



STAFFER
EUROPEAN RAIL SKILLS ALLIANCE



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Identification of skill needs and occupational profiles from the point of view of suppliers

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1 INTRODUCTION

To gain a holistic understanding of the deliverables, a short introduction to WP3 should be given. WP3 “Identification of current and future skills and competences from the supplier point of view” covers the suppliers’ perspective towards the topic. It is also aligned to WP2 (operators’ point of view) and will be carried out under the methodological criteria defined in WP1. The main activities of WP3 consists of:

1. The definition of a future vision of the rail sector from the point of view of suppliers. The analysis of the needs of the rail supplier will take into account the current trends of the rail sector and their specific impact on rail industry suppliers;
2. The application of the methodology developed in task 1.2 (“Methodology for the skill needs assessment and monitoring”) to identify the skill needs and occupational profiles from the point of view of suppliers and infrastructure managers.

Deliverable 3.2 “Identification of skill needs and occupational profiles from the point of view of suppliers”, is the second result of WP3-Identification of current and future skills and competence needs from the supplier point of view. The deliverable will describe the results of a research on the existing evidence for the rail sector, but also the results of monitoring and evaluating the feedback from supplier companies regarding future skills and competence needs. It will feed into the activities as set out in WP4, 5, 6 and 7.

While deliverable 3.1 aims to give an overview about specific macro-trends and their impacts on the rail industry supplier as well as relating thereto assumed needs, deliverable 3.2 has set itself the task to dig deeper into the topic of skill shifts and to explore current and future needs of skills and competences and to analyze occupational profiles. The original task describes the identification of these needs, but predictions of the future are limited sources if it is not able to forecast any possible incidents and happenings.

2 METHODOLOGY

On the one hand, the overall methodology developed in WP1 (task 1.2) will be used to identify the needs of the rail suppliers. On the other hand, the methodology of 3.2 considers different stakeholders and their perspectives. Based on the definition and analysed trends provided in 3.1, this task will:

- Collect and analyse the stakeholders’ requirements
- Identify the needs in terms of training provision
- Identify the occupational profiles with reference to the classification of European Skills, Competencies, Qualifications and Occupations (ESCO)

While WP1 has worked with a questionnaire, the project team has decided against a second questionnaire to gain deeper insights into the skill shift and preferred expert interviews to have the specific know how at hands. Secondly, we did an experimentation with a data scrolling by an external partner to make use of digital data analysis methodology with the assumption that big data promised to inform our task in a better way than further questioning. This might also represent a modern and fresh approach to focus on big data analysis then the usual survey study.

The figure below represents the report’s methodology which had been used for the identification of skills needs and occupational profiles – the mentioned tasks above are embedded in this structure of methodology as follows:

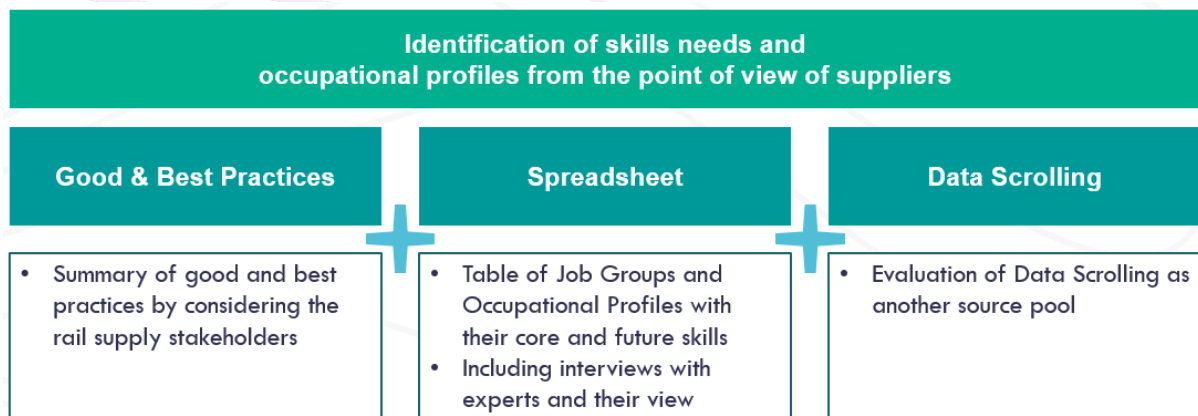


FIGURE 1 - METHODOLOGY

Good practices:

This task covers the stakeholders' requirements. It collects their practices on re-skilling and up-skilling the companies' workforce and is the first try to figure out on which future skills they work on to prepare the workforce for future requirements. The answers are summarized in form of one pager. To review the current good practises is also of importance as the result is not only reflecting training efforts that companies are conducting but also developmental programmes like job rotation, career path and others that help to close the skill gap.

Spreadsheet:

The document contains the list of future rail profiles which had been defined by the STAFFER consortium members and can also be found in deliverable 3.1. The spreadsheet itself primarily represents a table with the rail profiles and their core skills and competences according to the job profile descriptions in ESCO. Stakeholders had been asked to interview internal company experts regarding to these job profiles with a focus on the following two specific questions:

- 1.) What kind of changes are to be expected in a digitalized world?
- 2.) What future skills need to be built up?

The expert interviews were evaluated by qualitative content analysis.

Compiling the STAFFER list of rail profiles together with the information out of ESCO helped to gain further information about the validity of these job profiles regarding their descriptions, skills and competences. It also proved that some of the profiles mentioned in the STAFFER list are not existing yet as a job profile in ESCO.

The intention of the conducted expert interviews was not only to exposure skills needs and future skills, but also to discover the critical incidents within changes in a digitalized world and beyond. In our understanding critical incidents are defined as actions having a crucial impact on the job profile and, as consequence, on the needed skills and competences.

Example of critical incidents for Sales Manager:

In the course towards more digitalization in our products and services sales will move towards consultative selling – it is more sales + consultant to be able to co-create with the customer solutions. With a portion of digital application as being part of the deliverables the need for consulting at the customer site is increasing. Future skills that are then relevant are problem solving, communication skill, consultative selling, technical product knowhow while pure presentation and customer negotiation is getting less important.

Critical incidents help to understand the broader context of skill changes. Talking about future skills provokes the expectation that future skill is something very new or extraordinary like in digitalization where you really need to learn new programming languages etc. In most cases future skill indicates a shift or a different intonation of skills. These slight moves could be better understood by critical incidents in the like of the context.

Data scrolling:

Though the group of representatives for the supplier is small, an experimentation with a data scrolling by an external partner should enhance our resources of information and to also make use of digital data analysis methodology. The project scope of the data scrolling was to explore the actual talent demand on the job market for rail supplier as well as an analysis about skills and their request development over the past four years. These big data analyses are especially interesting as you get smart intelligent insight of big trends in skills that are reflected in job postings and can analysis and even sometimes quantify the skill need in the labor market.

3 SKILLS

This section presents the collection and analysis of the stakeholders' requirements, which are summarized as good practices in shape of one pager. Second, the section consists of a compilation of skill needs from the point of view of suppliers, which can be found in the above-named one pagers in 3.1 as well as in the subsection 3.2. Furthermore, this is also a trial of prediction about future skills.

3.1 Company's Good Practices

The good practices aim to summarize the stakeholder's requirements for skills development on their workforce. Therefore, the members of WP3 as well as the associated members from UNIFE representing small and midsize companies had been asked to share their good practices on re-skilling and up-skilling to keep up employability and indicate with that on which future skills they work on to prepare the workforce for future requirements. The results are compiled in a one pager per company and the answers of the UNIFE small and midsize company members are summarized in one (the answers about future skills are presented in 3.2).

3.1.1 Alstom

In an ever-changing business environment, learning is the backbone to adapt and innovate at Alstom.

Alstom University is our award-winning learning and innovation catalyst, bringing employees an environment to continuously learn and share; to upgrade their profiles and extend their skills.

