DRIVES

Development and Research on Innovative Vocational Education Skills

AUTOMOTIVE SKILLS AGENDA

STRATEGY & ROADMAP

Deliverable 2.9 – First Release

May 2020

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Development and Research on Innovative Vocational Skills -DRIVES – Project number 591988-EPP-1-2017-1-CZ-EPPKA2-SSA-B

TITLE OF THE DOCUMENT

Report Title:	Automotive Skills Agenda Strategy & Roadmap		
Responsible Project Partner:	SPIN360	Contributing Project Partners:	Work Package 2 Partners ACEA AIC CLEPA EFVET Enginuity ETRMA ISCN SERNAUTO SFC TUG UTWENTE VSB-TUO

Document data:	File name:	DRIVES-D2.9 Automotive Skills Agenda Strategy and Roadmap		
	Pages:	77	No. of annexes:	3
	Status:	Final	Dissemination level:	Public
Project title:	Development and Research on Innovative Vocational Educational Skills		GA No.:	2017-3295/001-001.
WP title:	WP2 Sectoral Intelligence and Roadmapping		Project No.:	591988-EPP-1-2017-1-CZ-EPPKA2-SSA-B
			Deliverable No:	D 2.9
			Submission date:	22/05/2020
Keywords:	Automotive sector, Drivers of Change, skills, job roles, challenges, strategy, roadmap, survey, key actions, key areas, stakeholders			
Reviewed by:	Marta Conti, ETRMA		Review date:	08/05/2020
	Petr Dolejsi, ACEA		Review date:	20/05/2020
	Utimia Madaleno, EUPPY		Review date:	22/05/2020
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LIST OF ABBREVIATIONS

ABBREVIATION	MEANING
3D	Three-dimensional
ACEA	European Automobile Manufacturers' Association
ADAS	Advanced Driver-Assistance Systems
AI	Artificial Intelligence
AIE	European Association of Electrical Contractors
ALBATTS	(the) Alliance for Batteries Technology, Training and Skills
BASE	Big Data, ADAS and After Sales, Supply chain and Sharing, Electrification
BEV	Battery Electric Vehicle
CAR2X	Car to Everything
CAD	Computer-Aided Design
CEO	Chief Executive Officer
CLEPA	European Association of Automotive Suppliers
CO_2	Carbon Dioxide
CTE	Career and Technical Education
CVET	Continuing Vocational Education and Training
D x.y	Deliverable x.y
DoC	Driver of Change
DRIVES	Development and Research on Innovative Vocational Educational Skills
EASCY	Electrified, Autonomous, Shared, Connected and Yearly updated
EEA	European Environment Agency
ETRMA	European Tyre & Rubber Manufacturers' Association
EVs	Electric Vehicle
ExVe	Extended Vehicle
EQF	European Qualifications Framework
ESCO	European Skills, Competences, qualifications and Occupations
EU	European Union
EU28	European Union (28 states)
GPS	Global Positioning System
HEV	Hybrid Electric Vehicle
HQ	Head Quarter
HR	Human Resource
IT	Information Technology
IoT	Internet of Things
IVET	Initial Vocational Education and Training
KA	Key Action
KAR	Key Area
KPI	Key Performance Indicator
OBD2	On-Board Diagnostics II
OE	Occupational Education
OEM	Original Equipment Manufacturer
OTP	Open Telecom Platform
PDCA	Plan–Do–Check–Act
PVE	Professional and Vocational Education
R&D	Research & Development
R&D&I	Research & Development & Innovation
SME	Small Medium Enterprise

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ABBREVIATION	MEANING
TaaS	Tyre as a Service
TVE	Technical-Vocational Education
TVET	Technical and Vocational Education and Training
U.S.	United States of America
V2X	Vehicle to Everything
VET	Vocational Education and Training
WE	Workforce Education
WP x	Work Package x

EXECUTIVE SUMMARY

The ongoing changes in Automotive Sector requires a high level of upskilling and reskilling of the current and future workforce. DRIVES project, as the Blueprint for Sectoral Cooperation on Skills in the Automotive sector, proposes Automotive Skills Strategy and Roadmap based on project analysis from last year's survey and other existing inputs.

The methodology applied for the sectoral strategy for the skills agenda in the automotive sector focuses on fulfilling the mission, vision and values. The work is based on 8 **Key Areas (KARs)** that serves as elements for the analysis and definitions:

1. Scope of the sector
2. Sectoral stakeholders
3. Drivers of Change influencing the sector
4. Target job roles and occupations
5. Target skills
6. Training and education provision mechanisms
7. Recognition mechanism
8. Recruitment and attractiveness of the sector

Each KAR is described further in detail with a **Base** and **Specific Objectives** that serves as basis for sectoral skills agenda strategy composed by **Key Actions (KAs)** with specific **Actions** to be taken.

Automotive Skills Agenda Analysis is based on 2 years of analysis performed by DRIVES project. The eight Key Areas show that stakeholders involved in the supply chain of the Automotive sector (interviewed with the "Demand Survey") and VET providers offering skills and services for them (interviewed with the so called "Offer Survey") drive in a similar direction, but with significant difference. The relative importance attached to different Drivers of Change by respondents to both surveys (the "Demand" and "Offer") were similar in many respects. However, "STRUCTURAL CHANGES" has been ranked first in the Demand survey, while the Offer survey "CLIMATE GOALS, ENVIRONMENTAL AND HEALTH CHALLENGES" was ranked first. Comparison of the two sets of responses with respect to "STRUCTURAL CHANGE" (restructuring, acquisition of new skills, continuous

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training) points to a difference of 7% between overall demand and offer survey responses identified as especially important.

With regards to the urgency (to investigate the impact of the Drivers of Change), even if the ranking between Demand and Offer is similar in terms of position, with “STRUCTURAL CHANGE” identified by both as very urgent (considering by 2020), the real main difference between Demand and Offer is that respondents of the Offer survey are more likely to cite a longer term urgency (by 2025) for all specific Drivers of Change.

Concerning the analysis of skills need between Demand and Offer the difference is now more evident, in fact only 5 similarities are present into the TOP20 skills list, comparing Demand and Offer point of view; more than before, the gap between Demand and Offer is evident and it is important to better evaluate this situation.

