsibilities. Therefore, collective bargaining or workers participation, meaningful social dialogue, and the involvement of social partners and workers representatives alongside HR and line managers at relevant levels should play a crucial role in fostering trust and openness throughout digital and other transformation processes, motivating staff to take part in training, and opening communication about problems and challenges. This is true irrespective of national and company-specific context factors and social dialogue frameworks. Social dialogue, information, consultation, participation and the negotiation of framework conditions should be an integral part of navigating railway companies through the transformation process, in full compliance with the EU legal framework on worker information and consultation.

5.3.3   POLICIES AND MEASURES PROMOTING AND STRENGTHENING EMPLOYABILITY

In order to manage digitalisation and automation, as well as other trends and drivers that will strongly impact the future of the rail sector and the four dimensions of employability, it is important to define policies[71] and concrete measures[72] that would help create better employability and a better overall vision of future railways.

Table 11: Dimensions of employability and related policy examples in railways

Dimensions of Employability	Policies	Measures
Employability in light of digitalisation, automation and other trends and drivers	• Raise awareness of the social impact of digitalisation and automation in the rail sector • Engage in dialogue regarding both opportunities and risks pertaining to the impact on employability • Introduce and implement change management plans to facilitate the transition process and manage the social impacts • …	**Measures should be based on the good practices identified in the different countries**
Work, working conditions and work organisation, leadership	• Improve working conditions and mitigate the risks that stem from digitalisation and automation • Establish a work-life balance policy that contributes to the requirements and expectations of workers and employees over their working life cycle • Develop a new leadership culture that takes new requirements and needs into account • Attract a broader and more diverse workforce to the rail sector, including groups that are currently underrepresented in many occupations (e.g. women, disabled workers), by seizing the opportunities provided by automation and digitalisation • Attract young people to the rail sector and address the shortage of workers in certain occupations • …	
Values, attitudes, and motivation	• Adopt policies and commitments to diversity, equal opportunity and participation • Ensure the compatibility of work and private life • … • …	
Skills, competences, learning	• Establish a system and policy of lifelong and continuous learning • Develop new forms of education and learning with digital tools and implement them only in close consultation with trade unions/workers representatives • Establish a career development policy • ….	**Measures should be based on the good practices identified in the different countries**
Health and functional capacity	• Establish socio-psychological risk assesment policies relating to the impacts of digital and automated workplaces and working environments • …	

Source: wmp consult

The table above may provide a basis for further consultation between the social partners in the rail sector, allowing them to take stock of current policies and measures that support, maintain, and improve employability in light of digitalisation, automation, and other drivers. It will also help them identify gaps in current policies at sectoral and company level that need to be addressed, not only to improve employability but also to develop the human factor involved in strengthening the European railway system and making it fit for the future and the ambitious targets that have been defined at European and national level.

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71 **Policies** or strategies should describe relevant domains of practice, often but not always linked to the HR units within railway undertakings that need to be involved in the process. Major policies are already included in the figure below as they are quite similar across companies and countries in the rail sector.

72 **Measures** are concrete practices (programmes, projects, or other types of action) that contribute positively to the different dimensions of employability and maintain, support, improve or rebuild employability. Measures should be suited to concrete requirements and needs at the sector and/or company level and therefore may differ from country to country and between companies.

Annex

EDA Rail Steering Committee Members

Name	Country	Organisation	Type
Jedde Hollewijn	EU level	European Transport Workers' Federation, ETF	Trade union federation
Alberto Mazzola/Soline Whooley	EU level	Community of European Railway and Infrastructure Companies, CER	Employer organisation
David Gobé	France	CGT	Trade union
Marie Luise Rabe	Germany	EVG	Trade union
Róbert Zlati	Hungary	VSZ	Trade union
Maria Rathgeb	Austria	Vida	Trade union
Sara Tripodi / Loide Curcio	Italy	CGIL Lombardia	Trade union
Emanuela Rolle	Italy	UILTRASPORTI	Trade union
Barbara Grau	France	SNCF	Railway company
Claudia Kürzl	Austria	ÖBB	Railway company
Tine Moe Svendsen / Maiken Lykkegaard	Denmark	DSB	Railway company
Roberta Tomassini	Italy	FS	Railway company
Matthias Rohrmann	Germany	DB AGV Move	Railway company Employer organisation