Employees, partners, and customers can learn with Alstom University and can develop their credentials by obtaining certificates from our Academies (from technical to soft skills) and the most prestigious universities worldwide.

Alstom University holds under its roof a variety of job-related academies (from Finance to Digital Mobility), adopting a complete and holistic approach towards corporate education, learning & development – leveraging its digital, classroom and blended learning curricula, that cover both technical & soft skills, as well as introducing new innovative VR technologies in its learning process.

All courses are structured in the above-mentioned academies which address the needs of functions such as commercial, finance and project management among others. There are also transversal academies which cover soft skills like leadership and management, as well as innovation and CSR (Corporate Social Responsibility). Finally, technical academies are the hard science section and include digital, engineering, industrial and more.

Alstom recognizes the importance of getting the junior talents up to speed as quickly as possible, because upskilling and keeping the pace with all new technological developments is key; in the same framework, reskilling of certain profiles is also of the utmost importance.

Bombardier Transportation, as a part of Alstom, takes pride in the learning culture and proactively identify the needs for re-skilling and upskilling our employees. There is variety of learning methods and the use of a single source of data to drive the effectiveness of the training programs. The tool covers the following functionalities:

- Create and manage training items (Learning catalog)
- Create and manage scheduled offerings or sessions
- Register learners to classes, organize the registration process and record the attendance
- Assign trainings to employees, be it manually or through automatic assignment profiles (predominantly used for mandatory trainings)
- Administrate trainers and training rooms

The Learning center comprises a dedicated Reporting permitting to pull-out data related to Learning. However, most of the data can directly and more conveniently be looked up in the

Learning Dashboard which enables the Line manager, Employees and HR team to effectively have an informed developmental discussion.

In addition to internal certified trainers, there are collaborations with many external certification programs where employees can choose on-demand learning. The learning programs are fully digital and with the development of the employee's knowledge and career in mind, brings full access to extensive digital contents with the world-class i-Learn internal platform. The learning platform is accessible AnyWhere, AnyTime, and on AnyDevice to let employees go mobile with their learning.

3.1.2 CAF (Construcciones y Auxiliar de Ferrocarriles)

Performance Management System

The re-skilling and up-skilling in CAF is linked to annual performance assessment. We have been improving our performance management system during the last years to make it more flexible and continuous (not only once per year). Based on face-to-face meetings we identify individual skills that should be developed or improved, according to business needs.

Annual Detailed Training Plan (+500 actions)

One of the outputs of our performance management system is the training plan. We have an extensive training program, both for hard (technical) and soft (general and management) skills development through training. In the last few years, we have been working in the development of a new e-learning Platform, that has become particularly relevant through pandemic. Obviously, training is one of the best means for re-skilling and up-skilling and we promote it, conducting a bottom-up reflection process and partnering with several companies and consultancy firms to provide our employees the best training possible.

Internal Mentoring Programs

We strongly believe that a good way to develop skills is sharing knowledge, know-how and values between employees. That's the reason why we have got internal mentoring programs that last between 6 and 8 months. Each mentee decides the skill or skills that should be developed and counts with a senior mentor, with larger experience, that can give advice and helps developing skills. Internal Mentors have specific training with an external consultancy firm.

Job Shadowing Practices

Another good practice for re-skilling and up-skilling in CAF is apprentice role playing. We call it job shadowing and it consists in learning through observation, without specific responsibility.

An employee that needs or wants to improve a specific skill, joins another employee routine (someone really good in this skill) and has the chance to see how this person behaves and interact in a real situation. Obviously, there are some rules, and the process is absolutely monitored but it is a natural and quite easy way to develop skills. The person that is been observed doesn't need to do anything special, just follow daily agenda and behave the way that normally does.

Career Plans

In CAF, we also have Career Plans, that consist of skills development for different roles than the one a specific person has got nowadays and focused on the next 2 or 3 years. We prepare employees for different roles, so that when there is a vacancy or opportunity for different reasons, we have some people prepared to tackle with new responsibilities.

We have four different Career Paths, as showed in the graph aside.

Functional Versatility	Technical Special.
Projects Managem.	Leader- ship

Network with universities and vocational training centers

Another relevant tool for up-skilling and re-skilling is a strong link with universities and vocational training centers. We have got several agreements that let us improve our employees' skills. For example, we have developed some programs with vocational training centers to re-skill some assembly employees to design functions (planners). Regarding universities, we have what is called CAF classroom in one of the most renowned engineering faculties in the Basque Country. It is a physical space in the university with technical equipment, where students meet CAF employees and develop specific projects. Been in touch so close with universities let our employees refresh and update some skills.

3.1.3 Hitachi Rail

Given the current rapid evolution of the technologies, of the markets and of the work environment, Hitachi Rail has adapted its practices on re-skilling and up-skilling in order to match these rapid changes in the business and in the overall environment. Therefore, the education and training tend to be more and more business driven and on demand, and its contents and fruition tailored to the target groups.

The event which triggers a re-skilling or up-skilling campaign is typically the occurrence of a technological leap, or the introduction of a new technology or line of products but may also come from a process change or an organisational or regulatory update. In some cases, the need

for a broader campaign can come from a systematic or environmental change, as in the case of the introduction and then of the intensive use of the remote working, which requested to involve all the company in an information campaign which requested not only the acquisition of new skills but also the adoption of a totally new mindset.

The fruition of the education is principally online, in order to overcome the geographical barriers and to be flexible and adaptable to the interested resources' needs and timings. That allows also to reach a targeted audience and to convey a personalized content: the education campaigns can be directed to the whole company or to specific groups or roles, and the content may be tailored based on the job performed or on the roles.

Hitachi Rail believes that the main trends which the workforce will have to be prepared for in terms of future skills are related to the digitalisation and to the evolution of the rail sector, which will involve the introduction of an intelligent asset management, the full automation of the railway systems and their integration in a door-to-door mobility ecosystem. At the same time, the environmental sustainability and carbon free mobility will be further enhanced, including the reduction of the noise pollution, while the safety and security will remain a backbone of the rail transport. Therefore, the evolution of these technical skills will interest profiles such as the railway system signalling and vehicle engineer and the RAMS specialist, while the railway system integration engineers and railway construction managers will have to deal with new structures and philosophies of transport. On the other hand, the profiles related to the digitalisation, such as cybersecurity experts, data analysts/scientists, SW designers and network engineers will become more and more important in order to stay in line with the new trends of the market.

In that regard, we believe that it will be more and more essential within the workforce the capacity to have a broader view of all the fields of discipline. In particular, the interdisciplinarity is key to the mastery of the complexity of the new technologies and processes, together with the ability to connect different systems and processes. That includes the capability to develop an overall view of the system, enabling to put together the different technological, normative and environmental aspects involved. We believe that it will be particularly useful to integrate that approach in the Staffer outcomes, aiming at the creation of educational paths which will lead to profiles with a broader view of the systems and components involved, rather than a very specialized preparation on some aspects related to the rail sector. For that reason, Hitachi Rail recommends the creation of specific classes or disciplines within the existing technical courses to complement the overall preparation with knowledge of the rail processes and technologies, rather than the creation of specific schools or degree courses specialized only to the rail sector.

3.1.4 Knorr Bremse

Knorr-Bremse uses a Strategic Qualification Management to enable a holistic, sustainable approach for handling skills across the entire range of job roles within Supply Chain Management and Service Centers:

In the SQM-tool every job role is connected with a specific set of defined skills, the so-called Target Competency Profiles. Every skill has a value range from I – V, where Level I stands for Beginner Knowledge and Level V is the absolute expert level.

To reflect the qualification status of the employees, Current Competency Profiles are set up.

Those state the actual skills and skill levels of the employees.