Regarding the preferences of stakeholders in relation to the most appropriate VET mechanisms to meet changing needs, even if the Demand and Offer both highlight the importance of “TRAINING ON THE JOB” as the most effective VET approach. “MENTORING” and “DUAL SYSTEM/APPRENTICESHIPS” are shown as high importance on the Demand side as opposed to low rated in the Offer side.

DRIVES Partnership recognises that the picture represented by these survey does not take into consideration the effects of COVID-19. In the perspective of VET mechanisms, the most immediate consequence would be that the chosen types of training would be now much more difficult to implement and that online trainings would acquire a much bigger importance.

Another interesting point of 8 KARs is the point of view related to the attractiveness of the sector and understanding stakeholders’ views relating to the best recruitment method to attract new and talented (young) workforce. The differences are most obvious with respect to “ONLINE/SOCIAL NETWORK”, with respondents to the Offer survey consistently placing these methods as the least important, while respondents to the Demand survey place a somewhat higher level of importance on these methods. Company Reputation (“INCREASE COMPANY REPUTATION” as a means of attracting workers into the sector) is also perceived as more important on the Demand side while respondents to the Offer survey placed as not so important.

Based on the analysis DRIVES proposes **Automotive Skills Agenda Strategy** with 8 **Key Actions** (KAs) with specific **Actions** to be taken:

1. KA 1: Establish EU Reference Recognition of Skills and Job Roles

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2. KA 2: Establish Harmonized Approach to Education and Training Offer
3. KA 3: Understand and make available innovative methods of delivery of training and education
4. KA 4: Modular Approach to the Training Provision
5. KA 5: Focus on All Levels of Education and Training
6. KA 6: Improve Recruitment and Attractiveness of the Automotive Sector
7. KA 7: Actively Involve Key Players and Sectoral Intelligence Update
8. KA 8: Ensure Sustainable Approach

For each of the KAs, the **Automotive Skill Agenda Roadmap** has been proposed takes into the account the Key Actions identified and links it to the **Stakeholders** involved, assigning them a specific **Role** (key or supporting) and **Timing** (short/mid-term or Continuous).

For the purposes of the roadmap all stakeholders have been grouped into several main categories as follow:

- EC: European Commission
- Education and Training Providers: Accreditation, certification or qualification bodies, Colleges / Universities, Private companies and involved into EQF3 to EQF8 “activities”, Research institutes as well as research centres, VET schools whether or not organised and represented by Umbrella organizations and Sectoral VET associations
- Industry: Large Enterprise and Small and Medium Enterprise whether or not organised in sectoral/industrial or other associations at regional and/or European level.
- National Authorities: Education and Labour Ministries, Labour Market Intelligence Entities, National Statistics Labour Offices and Public Authority (Labour) Public Authority (Employment), Chambers of Commerce, Public/Private Employment Services, Technology Centre.
- Trade Unions

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1 INTRODUCTION

This document is the first release of AUTOMOTIVE SKILLS AGENDA STRATEGY & ROADMAP, which is provided as one of the outputs of the **D**evelopment and **R**esearch on **I**nnovative **V**ocational **E**ducational **S**kills project (**DRIVES**), the Blueprint for Sectoral Cooperation on Skills in the Automotive sector. The **DRIVES** project "drives" the Automotive Skills Agenda, ensures its development and adoption by key stakeholders. It covers overall EU Automotive Sector, and its value-chain.

The aim of this document is to provide strategy and roadmap for Automotive Skills Agenda and its future developments complementary to other strategies in the sector.

The DRIVES project sees this Strategy and Roadmap as a toolkit to be used by a wider set of stakeholders within the sector – particularly involving those categories that we see as actors of the actions here outlined. Based on this feedback, a second release is planned by the end of 2020 and a third and final release by the end of 2021. Nonetheless, as the sector is subject to continues changes and developments, the DRIVES partnership recommends that this Strategy and Roadmap is reviewed periodically.

DEVELOPMENT AND RESEARCH ON INNOVATIVE VOCATIONAL EDUCATIONAL SKILLS PROJECT (DRIVES)

The Development and Research on Innovative Vocational Educational Skills project (DRIVES) delivers human capital solutions to the whole automotive supply chain through the establishment of an Automotive Sector Skills Alliance. This covers all levels of the value chain (vehicle production, automotive suppliers and automotive sales and aftermarket services). Through the network of the full project partners, such as ACEA, CLEPA and ETRMA, and associated partners, such as Stuttgart Region, DRIVES outcomes are disseminated EU-wide to more than 300 associations, bringing together more than 270,450 companies of all sizes, representing over 7 million workers.

The DRIVES project is part of the Blueprint for Sectoral Cooperation on Skills in the Automotive Sector.[1] The goal is to establish an Automotive Sector Skills Alliance covering all levels of the value chain and

[1] *https://ec.europa.eu/social/main.jsp?catId=1415&langId=en*

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to ensure that needs of industry are reflected by education and training institutions. The Project is based on cooperation between 24 full partners from 11 EU countries[2]. The goals of the DRIVES project are to:

- **Analyse key trends** in the automotive sector, covering the whole value chain
- **Define the skills and job roles** needed in the future
- **Analyse the training offer side** currently available
- **Identify skills gaps** for foreseen changes
- Ensure **mutual recognition** of the skills and job roles **across the EU**
- **Create an EU-wide framework** that can be used throughout the EU and implemented in the EU regions – based on commonly used definitions
- **Create training** for selected skills and job roles in the automotive sector
- **Pilot 1100 learners across the EU** and across the education and training institutions
- **Provide clear guidance for the education and training providers** on skills needs of the automotive industry

One of the aims of DRIVES project Work Package 2 Sectoral Intelligence and Roadmapping is the development of the AUTOMOTIVE SKILLS AGENDA STRATEGY & ROADMAP under the "Deliverable 2.9 Automotive Skill Strategic Roadmap" and its update at least for the duration of the project.