By conducting Skill Gap Analyses, the SQM-tool compares Target Competency Profiles of job roles with Current Competency Profiles of employees. The results represent training demands and can be sorted in priorities.

When employees participate in according Qualification Measures, which cover the training demand, their skill set is updated.

By continuously going through this Qualification Management cycle, we ensure to always stay up-to-date on qualification needs of our employees within Supply Chain Management and Service Centers.

FIGURE 2 - GOOD PRACTICE (KNORR BREMSE)



3.1.5 Siemens Mobility

Workforce Changes:

Business transforms in different pace and not all jobs are affected by transformation at the same time. To identify the need for re-skilling and upskilling Siemens has decided to train HR Business Partner on challenging business manager on transformation topics and ensure an early identification of areas where re-skilling or up-skilling is needed. This approach is called *#NextWork*.

#NextWork is an initiative to drive the workforce transformation within Siemens and to face the challenges for the current workforce caused by digital transformation and structural changes with the strong believe that up- and reskilling is the imperative at Siemens to setup a future-proof workforce. Business transforms in different pace and not all jobs are affected by transformation at the same time. To identify the need for re-skilling and upskilling Siemens has decided to train HR Business Partner on challenging business manager on transformation topics and ensure an early identification of areas where re-skilling or up-skilling is needed. This approach is called *#NextWork*.

The approach addresses changes in the nature as well in focus and scope of daily work and related competencies – in order to address these workforce changes, *#NextWork* is based on a structured approach by analyzing the current situation, looking at embellished figures and understanding trends and impacts, examining value streams and studying the competition to define a future state.

Creating a learning culture:

Siemens had always a broad internal offer of all kinds of business and product training. Already before the pandemic Siemens has decided for a global learning platform with intelligent algorithm that work like Netflix. This is today state of the art in many big companies. With the learning platform, called also the decision was taken to offer training virtually and give people the chance to have the right training just in time at hand whenever an employee needs a training to cope with a task or challenge.

My Learning World creates a personal learning experience and is tailored to every single employee by suggesting learning opportunities matching their interests, browsing habits, organization, or region. The online platform bundles a broad range of internal and external learning content and tools to develop and improve skills. Employees can explore several learning channels and articles or summaries. There are also opportunities to take part in e-learning modules

from beginner to advanced. Through the one easy entry point employees are also able to learn anytime from anywhere.

Developing and tracking skills:

My learning world also offers the possibility to follow and evaluate the own skill development using the tool *MySkills*. As a part of learning every employee can work on own skill and evaluate the own skill level. Out of skill library with more than 500 skills every employee can select skills that are either important for their work or they want to grow into. Once the employee has evaluated the skill level the intelligent algorithm of the learning platform makes learning recommendation for the individual. So, every employee can have a won and tailormade, own skill development and learning program at hand.

3.1.6 Company Members from UNIFE

To gain a broader overview, 13 member companies of UNIFE shared their practices on re-skilling and up-skilling and their perspectives about future skills. The answers are anonymous.

The companies with rather a small workforce (<500) mainly indicate internal sources and less external ones such as training from other companies, providers, or platforms such as LinkedIn or Udemy.

There is frequent use of **in-house trainings** for skill development, such as organizing training sessions and courses or dedicated training programs to coach the growth of team leaders for example. Companies also apply models of mutual ways of learning like peer-learning, inter-generational learning, or on-the-job-trainings. To support autonomous and continuous personal further development and learning, companies are also using specific eLearning platforms or providers like LinkedIn or Udemy.

Next to inhouse trainings, companies run own **initiatives** and **programs** for re- and up-skilling their workforce. Technical cross experiences are used to improve team cohesion and organizational know-how. Others are widening their perspective beyond vision and mission of the own organization and are working on the purpose and contribution that each job position develops within the whole business project. The initiatives are also consisting of continuous (self)learning programs e.g., deploying employees in complex and long-term projects in which they are forced to improve their skills and qualifications or encouraging employees to join specialized conferences, projects with technical universities or dialogues between management and employees.

Bigger companies (500 – 10.000) are applying similar practices e.g., training courses on specific topics or training on the job, the use of eLearning Platforms or the implementation of leadership programs to foster collaboration. Furthermore, companies mentioned activities to create communities of exchange about knowledge and best-practices and the deployment of smart and agile working methods.

3.1.7 Summary:

This review of current companies' good practises makes obvious that learning connected with up-skilling and r-skilling becomes a domain of special importance. The learning offerings in companies varies from product related learning to soft skill or transversal learning. Nowadays, many of the big companies integrate learning and skill management with the support of digital technology to help the learner to figure out the right learning for a respective skill. Secondly, many activities could also be seen where concepts promote to learn from each other, mentoring or job shadow. This is nicely reflecting the 70-20-10 rule of learning. 10 percent is formal training courses but 20 is learning from each other 70 percent is even learning from the tasks in the own job. It is all arranged around building a new learning culture in companies that is establishing learning not as w once in year practise but as a continuous layer to work on for everyone. As an evident element of people's employability.

3.2 Identification of skills needs and future skills

Re- and up-skilling the workforce is based on the idea of bridging knowledge gaps and enhance employees' skills and competencies in terms of future requirements and changing conditions.

Given the fact that the European rail system is confronted with several challenges caused by market drivers (urbanization, servitisation of products) and technological drivers (digitalization, sustainability, automation, standardization) as well as changes in society, environment, and politics, it is essential to enhance skills and competences of the European's rail workforce.

In reference to deliverable 3.1 ("Future vision of the rail sector from the point of view of the rail supply industry"), following opportunities had been emerged to play a crucial role for the rail supply industry and therefore:

- Introduction of new services which are driven by massive data analysis technologies, the cloud data storage, and Internet of Thing (IoT) technologies.
- Development of new interfaces, ICT technologies based on 4G (LTE) and 5G and even more performing technologies (e.g., technologies based on the Global Navigation



Satellite System (GNSS)), aimed at precisely locating the trains for the safe control of circulation.

- New European R&D projects related to the future of ERTMS (ATO, GPRS or LTE, Galileo, N3) and international projects related to freight transport.
- Increasing demand for mobility, population growth and concentration in urban areas.
- Need to modernize railway infrastructures with new technologies.
- Implementation of the Smart Electricity Grid concept.
- Inclusion of renewable energy sources and storage systems.

The tables below are showing a summary of the results out of the WP1-survey and the mentioned skills in the one pager.

Hard Skills (Technical Skills)
<ul style="list-style-type: none"> ▪ Skills and knowledge about all over the railway system (holistic understanding) ▪ Project Management ▪ Language skills ▪ Engineering skills ▪ Digital knowledge and skills <ul style="list-style-type: none"> ○ Digital competence (handling and application of digital technologies) ○ Digital understanding in specific areas (artificial intelligence, machine learning, deep learning, edge, cloud and fog computing, ...) ○ Data analytics and data science ○ Cyber security ○ Cloud architecture, cloud systems ▪ ERTMS design and signalling competences ▪ Telecommunication competences e.g., for future FRMCS systems ▪ IXL configurator

TABLE 1 - IDENTIFIED HARD SKILLS

Soft Skills (Human Skills)
<ul style="list-style-type: none"> ▪ Attitude ▪ Adaptability to changes



- Internalization of lifelong learning & continuous training
- Responsibility
- Resilience
- Emotional intelligence
- Leadership and people management
- Cultural skills
- Team skills
- Communications skills

TABLE 2 - IDENTIFIED SOFT SKILLS

Methodology & Tools (Conceptual Skills)
<ul style="list-style-type: none">▪ New collaboration forms▪ New business models with consequences in all company areas▪ Holistic understanding

TABLE 3 - IDENTIFIED CONCEPTUAL SKILLS

Reflecting upon the tables above, there are almost rarely essential skills and competences which had not been existing as unknown before. Most of the mentioned skills above are not new to us. Similarly, the one pager show that companies do already have a solid infrastructure of programs for re-skilling, up-skilling and learning development. In fact, our conclusion was to give more attention to the dynamic processes and critical incidents which must be the crucial triggers behind the impacts on skills and occupational profiles and their changes within. It is more the shift of known skills then realizing new skill needs.

The intention of this skill gap initiative is to help the workforce stay relevant in changing times.



4 OCCUPATIONAL PROFILES

The section about occupational profiles is combined with the insights gained during the search and identification of future skills and competences. It will present the European Commission's project ESCO and its value for the process of the STAFFER project. ESCO did set the base for the spreadsheet of occupational profiles, which is used for the conducted expert interviews to discuss the change of occupational profiles with their skills and competences regarding future requirements and challenging drivers. Furthermore, the section's goal is to picture the critical incidents.

4.1 ESCO – description and value of use

ESCO (short term for European Skills, Competences, Qualifications and Occupations) is a European Commission project by Directorate General Employment, Social Affairs and Inclusion (DG EMPL) and is a multilingual classification of skills, competences and occupations. It offers a “common language” on occupations and skills for the use by different stakeholders on employment, education, and training topics and therefore to support job mobility across Europe for a more integrated and efficient labor market. ESCO works as a dictionary, describing, identifying, and classifying professional occupations and skills which are relevant for the EU labor market.

ESCO describes its concepts and descriptions as useful for understanding:

- What knowledge and skills are usually required in specific occupations
- What knowledge, skills, competences are obtained because of specific qualifications
- What qualifications are demanded or requested by employers for searching candidates

The use of ESCO is helpful to set a basis for defining occupations and job families with their related skills and competences.

4.2 Spreadsheet of occupational profiles

The basis for the spreadsheet is the list of future rail profiles which had been defined by the STAFFER consortium members. Out of this list those occupational profiles which are represented by suppliers had been extracted and compiled together in one single document. Based on the information of ESCO, the profiles are described within their functions, knowledge, skills, and competences.

List of occupational profiles in the spreadsheet	
Railway Engineers	System Engineers**
Welding Engineers	Transportation System Engineers*
Civil Engineers	Programmers*
RAM/ LCC Engineers*	Artificial Intelligence Engineers**
ILS Managers*	Information Technology Engineers
Computer Engineers**	Process Engineers
Signal Processing**	Electrical Engineers
Robot Engineers	Mechanical Engineers
Vehicle Architecture	Safety Engineers**
Automation Engineers	Welding Technicians
Software Engineers	Electrical Technicians
Network Engineers	
<p>*ESCO has no profile or skills/ competences/ knowledge defined for this occupational job group – the descriptions are only proposals and compositions of related or similar job profiles mentioned in ESCO</p> <p>**ESCO has no profile defined, but a description of the occupational profile in form of a single skill/ competence/ knowledge</p>	

TABLE 4 - CONTENT OF OCCUPATIONAL PROFILES IN THE SPREADSHEET

As shown on the *marked occupational profiles, ESCO did not include every job profile, at least not in the way they are seen by railway suppliers. In case of the STAFFER project's objectives, ESCO provides a solid base especially in terms of training provisions but is limited regarding future topics and validity of job profiles. Due to the dynamics of the market changes prediction of skill needs as consequence is getting difficult and can only be reflected in a dynamic process that reviews job profiles against current market developments.

4.3 Expert interviews

With the spreadsheet as basis for the interview and the knowledge about the understanding of critical incidents, the stakeholders discussed with internal company experts about these job profiles with a focus on the two leading main questions:

- 1.) What kind of changes are to be expected in a digitalized world?
- 2.) What future skills need to be built up?

Like already mentioned in the section about the methodology, the intention of the expert interviews is to discover the critical incidents within changes in a digitalized world and beyond (main question 1) as well as to exposure skills needs and future skills (main question 2).

We follow the approach that critical incidents are those actions having crucial impact on the job profile and with this to the needed skills and competences.

4.3.1 Overall results

The expert interviews proved that dramatic skill shifts in single job profiles are not the only essential key elements on top. For sure there is a need of re-skilling and up-skilling the workforce, but moreover in a general way.

The Challenges and their causes confronting the European rail system are well-known. Market drivers like urbanization and technological drivers like digitalization or sustainability are no new topics to the rail industry. Changes in society, environment and politics are happening continuously. The first question to be asked is not which skills and competences will be required, but to explore and find those situations, processes, etc. where the changes will be or are already located and have first impacts. Afterwards it is possible to figure out appropriate skills and competences and furthermore this gives the opportunity to retrace the directions of ongoing impacts and related job fields.

Leading question 1: What kind of changes are to be expected in a digitalized world?

Considering a look to the organization's macro-perspective, it's clearly visible that several single systems are fusing together towards **interconnected and inter-divisional systems with high complexity and temporal delimitation** as every single system still has its own character, structure and discipline. Relating thereto processes and division of tasks will be affected, and from the point of view of suppliers, this incident is primarily taking place in the **field of engineering**, where a dramatic skill shift and skill enhancement will play the biggest role, or at least will play the first role and from that point will release the rolling "changing-wave" towards the



next areas within the company. Any changes in technology might also different business opportunities and when a company pick up on changing business models the wave of affecting more profiles with skill changes is started. The content of occupational profiles in the spreadsheet already shows the importance of this job field.

Regarding to the growth of these complexity between systems and divisions, there will be a **high demand in inter- and intra-disciplinary work-models**, which in turn requires a holistic understanding and the broadening of the own know-how towards neighboring disciplines. Especially employees in the field of engineering are asked to keep their core know-how but to enhance their understanding in neighboring disciplines to communicate and work in the language of their colleagues. Experts compared this ability with the metaphor of a “chewing-gum” between the different elements. Especially in digitalization companies are today challenged by bridging between the new digital technicians that come in and the traditional technicians that have deep knowledge in the rail systems technologies. Keeping both close and make them understand the other party by enlarging own technology areas is crucial. Common problem-solving competencies are needed where everyone brings in its diverse perspectives and understands the perspective of the others.

Suppliers also take the view that **business models must change** in terms of facing these challenges and in order to be able to regulate inter-divisional and complex systems and processes. But the way they will be affected is **related to the driving forces** by technological progress. We think that these driving forces are, as already mentioned above, located in the field of engineering, wherefore the engineering profiles are the suppliers’ crux of matter when it comes to the question of future skills and competences.

Another important factor is the **chronological sequence of the change-process itself**. Objects in technological revolutions are simultaneously adapting to the requirements of innovations, but changing human factors like habits, mindset and thinking is a more complex and highly time-consuming process. Developing a software solution to integrate in thousands of objects which runs in the background is not comparable to developing a software solution in thousands of individual human brains which needs active process. In addition to the speed of technological revolution and non-stopping changes in environmental, societal and political circumstances, the complexity is increasing, which requires a high amount of **flexibility and adaptive capacity**, both on employee and company side.

There have also been mentioned in the expert interviews to consider the **shifts of generations** which contain potential risks of generation gaps. Also, **pre-existing differences within** them

need to be considered when it comes to new forms of working, learning, and understanding. The way of collaboration and work more in agile teams is also requested by the new generations and it causes an internal shift from more hierarchical towards more democratic structures.

A digitalized world also implies the need for more digital security in every kind of way. Experts explain that **cyber security** will be a significant role in all job areas.

Leading question 2: What future skills need to be built up?

As already mentioned above, suppliers believe that the prediction of future skills is related to the driving forces for critical incidents and changes. The leading approach consists of the exploration of these critical incidents and to connect these ones within occupational profiles and their processes with potential effects to neighboring jobs and company areas. Subsequent changes are dependent to the previous ones.

In summary, following skills and competences are seen as necessary for the future, but in an overarching way and especially in the field of engineering. Specific skills and competences on occupational profiles are broken down and analyzed in the next chapter.