More information about DRIVES project and contact: www.project-drives.eu

DOCUMENT OUTLINE

The document is composed by sections and appendixes as follow:

Section 1 "INTRODUCTION", an executive brief of the document

Section 2 "AUTOMOTIVE SECTORAL SKILLS AGENDA" – MISSON, VISION & VALUES" introduces the main reason for the skills agenda, with goals to be achieved and values that need to be followed

[2] *https://www.project-drives.eu/en/home*

Section 3 "METHODOLOGY FOR SECTORAL STRATEGY & ROADMAP" describes the approach, which will be taken regarding proposed Strategy and Roadmap

Section 4 "REPRESENTATION OF AUTOMOTIVE SKILLS AGENDA" introduces key areas used to prepare the strategy and roadmap and to analyse the sector from different points of view

Section 5 "AUTOMOTIVE SKILLS AGENDA STRATEGY" describes the strategy for the sectoral skills agenda, including Key Actions to be taken

Section 6 "AUTOMOTIVE SKILLS AGENDA ROADMAP" describes the roadmap for the sectoral skills agenda related to the Key Actions to be taken involving stakeholders and timing

Appendix A "AUTOMOTIVE SKILLS AGENDA ANALYSIS – METHODOLOGY" describes in more detail the steps of the analysis conducted by DRIVES project

Appendix B "AUTOMOTIVE SKILLS AGENDA ANALYSIS – KEY RESULTS" describes key findings of the analysis related to defined key areas

Appendix C "ONGOING CHANGES IN THE AUTOMOTIVE SECTOR" introduces the ongoing changes in Automotive sector to set up in the background for the Skills Agenda

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2 AUTOMOTIVE SECTOR SKILLS AGENDA – MISSION, VISION & VALUES

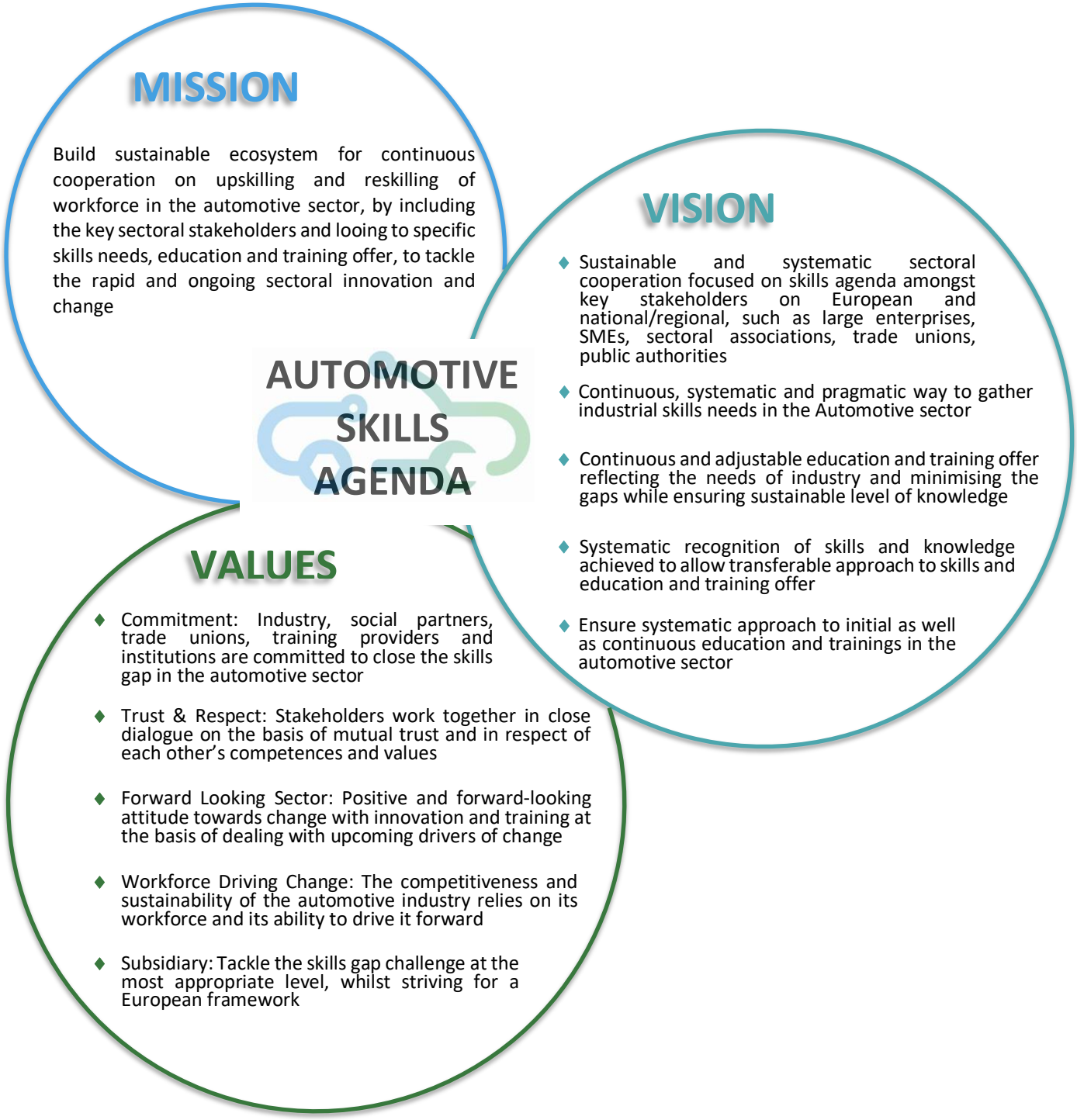

Figure 1 DRIVES project Mission, Vision and Values

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3 METHODOLOGY FOR SECTORAL STRATEGY & ROADMAP

The methodology applied for the sectoral strategy for the skills agenda in the automotive sector focuses on fulfilling the mission, vision and values defined in the previous section (Figure 1).