The expert interviews emerged that the **competence of understanding the complexity of the entire system** is crucial to face new challenges and to connect them with the different changing drivers. Market drives requires more knowledge about entrepreneurship and entrepreneurial thinking and mindset in all kind of areas. Technological drivers assume the understanding of digital technologies and their use and demand as well as the connection to societal, environmental, and political changes.

Skills and competences need to be enhanced to be able to work in this complexity. Employees need the attitude to be **ambidextrous in their know-how**: Both being a specialist in their own field of work and striving for general know-how in order to be capable to meet new complex challenges and demands in a high agile way and to be acquainted with connected disciplines. It will be important to differentiate between specialist know-how and general know-how and to emerge which general know-how will be required for the single occupational profiles, job groups and disciplines. Portraying these competences as a specific future job profile, experts called this one **system integrators/ system architects**: persons, who can understand and communicate the language of neighboring disciplines, bringing them together on point and meet complex future demands by connecting the needed know-how of these disciplines in order to innovate a system-embedded solution.

Another future skill set which needs to be trained (and is actually a today-skill), is the **flexibility and adaptive capacity**.

The figure below aims to explain how the mentioned overall skills are connected to critical incidents and the whole entire system.

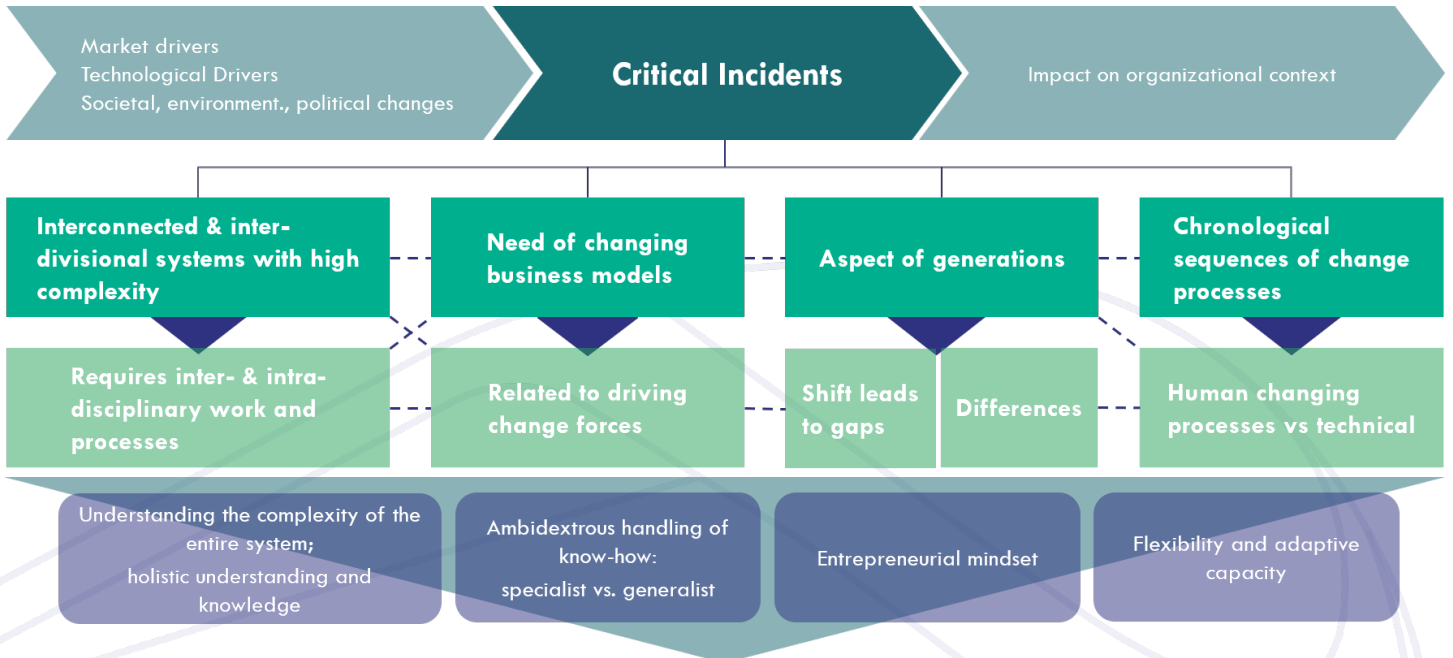


FIGURE 3 - EXPERT INTERVIEWS: OVERALL RESULTS

4.3.2 Results on specific occupational profiles in the spreadsheet

This section delivers concrete skills for specific job profiles which have been named in the expert interviews to be important for the future. Analyzing and rating the importance of the occupational profiles and their respective competences and skills in the future was difficult as many of them are not yet seen as urgent enough for today's challenges. The prediction of particular job profiles like Robotics or Artificial Intelligence is strong related to the uncertainty of the point of time and the scope in which these profiles will be needed. This depends on major business decisions in line with companies' strategies. Furthermore, some experts critically remained that the spreadsheet should not induce further specialization of occupational profiles.

The following tables show which of the listed occupational profiles of the spreadsheet had been discussed in the expert interviews with an outcome. Afterwards every discussed occupational profile is presented in an own table, split with the expert answers about the expected changes in a digitalized world and need future skills. This overview shows a comprehensive overview of

single and job-specific skill needs to that can be used to enrich current training and as a base of more focused recruiting.

Reviewed Occupational Profiles	
Electrical Engineers	Computer Engineers
Civil Engineers	Automation Engineers
RAM/ LCC Engineers	Vehicle Architecture
Software Engineers	System Engineers
Programmers	Mechanical Engineers
Telecommunication Engineers	Safety Engineers
ILS Manager	Information Technology Engineers
Welding Engineers	Artificial Intelligence Engineers
Welding Technicians	
Non-Reviewed Occupational Profiles	
Railway Engineers	Network Engineers
Signal Processing	Transportation System Engineers
Robot Engineers	Process Engineers

TABLE 5 - REVIEWED AND NON-REVIEWED OCCUPATIONAL PROFILES

Electrical Engineers
Changes expected in a digitalized world
<ul style="list-style-type: none"> • Increasingly adoption of automated systems for managing and controlling network grids and power supply based on programmable controllers (PLCs) and electronic protections. • Interconnection of electrical devices even more based on optical fibers cables and advanced communication protocols. • Energy saving and recovery thanks to the adoption of storage systems deployed at the substation sites or train borne, to optimize the energy consumption both for traction and auxiliary services. • Use of renewable energy such as wind or solar energy in train depots depending on the conditions of the installation area.
Future skills needed
<ul style="list-style-type: none"> • Technicians and electrical designers that can add to their portfolio of competences also an adequate skill in the renewable energy area of knowledge.

TABLE 6 - PROFILE: ELECTRICAL ENGINEERS

Software Engineers
Changes expected in a digitalized world
<ul style="list-style-type: none"> • Higher complexity will require a shift from a functional paradigm to an object-orientated paradigm • Because of this rising complexity, it will be necessary to have a good understanding in conceptual work, especially in order of safety-relevant reasons (e.g., for admission procedures) • Cybersecurity will play a basic role in a digitalized world
Future skills needed
<ul style="list-style-type: none"> • Experience in the most advanced SW language and technologies. • Experience in Web based client and client server architectures, cloud. • Experience in Cybersecurity topics. • Experience in Safety Critical Embedded Systems. • Soft skills, especially communication

TABLE 7 - PROFILE: SOFTWARE ENGINEERS

Civil Engineers

Changes expected in a digitalized world

According to the profile described the most relevant changes expected will be related to increase:

- a robust interface methodology using the last software ad hoc issued.
- approach using “time and cost schedule” methodology for site activities
- knowledge of HSE rules in huge infrastructure project.
- knowledge of cost estimation for site activities.
- knowledge of signalling products in Hitachi to have an overall picture of the entire project work.