The approach to the sector of the DRIVES project relating to the skills agenda is described by Figure 2 and can be summarised into the following elements:

- **Key Areas of Skills Agenda** - the work is based on eight key areas defined by the partnership. It serves as the main elements for a sectoral strategy on skills and has been analysed one by one in order to permit a deep evaluation of each characteristic and evaluate specific actions.
- **Automotive Skills Agenda Analysis** - based on the defined Key areas, the DRIVES project has carried out over last two years composed of **Desk research, Survey focused on Skills needs and Survey focused on Skills offer**. It served as one of the inputs to the strategy: a funnel of information gathered by the desk-research activity, combined with direct engagement of stakeholders to support findings and recommendations included in the strategy and roadmap. European meetings were carried out with stakeholders to present previous outcomes and the main results and to collect first-hand feedback and opinions. The overall approach and key findings of the sectoral analysis are described in Appendix B.
- **Automotive Skill Agenda Strategy** - DRIVES is proposing an overall set of **Base Objectives** and **Specific Objectives** that serve as the basis for a sectoral agenda skills strategy. On that basis we are proposing **Key Actions**, with detailed **Actions** what should be done.
- **Automotive Skill Agenda Roadmap** – takes into the account the Key Actions identified and puts it to the perspective of **Stakeholders** involved and **Timing.**

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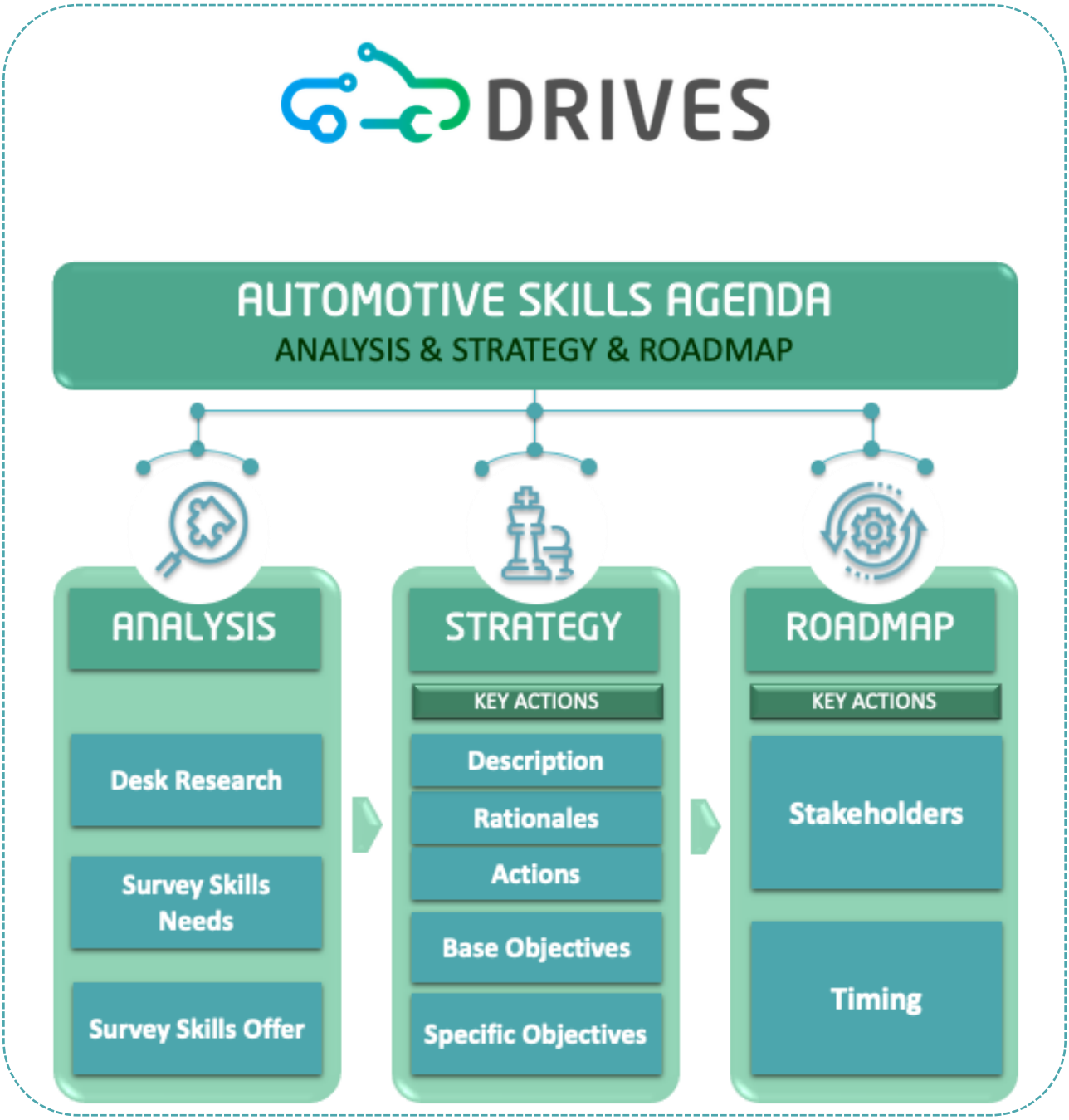

Figure 2 Automotive Skills Agenda – Analysis & Strategy & Roadmap

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4 REPRESENTATION OF AUTOMOTIVE SKILLS AGENDA

The Representation of the Automotive Skill Agenda is divided into eight main key areas as per Figure 3. The key areas were used for capturing the sectoral skills agenda as the basis for sectoral analysis. Key results of the sectoral analysis are in Appendix B.