Future skills needed

Hard skills:

- Have a good knowledge of BIM modelling - could be request have a basic level.
- Have a good knowledge of software for scheduling (such as: Project, Primavera P6; Tilos).
- Have a certificate course for HS management during construction phase (such as in Italy: Coordinatore Sicurezza in fase di Esecuzione);
- Have a good level or Project Management basic module for cost estimation and time estimation (such as: Earned value).

Soft skills:

- Be proactive during the daily activities.
- Having interest in a technological issue and their functionality.
- Have a good English language knowledge written & spoken (one adds language it's till mandatory nowadays).
- Be problem solver oriented – take a “quick” decision it's always requested.
- Be collaborative in a project work and working in Team.
- Be flexible during daily work organization.
- Be interested to work in /and with different culture environmental.

TABLE 8 - PROFILE: CIVIL ENGINEERS

RAM/ LCC Engineers
Changes expected in a digitalized world
<ul style="list-style-type: none"> • Artificial Intelligence and possible RAM and Safety implications. • Human Factor and the link between technology and operators. • Cybersecurity vs Safety and Service Availability to identify possible weaknesses and mitigations in a generic rail transport system. • Physics of failures: internal mechanisms that can lead to failures and the possibility of modeling these mechanisms in a more realistic way. • Systems engineering extended to integrated transport networks (e.g., Railway, metro, bus, car integration, etc.) with relative involvement of RAM and Safety issues. • Internet of Things applied to railways to favor RAM/LCC monitoring (e.g., operating temperatures, the status of the various devices, etc.), control of fault latencies, and the possibility of making fewer conservative assumptions based on actual and not theoretical data. • Analysis of flows in infrastructures and passenger behavior in the face of possible scenarios (e.g., emergency evacuation) for safety evaluations.
Future skills needed

TABLE 9 - PROFILE: RAM/ LCC ENGINEERS

Programmers
Changes expected in a digitalized world

Future skills needed
<ul style="list-style-type: none"> • Knowledge of the most advanced SW language and technologies. • Knowledge of Web based client and client server architectures, cloud. • Knowledge of Cybersecurity topics. • Knowledge of Safety Critical Embedded Systems.

TABLE 10 - PROFILE: PROGRAMMERS

Telecommunication Engineers

Changes expected in a digitalized world

- Digitalization is more and more influencing the enterprise processes and the products' lifecycle. Digital tools (like such as ERP-Enterprise Resource Planning, CRM-Customer Relationship Management, SCM-Supply Chain Management, PLM-Product Lifecycle Management, SRM-Supplier Relationship Management) are nowadays key elements to support enterprises to deliver projects in a more effective and efficient way. Also, Railways market is of course impacted by this change. As part of the delivery cluster of Hitachi Rail operating in the Railways/Mass Transit market, Telecom engineers are requested to add value thanks to the application of multiple COTS digital tools and, as a result, to implement ad-hoc customization of such digital tools leveraging their knowledge on railways-specific telecom solutions. This can be applied to all the phases of a typical delivery of any railways project. By doing this, they can "challenge" the existing working processes, boost the quality of deliverables and significantly improve the overall efficiency.

Future skills needed

- The future skills set required to a Telecom engineer encompasses strong ICT competencies (such as networking, SW architecture principles, Cloud-based applications, notion of AI) to be combined with a "process-oriented mindset" according to the working principles of the even more impacting integrated business management systems (ERP, SCM, CRM, PLM, SRM).

TABLE 11 - PROFILE: TELECOMMUNICATION ENGINEERS

Welding Engineers + Welding Technicians

Changes expected in a digitalized world

- Digitalization of welding special process for robotized welding could lead to the possibility to predict welding quality and welding defects and by consequence to automatically adjust the welding parameters (Digitalization of Welding processes)

Future skills needed

- Robot welding knowledge
- New applicable norms constant updating
- Root cause analysis
- Problem solving technics (Welding Specialist)

TABLE 12 - PROFILE: WELDING SPECIALISTS



ILS Manager
Changes expected in a digitalized world
<ul style="list-style-type: none"> • TMS (Transport Management System)/Supply Chain Control Tower solutions are expected to be implemented by the majority of the company especially if they have a global business. These applications allow a digital management of the end-to-end supply chain transaction with real-time visibility of freight-in-transit and intelligent predictive arrival time. The introduction of these solutions will digitize and automate much of logistic activities, allowing logistics team members to focus on more strategic and value-add activities.
Future skills needed
<ul style="list-style-type: none"> • Capability of using digital solution (TMS, Control Tower) in addition to SAP; • Being up to date with the knowledge of import/export regulation framework and trade controls (dual use, etc.); • Flexibility to be able to work in unpredictable scenarios (for example, the actual COVID emergency has a significant impact on logistics activities).

TABLE 13 - PROFILE: ILS MANAGER

Computer Engineers
Changes expected in a digitalized world
<p>The evolution of Automation in our sector is mainly linked to the following streams:</p> <ul style="list-style-type: none"> • Digitalization. • Artificial Intelligence, to enhance the extent of support to traffic operators.
Future skills needed

TABLE 14 - PROFILE: COMPUTER ENGINEERS

Automation Engineers
Changes expected in a digitalized world
<p>The evolution of Automation in our sector is mainly linked to the following streams:</p> <ul style="list-style-type: none"> • Digitalization. • Artificial Intelligence, to enhance the extent of support to traffic operators.
Future skills needed

TABLE 15 - PROFILE: AUTOMATION ENGINEERS

Vehicle Architecture
Changes expected in a digitalized world
<ul style="list-style-type: none"> • Anticipate information for production by using tools based on 3D model in concurrence with Manufacturing Engineering.
Future skills needed
<ul style="list-style-type: none"> • Augmented reality

TABLE 16 - PROFILE: VEHICLE ARCHITECTURE

Information Technology Engineers
Changes expected in a digitalized world

Future skills needed
<ul style="list-style-type: none"> • IT Service Management (ITSM): that is to say to the entirety of activities – directed by policies, organized and structured in processes and supporting procedures – that are performed to plan, deliver, operate and control IT services offered to customers. It is thus concerned with the implementation of quality IT services that meet the needs of customers, and is performed through an appropriate mix of people, process and information technology.

TABLE 17 - PROFILE: INFORMATION TECHNOLOGY ENGINEERS



System Engineers
Changes expected in a digitalized world
<ul style="list-style-type: none"> • System Engineers are seen as extremely important for the future, because of the rising interconnectedness and complexity • To keep efficiency and quality, it would be necessary to design products according to the rules of formal logic • Furthermore, the changes will require more and more automatic validation of the systems and programs (e.g., the benefits of working with formal logic would be a high grade of quality because errors and mistakes would have been found earlier)
Future skills needed
<ul style="list-style-type: none"> • Use of innovative tools for Train Performance Simulation and Requirement Management • Skill oriented for using of the Big Data for improvement of the CBM (Condition Based Maintenance) at vehicles • Training on skills in formal logic

TABLE 18 - PROFILE: SYSTEM ENGINEERS

Artificial Intelligence Engineers
Changes expected in a digitalized world
<ul style="list-style-type: none"> • Changes will require the use of AI, but it is still not possible to predict the place of action, the point of time and the scope • Use of AI first to be expected in the areas of optimizing possibilities
Future skills needed
<ul style="list-style-type: none"> • Fundamental Know-How about AI • Strong system insights • Know-How about Cybersecurity • Admission procedures

TABLE 19 - PROFILE: ARTIFICIAL INTELLIGENCE ENGINEERS



Safety Engineers

Changes expected in a digitalized world

Technological advancements are changing the nature of how HSE professionals are working.

Develop new solution to monitor and manage risks, i.e., new HSE tool to:

- Support the risk management and prevention (risk assessment, mitigation actions, etc.).
- Monitoring.
- Support decision making and resource allocation.
- Incident management.

Mobile apps to support the HSE activities (incident managements, inspection, etc).

Additional risks to be managed:

- Risk from digital manufacturing.
- Psycho-social risks.
- Electromagnetical fields.

New system to: 3D safety training.

Future skills needed

The actual HSE professional profile is expected to be enriched by a holistic view of the hazards, broad-based knowledge of safety, health, environmental areas: therefore an interdisciplinary approach should also consider knowledge an awareness of the impact of:

- Work environment design (engineering, ergonomic, software, and automation);
- Tools and devices (technology, health tech, and sensors);
- Physical and social impacts (public health, nutrition, physical activity, and demographics);
- Human nature (Psychology, Sociology and Economics);
- Work organization models.

TABLE 20 - PROFILE: SAFETY ENGINEERS

Mechanical Engineers

Changes expected in a digitalized world

- Self-monitoring technologies for the in-line performance assessment of highly stressed mechanical structures.
- Predictive analytics.

Future skills needed

TABLE 21 - PROFILE: MECHANICAL ENGINEERS

5 DATA SCROLLING

To enhance the work package's resources of information and to gain more intelligent insight by using data analysis methodology, the global research and advisory firm Gartner had been requested for an investigation about actual talent demand and an analysis of skills for rail supplier.

The section will give an overview about the results of the data scrolling and will refer back to the previous findings of this report.

5.1 Methodology

The resource for the methodology was set by the request to analyse talent demand and skills based on the company's job postings in Europe on corporate career sites and job boards. In total, Gartner analysed 1.021.062 job postings globally. The following focus functions have been defined:

- Digitization (IT)
- Engineering
- Manufacturing
- Project Management
- R&D

To give a broad overview about the talent demand, Gartner did an historical (Q3 2018 – Q2 2019, Q3 2019 – Q2 2020) and annual (Q3 2020 – Q2 2021) research for these focus functions. The annual demand represents the number of job postings in Q3 2020 to Q2 2021. Out of this information, Gartner also compiled a list of top titles for each focus function, differentiating between top, decreasing and growing titles over the past 2-3 years.

For the skill analysis, they studied the skill evolution of the past 4 years and defining key skills for each focus function. Also, here, Gartner distinguished these key skills between prevalent, in-demand and emerging skills, based on the job demand analysis between Q3 2020 and Q2 2021. Referring only to the in-demand skills, an additional analysis between top hard and soft skills across each function had been delivered.

5.2 Results

The research on annual talent demand based on about 1 million job postings showed that digitization/ IT is the most requested job family searched on the job market and constitutes half of

the evaluated job postings with the most increasing demand over the past years. The demand for engineers and project management is similar with a percentage of 20% for both, the historical request for each has been constant. R&D is the focus function with the least job postings on the market, nevertheless the historical research reveals an increasing demand for R&D. This may be interpreted as a result out of the increasing demand on digitalization that might overlap with R&D to a certain degree. The request for manufacturing is higher than for R&D, but in contrast to all other focus functions, the demand for it declined the most over the past years.

The following table shows the top titles for each focus function, based on the highest volume of job postings in Q3 2020 to Q2 2021:

Digitization (IT)	
Software Developer	Embedded Software Engineer
Software Engineer	Senior Software Developer
Data Engineer	Data Architect
Senior Software Engineer	Software Architect
Front End Developer	Senior Data Engineer
Engineering	
Electrical Engineer	Senior Mechanical Engineer
Mechanical Engineer	Senior Electrical Engineer
Civil Engineer	Electrical Maintenance Engineer
Electronics Engineer	Electrical Engineer Engineering
Senior Civil Engineer	Mechanical Maintenance Engineer
Manufacturing	
Production Manager	Team Leader
Manager Engine Plant	Training Machine Plant Manager
Production Supervisor	Assistant Production Manager
Plant Manager	Manufacturing Manager
Production Team Leader	Machine Plant Manager

Project Management	
Project Manager	Assistant Project Manager
Senior Project Manager	Mechanical Project Manager
Technical Project Manager	Engineering Project Manager
Junior Project Manager	Electrical Project Manager
Bid Manager	PMO Analyst
R&D	
Project Engineer	Electrical Project Engineer
Project Manager	RAMS Engineer
Principal Engineer	Electrical Engineer
Senior Engineer	Engineering Manager

TABLE 22 - DATA SCROLLING: TOP JOB TITLES

On the first sight, the table of top titles shows the demand for a few senior titles, which could be a concrete indication for companies and institutions in reference to further development of training and learning programs if the job market does not deliver the appropriate employees. Furthermore, the result of Gartner in the focus functions for digitization and engineering are highly matching the listed occupational profiles in the spreadsheet, but also gives a reliable enhancement for it.

In the next step Gartner filtered the key hard skills for every focus function and arranging them in descending order of proportion of job postings in the time period of July 2020 until June 2021. It is to be mentioned that the present lists are non-exhaustive.

The following tables also differentiate between **prevalent**, **in-demand** and **emerging** skills and have been identified based on job growth for job postings between July 2017 to June 2021.

Digitization (IT)	Engineering
1. SQL	1. Electronics
2. Java	2. AutoCAD
3. Python	3. Automation
4. JavaScript	4. Electromechanics
5. C/C++	5. Electrical Installation



<ul style="list-style-type: none"> 6. AWS 7. Microsoft Azure 8. IT Security 9. Microsoft .NET Framework 10. Docker 	<ul style="list-style-type: none"> 6. Safety Engineering 7. Control Systems 8. Programmable Logic Controllers 9. SolidWorks CAD 10. Electrical Design
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TABLE 23 - DATA SCROLLING: SKILLS DIGITIZATION & ENGINEERING

Manufacturing	R&D
<ul style="list-style-type: none"> 1. Quality Control 2. Lean Manufacturing 3. 5S 4. Industrial Machinery 5. Six Sigma 6. Quality Management 7. Supply Chain 8. Automation 9. Quality Systems 10. Hazard Analysis 	<ul style="list-style-type: none"> 1. Testing 2. Innovation 3. Risk Assessment 4. Automation 5. AutoCAD 6. Electronics 7. Railway Systems 8. Control Systems 9. Software Development 10. Safety Management