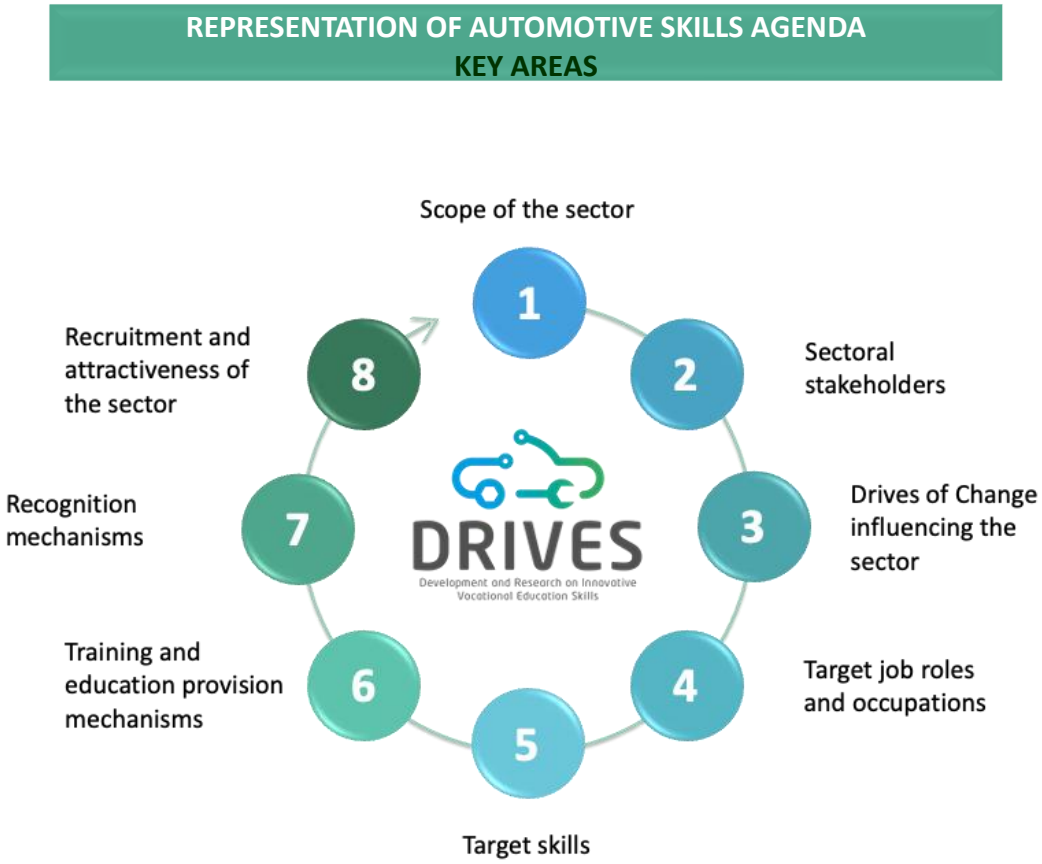

Figure 3 DRIVES 8 key areas used to investigate the sector

Key areas are described as follow:

1. Scope of the sector
2. Sectoral stakeholders
3. Drivers of Change influencing the sector
4. Target job roles and occupations

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5. Target skills
6. Training and education provision mechanisms
7. Recognition mechanisms
8. Recruitment and attractiveness of the sector

Key Area 1 – Scope of the sector

This key area is necessary for understanding and the clarification of the framework for the whole process and to prepare a clear picture of the main elements and priorities in terms of sector / subsectors importance and geography, supply chain structure, companies organisation and value chain, turnover and numbers of employees.

This key area is important into a skill anticipation process to define the scope, design the framework, set up KPIs.

Key Area 2 – Sectoral stakeholders

This key area is essential to understand the current vision of the sector by the stakeholders (industry and service providers). Stakeholders are composed of Accreditation, Certification or Qualification Bodies; Chambers of Commerce; Colleges / Universities; Education Ministries; European Commission; Labour Market Intelligence Entities; Labour Ministries; Large Enterprise; National Statistics Offices; Private companies involved into EQF3 to EQF8 “activities”; Public Authority; Public/Private Employment Services; Research institutes as well as research centres; Sectoral/Industrial Association; Small and Medium Enterprise; Technology Centre; Trade Union; Umbrella organisations; VET schools

This key area is important into a skill anticipation process for data gathering, data validation, network implementation.

Key Area 3 – Drivers of Change influencing the sector

Drivers of Change are those factors which bring change in the sector. The analysis of the sector must start from the identification of the evolution, changing and their evaluation. Without this activity it is impossible to pilot the strategic direction of the project.

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This key area is necessary into a skill anticipation process to identify the scheme of the process, orientate decisions, and articulate the strategy.

Key Area 4 – Target job roles and occupations

An occupation is a grouping of jobs involving similar tasks and which require a similar skill set. Due to the fact that Occupations is a "technical" definition and all stakeholders involved in our activities found difficulties understanding the difference between Occupation and Job Role, we decided to use Occupation as synonymous of Job Roles. Analysing target occupations is a necessary key area into a skill anticipation process to target project actions, study appropriate training courses.

Key Area 5 – Target skills

Skills are the core necessity into a skill anticipation process. They are the main, basic information to plan future project activities (according to Drivers of Change). As it is the basic talent (action verb[3]) necessary to describe all the Occupations, a skill is the ability to apply knowledge to complete tasks and solve problems. A Skill is also an easy transferable "item" around Europe. Sometime "Job Roles" have different meanings in different countries (and also in same country within different companies). A Skill is a more standard element, easier to map and analyse.

This key area is necessary into a skill anticipation process to better describe Job Roles, support an easy transferability of knowledge between European countries, allow the development of target training and education programmes.

Key Area 6 – Training and education provision mechanisms

Vocational Education and Training (VET) aims to equip people with knowledge, skills and/or competences required in particular occupations, or more broadly within the labour market.

Understanding how Vocational Education and Training is currently provided to the sector is an essential element to help define the overall skills strategy. In addition, understanding the preferences of the sector in relation to the most appropriate mechanisms for delivering VET.

[3] https://europass.cedefop.europa.eu/documents/european-skills-passport/certificate-supplement/action-verbs-glossary

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This key area is necessary into a skill anticipation process to orientate training providers, analyse effectiveness and cost-based efficiency of alternatives, move from a theoretical to a practical point of view, evaluate relative importance of strategy against others.

Key Area 7 – Recognition mechanisms

This key area is fundamental to obtain structured information on the current use of specific Recognition and Qualification frameworks and on the perceived importance of harmonisation activities at European level. The European Union is made up of many different nations, with different standard and peculiarities. Having the possibility to easily move skilled and talented people between countries is a core asset of any "skill anticipation process".

This key area is necessary into a skill anticipation process to provide structured information to the transferability of skills around Europe, disseminate preference and harmonise the framework, analyse the effectiveness and cost-based efficiency of alternatives.

Key Area 8 – Recruitment and attractiveness of the sector

The attractiveness of the sector is a necessity into a skill anticipation process to understand the stakeholder point of view to capture whether the sector is attractive for young and talented workers.

This key area is necessary into a skill anticipation process to move from a theoretical to a practical point of view, maintain a highly skilled workforce and attract talented into the sector.

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5 AUTOMOTIVE SKILLS AGENDA STRATEGY

The main purpose of Automotive Skills Agenda Strategy is to assure implementation of the mission and vision statements, and to assure a sustainable approach to continuous upskilling and reskilling in Automotive Sector.

The Automotive Skills Agenda Strategy (Figure 4) consist of **Base Objectives** and **Specific Objectives** following the key areas of the Automotive Skills Agenda. **Key Actions** are the main actions to be taken to assure continuous and successful skills agenda in Automotive to tackle the ongoing changes (appendix C). Each Key Action is described in further detail with a link to Specific Objectives, which needs to be justified with Rationales from Automotive Skill Agenda Analysis and available intelligence, and with specific and related Actions to be taken.

Figure 4 Automotive Skills Agenda Strategy

BASE AND SPECIFIC OBJECTIVES

Key Area	Base Objectives	Specific Objectives
1. Understanding the scope of the sector	1.1 Clarify the main elements and priorities of sector	1.1.1 Continuously oversee and clarify the structure and role of Automotive sector
		1.1.2 Continuously oversee and clarify sectoral priorities
	1.2 Map and keep updated sector boundaries and cross-sectoral boundaries	1.2.1 Continuously oversee and clarify cross-sectoral boundaries in relation to other sector (e.g. IT sector, battery sector, material production, economic models, etc.)
2. Understanding and involving sectoral stakeholders	2.1 Identification of sectoral stakeholders	2.1.1 Continuously oversee and identify impact of changes on automotive value-chain
		2.1.2 Continuously oversee and update networks of sectoral skills agenda dialog partners at international level
		2.1.3 Continuously oversee and update networks of sectoral skills agenda dialog partners at national/regional level
	2.2 Ensure motivation and commitment of all key stakeholders	2.2.1 Ensure commitment of social partners, decision makers at European level
		2.2.2 Ensure commitment of social partners, decision makers at national/regional level
		2.2.3 Ensure commitment of education and training providers at European level
		2.2.4 Ensure commitment of education and training providers at national/regional level
		2.2.5 Ensure commitment of industry at European level
		2.2.6 Ensure commitment of industry at national/regional level
		2.2.7 Ensure commitment of Institutions at European level
		2.2.8 Ensure commitment of Institutions at national/regional level
3. Understanding how Drivers of Change influence the sector	3.1 Identify and continuously update intelligence (impact, severity, priority, timing, etc.) on major trends influencing the sector	3.1.1 Continuously oversee and identify Drivers of Change, and their severity, priority, timing and impact

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Key Area	Base Objectives	Specific Objectives
4. Identification of job roles/occupation needs	4.1 Identify and continuously update intelligence (impact, severity, priority, timing, etc.) on job roles within the sector	4.1.1 Continuously oversee and identify understanding of required job roles definitions (job role or occupation, etc.)
		4.1.2 Continuously oversee and identify new or emerging job roles and their linked skills
		4.1.3 Continuously oversee and identify disappearing job roles and their linked skills
5. Identification of skills needs	5.1 Identify and continuously update intelligence (impact, severity, priority, timing, etc.) on skills needs in the sector	5.1.1 Continuously oversee and identify understanding of required skills needs definitions (competence, skill, knowledge, etc.)
		5.1.2 Continuously oversee and identify new or emerging skills (technical, soft, transversal, etc.)
		5.1.3 Continuously oversee and identify disappearing skills
6. Identification of training and education provision mechanisms	6.1 Identify and continuously update intelligence on education and training provision mechanisms needs in the sector	6.1.1 Continuously oversee and identify required mechanisms by industry
		6.1.2 Continuously oversee and identify offered mechanisms by education and training providers
		6.1.3 Continuously review the communication of training and education needs from industry to providers and vice versa
7. Identification of recognition mechanism	7.1 Identify and continuously update intelligence on recognition mechanisms needs in the sector	7.1.1 Identify and continuously update intelligence on the recognition in received education and training
		7.1.2 Ensure of continuous alignment on EU level and national/regional level
		7.1.3 Ensure overall support from stakeholders across the sector
8. Identification of recruitment and attractiveness challenges	8.1 Identify and continuously update intelligence on attractiveness of the sector	8.1.1 Identify and continuously update intelligence on challenges of attractiveness in the sector
		8.1.2 Define ways of how to improve the attractiveness
	8.2 Identify and continuously update intelligence on recruitment in the sector	8.2.1 Identify and continuously update intelligence on the recruitment specifics
		8.2.2 Define tools for support of recruitment

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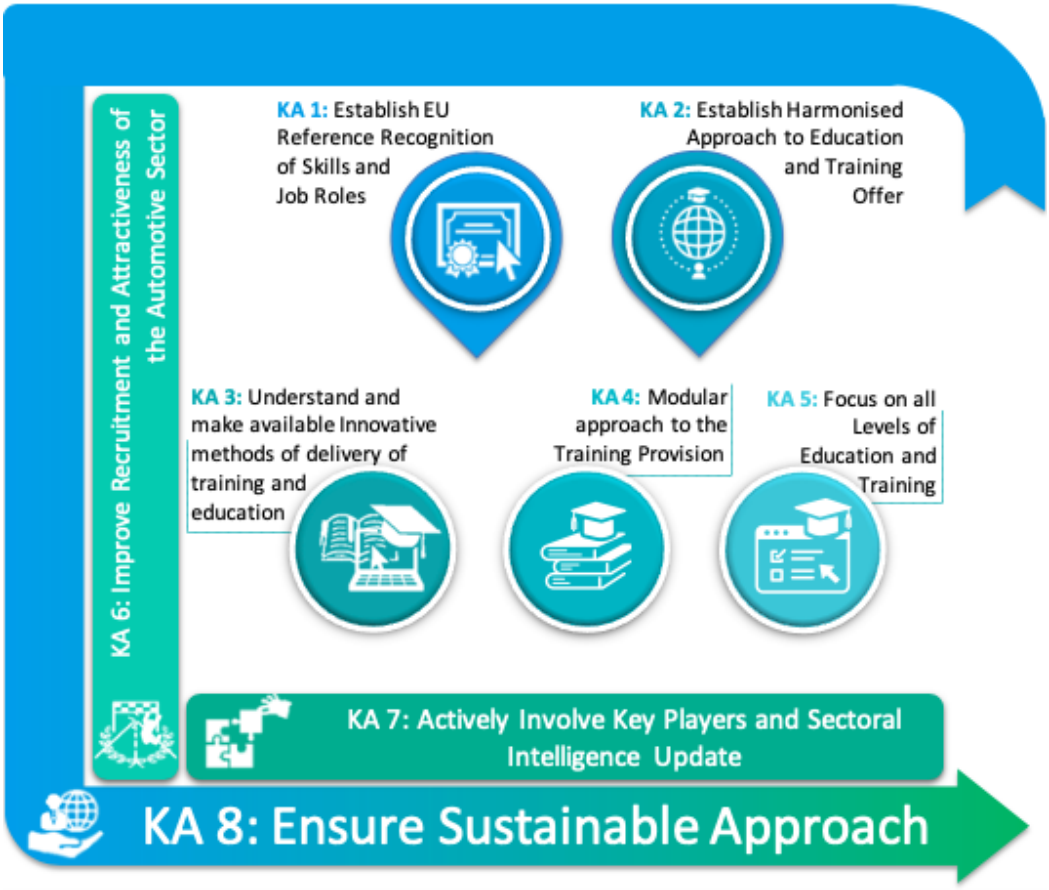
KEY ACTIONS