TABLE 24 - DATA SCROLLING: SKILLS MANUFACTURING & R&D

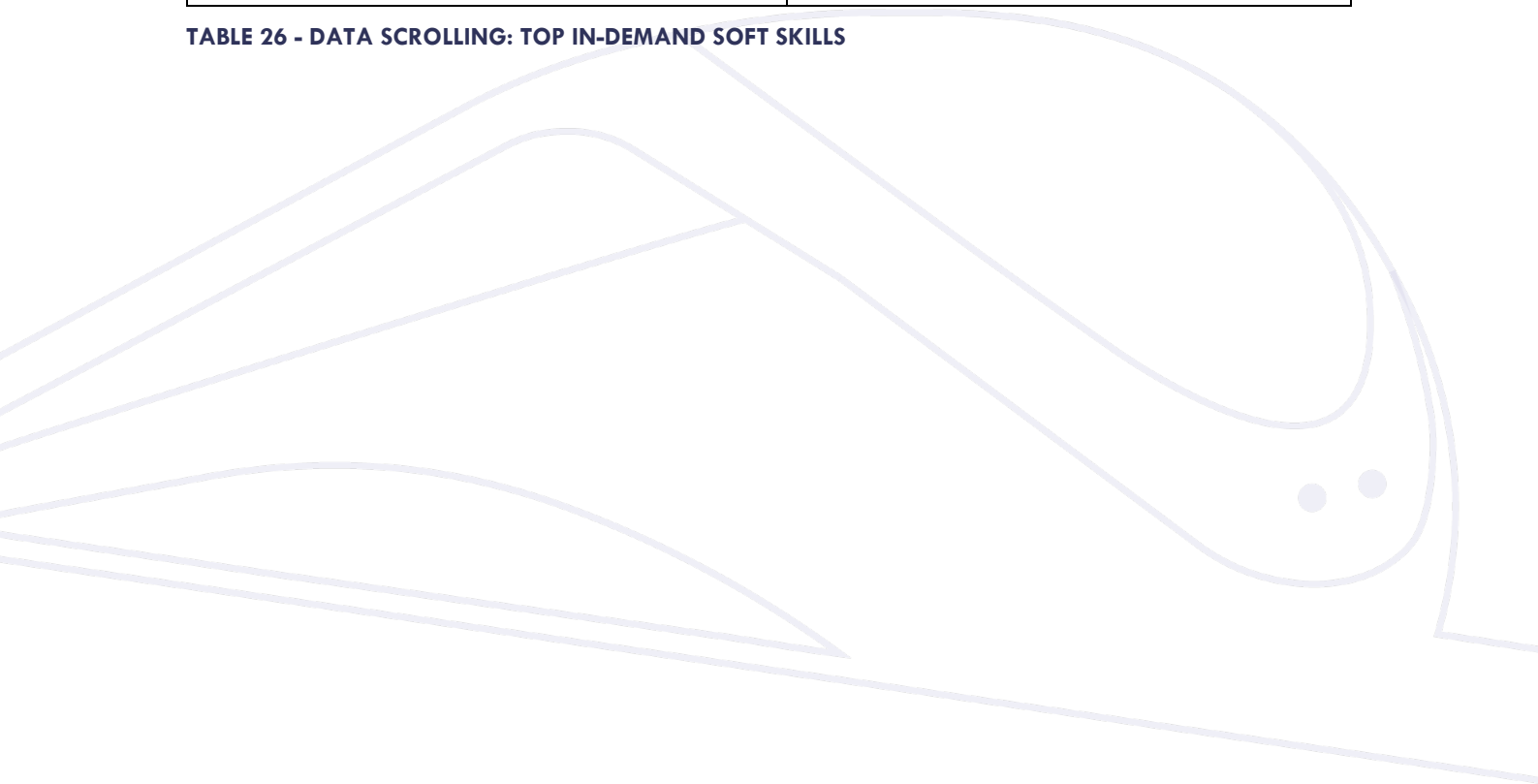
Project Management	
<ul style="list-style-type: none"> 1. Project Engineering 2. AutoCAD 3. Process Engineering 4. Mechatronics 5. Quality Management 	<ul style="list-style-type: none"> 6. Risk Assessment 7. Electromechanics 8. Control Systems 9. Mechanical Design 10. SolidWorks CAD

TABLE 25 - DATA SCROLLING: SKILLS PROJECT MANAGEMENT

While the tables above only show the hard skills by the focus functions, there have been also an analysis about the top in-demand soft skills. For this purpose, Gartner used corporate sites, public profiles, and secondary literature as additional resources.

Top in-demand soft skills	
Communication	Problem Solving
Monitoring	Planning
Collaboration	Leadership

TABLE 26 - DATA SCROLLING: TOP IN-DEMAND SOFT SKILLS



6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary

Summing up all insights from the different sources in the report so far, a broad demand on skills and learning needs are stated, however we also see that the feeling of ‘urgency’ goes in line with the pace of change and business needs. As we have also seen in WP1 rail industry enters late in the digital change curve we notice the urgency is firstly affecting engineering paired with the strong need to build up the capacity for digitalization.

Companies use all learning elements of the 70-20-10 scheme to ensure up-skilling on a broader base and deepening the learning of skill by role modelling and peer-to-peer approaches. This can also be a guiding principle for further STAFFER discussions not to focus only on training, but also to build a strategy of diverse elements to work on the filling of the skill gap and, furthermore, to keep the overall employability of the workforce to learn and to adapt high.

Discussing future skills requires diverse perspectives on future development of trends market, products and technologies as stated in WP 1. However, the skills which need to be increased, changed, or added could be a mix out of very common skills. The critical incidents technique helps to understand the context and derive the skill need from it. Future Skills are no ‘Black Swans’ that are rare to find. They are sometimes simple and well-known like *collaboration*. In the light of agile working structures, overcoming silo thinking and flattening hierarchy’s *collaboration* gets a different meaning than before.

The data scrolling was providing insights into the overall skill need. All companies have a high demand for digitalization profiles. Building recruiting strategies around digitalization profiles is an essential topic to ensure business reliability for the future. However, this high focus should not mislead to neglect the other occupational areas where we also see which profiles are high in demand. Also, the need for skill shift is maybe not marked as ‘urgent’ today and might take place in minor shift moves, but nevertheless the importance can be high and very specific at the same time.

6.2 Recommended top future skills

The report itself gives a broad selection on skill needs and future skills. Mirroring the current training activities against the broad portfolio of the named skills, we see that many skills are already covered by training as we are rarely seeking to cover new skills. The quality that makes the difference is more that skills need to be combined or applied for different work groups.

Like consulting skills for salespeople in our example named before. The working group discussed about how STAFFER can make a difference for us as supplier companies. We are used to build up domain specific knowhow for students that come with a broad education – but maybe not rail-specific. What would be an outcome of STAFFER that we all benefit from in a sense that we could not be able to build this up alone. The discussion focused on five most relevant future or needed skills which need to be developed from the point of view of suppliers and which are highly related with each other:

Soft Skills
<p>Collaboration: Working together although you do not have a common language, although organizational structure needs to be overcome is essential in our time. Companies build ecosystems with external parties, customers, academia, etc. that needs new ways of collaboration to be defined.</p> <p>Problem solving: In a time of change there are rather no given solutions anymore as they do not any longer help to solve the problem. To understand a problem, bring interdisciplinary faculties at the table and find new solutions is a capacity that is difficult to train but essential at the same time to make things work.</p>
Hard Skills
<p>Holistic understanding & system thinking: Especially in times of digitization, systems are continuously changing. Related to both soft skills collaboration and problem solving, a holistic understanding and system thinking are essential key skills to work in cross-functional and interdisciplinary systems. The focus is moving away from the specific knowhow to broader system understanding – also including more work groups from different faculties. Being able to adapt the system by adding or changing part through digital elements or adapting to new sustainable technologies or materials is crucial.</p> <p>Bridging of traditional and digital approaches: When a new group of digital experts is entering the company, how could collaboration and understanding with the existing group of traditional engineers be fostered. Especially the understanding of the two technical domains is crucial. This effects also the very early education of students as companies are today only getting people from either the one technical domain or the other. To generate more people</p>

who have a deep understanding of traditional rail as well as digitalization will be a success factor in the future.

Life-Cycle Management: Life-Cycle Management is a bit like the holistic understanding of the rail system but with the aspect of evolution over time of operation.

As an outcome, out of WP 3.2 we like to put these five skills forward for further exploration for the next WP's to develop skill gap solutions. We strongly recommend making an effort to understand the critical incidents first before developing a solution as all five skills are interconnected and with that rather complex.

6.3 Supplier's expectations of outcome from STAFFER

Bringing this deliverable to a close, the supplier discussed expected benefits from the STAFFER project: One hope is to receive better prepared and skilled employees – this hope applies to young professionals and career starters as well as to senior employees. Furthermore, the STAFFER outcome should contribute to bridging the skill gap demand or reducing this gap by connecting the traditional rail profession with today's digital approaches and therefore also taking an influence in the education system to develop this connection. The STAFFER project's aspiration should furthermore broadcast and increase the awareness as well as the importance of the rail industry as an employer and promote the image of rail industry. Rail is a very modern and fancy topic – especially if you think of all possible opportunities that raise with the digitalization coupled with traditional rail. Nevertheless, this awareness needs to be transported to the employee market.