Key Actions (KA) summarise actions to be taken into the account to build a **Sustainable ecosystem for continuous cooperation on upskilling and reskilling of workforce in Automotive sector**.

The ecosystem encompasses KA 1: Establish EU Reference Recognition of Skills and Job Roles supported by KA 2: Establish Harmonized Approach to Education and Training Offer. KA 3: Understand and make available innovative methods of delivery of training and education, KA 4: Modular Approach to the Training Provision and KA 5: Focus on All Levels of Education and Training help to create the ecosystem and its specific direction. All of the actions are supported by KA 7: Actively Involve Key Players and Sectoral Intelligence Update and KA 8: Ensure Sustainable Approach, which creates the basis for all the existing actions and possible future key actions to be defined and planned. All the work in skills agenda is directly or indirectly related to the pillar created by KA 6: Improve Recruitment and Attractiveness of the Automotive Sector.

SUSTAINABLE ECOSYSTEM FOR CONTINUOUS COOPERATION ON UPSKILLING AND RESKILLING OF WORKFORCE IN AUTOMOTIVE SECTOR



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5.1.1 KA 1: Establish EU Reference Recognition of Skills and Job Roles

KA 1: Establish EU Reference Recognition of Skills and Job Roles	
Description	The EU reference recognition of job roles and related skills is a key issue for harmonised approach to recruitment, facilitate understanding of skills and job role needs, which enables more efficient upskilling and reskilling of workforce through common and easy understanding of training and education needs. Framework will accelerate the process of training provision and enhance mobility of workers ensure mutual recognition of the definitions across the EU within the automotive sector. The establishment an EU-wide education and training Framework would facilitate creation of a real pan-European marketplace and ensure future competitiveness of the European automotive industry[4]. Minimally, it shall include clear reference description of existing and new or emerging job roles in automotive sector, its related skills or competences and knowledge. This will enable to establish an intelligence service to track skills changes for employers and providers and act as an accessible resource for both employers and providers. As well as it allows to have harmonised approach to skills and job roles awards and their recognition across EU automotive sector.
Rationales	This key action will tackle the challenges such as insufficient transparency of skills and qualifications, insufficient understanding of how to integrate different skills and qualifications into the labour market, lack of coherent and up-to-date overview of information on skills needs in Europe, clear information or guidance to support worker mobility is not easily available. Based on the finding of the DRIVES project and other Blueprints (e.g. ALBATTS[5]), the EU Framework on the commonly accepted reference definitions of skills and job roles must be established. This would include (or be compliant with) all the work done so far by other relevant projects/ bodies, such as ESCO or ECQA and others. This recognition should cover job roles and skills on all levels, with respect to 3 – 8 EQF levels.
Specific objectives covered	1.1.1 Continuously oversee and identify understanding of required job roles definitions (job role or occupation, etc.) 1.1.2 Continuously oversee and identify new or emerging job roles and its linked skills 1.1.3 Continuously oversee and identify disappearing job roles and its linked skills 1.1.4 Continuously oversee and identify understanding of required skills needs definitions (competence, skill, knowledge, etc.) 1.1.5 Continuously oversee and identify new or emerging skills (technical, soft, transversal, etc.) 1.1.6 Continuously oversee and identify disappearing skills 1.1.7 Identify and continuously update intelligence on needs for recognition of received education and training 1.1.8 Ensure of continuous alignment on EU level and national/regional level 1.1.9 Ensure overall support from stakeholders across the sector
Action to be taken	1. Determine importance of harmonisation at an EU level 1.1 Define the importance of national/regional standards definitions and the rules for their recognition within EU ontology 2.1 Define and assure coherence with ESCO definition

[4] *25 ACTION For a successful restart of the EU's automotive sector, May 2020 (ACEA, CECRA, CLEPA, ETRMA)*
[5] *https://www.project-albatts.eu*

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2. Continuously work on standardisation and harmonisation of ontology, in order to facilitate identification, and description of job roles
   - 1.1 Establish a common methodology to the harmonisation of skills ontology, in order to facilitate identification and description of skills
   - 2.1 Establish a common methodology to the harmonisation of job roles ontology, in order to facilitate identification and description of job roles
   - 3.1 Establish framework that function as intermediary body, facilitating encounters between different stakeholders
3. Develop a range of innovative and ongoing intelligence gathering methods in order to keep track of the implications of technological change for different job roles and associated skills (this needs to go beyond on line data gathering to include much more detailed intelligence gathering in relation to specific job roles and associated skills):
   - 1.1 Collecting and monitoring of EU Automotive vacancies in order to detect recruitment patterns and changing skill needs. This should be linked to the recent CEDEFOP initiative to develop real-time skills intelligence by analysing online job vacancies[6] – The potential for accessing data of particular relevance to the automotive sector should be explored.
   - 2.1 Establish or connect with skills domain groups of industry experts tasked with updating new and emerging job roles
   - 3.1 Draw on and where appropriate collaborate with national examples of good practice in relation to skills intelligence gathering.
   - 4.1 Work with research think tanks and data collection agencies focused on skills mapping
   - 5.1 Utilise existing automotive employer groups established at national and regional level together with national centres of expertise to undertake more detailed consultation on changing skill requirements
4. Adoption of the reference framework by the key stakeholders, including large, medium and small industry
5. Assure financial support and stimulation of the sustainable approach to reference definitions update (from EC, regional and national institutions, industry side, self-sustainable)

[6] *Cedefop (2019). Online job vacancies and skills analysis: a Cedefop pan-European approach.*

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5.1.2 KA 2: Establish Harmonized Approach to Education and Training Offer

KA 2: Establish Harmonized Approach to Education and Training Offer	
Description	Harmonised baseline view of the key training and education providers and their courses offered towards the automotive sector, with respect to reference definition of job roles and their related skills. Education and training shall assure coverage of reference job roles and skills definitions. This will naturally bring and overview about coverage of job roles and skills needs versus trainings and education offered. A database of key providers and their training courses shall be developed for the automotive sector throughout the value chain ensuring quality standards for the entrants and enable competition between the training providers across the EU. It should also enable comparison of the training offer serving the automotive sector in different skill areas and in different nations This should also have positive spill-over effect to push non-recognised/non-participating regional/local education providers to be part of the EU system and safeguard firstly their training offers to automotive value chain in their home region, secondly provide "export opportunities" for their trainings to other parts of the EU.
Rationales	There exists many training and education providers at a regional/national and EU level. Although various associations focus on different levels of training and education, it is challenging to have overall view of the offer. This was visible by Survey Offer (see more in Appendix B), run by DRIVES project, where it was very difficult to map the existing courses and education providers that are related to Automotive sector. It is also hard to compare the specific training offer by skill area and between nations. It is also difficult to define training courses and how they related to each job role and related skills.
Specific objectives covered	2.2.1 Ensure commitment of education and training providers on European level 2.2.2 Ensure commitment of education and training providers on national/regional level
Action to be taken	1. Based on the DRIVES and ALBATTS stakeholders' database, establish a EU-wide database of education providers (focused on universities, VET providers and apprenticeships) to be established. 2. Identify and map key training gaps/weaknesses by key areas 1.1 Set up training programmes with train-the trainers approach focused to technical skills, digital skills and soft skills 2.1 Update existing curricula to address the challenges and skills changes 3.1 Formulate concrete recommendations on the integration of specific skills emerging from disruptive changes in the value chain and requiring urgent attention, e.g. software and big data competences 4.1 Establish methods for comparing the mix of training (including apprenticeships) offered by skill area and in different nations 3. Establish a system to share resources / good practices available to address skill gaps and challenges. 1.1 Bring VET providers closer to understand needs and develop appropriate learning outcomes. 2.1 Ensure concerted effort to train the trainers in order to expand the VET and training organisations able to provide skills according to the priorities defined by the sector. 3.1 Establish a systematic communications system between VET and automotive partners on the evolution of skills and its consequences on VET and training. 4.1 Support and stimulate development of education and training courses specifically focused on identified skills gaps from reference skills definitions - basically the framework will

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enable creating training courses this way as there will be visible demand and offer creating new opportunities for training providers to close identified gap.

5.1 Prioritise the adoption and development of the "training on the job" process with a harmonisation of national rules to permit an easy and quick procedure and facilitating the movement of students between countries.

6.1 Develop new and innovative contractual frameworks to promote a widespread adoption of mentoring practices

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5.1.3 KA 3: Understand and make available innovative methods of delivery of training and education

KA 3: Understand and make available innovative methods of delivery of training and education	
Description	Develop and share methods for mapping training provision serving the automotive sector at all levels - At the moment there is no clear view of the range of training provision currently serving the EU automotive sector. In order to identify weaknesses and gaps in current provision we need to understand in more detail what provision currently exists and what is demanded from the industry side. It includes identification and support of innovative training and education methods such virtual reality or online/blended training courses, to tackle the needs of off-site training as well as the identification and support of training on the job methods and approaches There shall be a centralised resource with examples of good practice. This could be set up as a vehicle for gathering good practice in relation to particular examples of training, tackling recruitment difficulties etc. A range of easily accessible examples of particular relevance to the automotive sector located on one site would provide a valuable resource for employers, providers and others involved in trying to develop training (including apprenticeships) in order to meet the fast-changing requirements of the sector. This could draw on a wide range of existing documented good practice, which could be the basis for communication campaigns to ensure the sector is informed and can draw from these.
Rationales	It has been pointed out that across a wide range of different sectors, the pace of technological change highlights the need to adapt learning programmes to reflect the critical importance of an interdisciplinary approach to innovation in the workplace. Findings of DRIVES Survey Demand (industry needs) stated the need for work-based training, including dual system/apprenticeship, mentoring or training on the job.
Specific objectives covered	3.1.1 Continuously oversee and identify required mechanisms by industry 3.1.2 Continuously oversee and identify offered mechanisms by education and training providers 3.1.3 Ensure the understanding of training and education needs and possibilities from industry to providers and vice versa
Action to be taken	1. Identification of suitable VET types within the Automotive sector 1.1. Define the most effective VET approach and appropriate implementation measures for different stakeholders in the Automotive sector 1.2. Communicate broadly to VET providers the needs of industry and to industry possible offer in regard to preferred VET provision mechanisms 2. Establishment of a good practice section within the DRIVES tools to act as a forum for encouraging stakeholders to put forward other examples. 2.1. Create a website to record good practices at EU level

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5.1.4 KA 4: Modular Approach to the Training Provision

KA 4: Modular Approach to the Training Provision	
Description	In order to respond to fast changing skill requirements more flexibility is required in how training provision is designed and delivered. Many employees and employers do not require full training courses but need to focus on particular gaps/weaknesses in current individual/workforce skills and competences. Making it easier to 'top-up' these specific skills would encourage existing employees to participate in training. This would SME's (which are typically highly specialized) to make efficient use of training costs and facilitate the release of employees for such training. It would also support much more flexible career pathways.
Rationales	This is underlined by recent research[7] which highlights how the rapid pace of technological change demands more modular and flexible training courses that can be used to upskill and reskill the existing workforce, sometimes alongside full-time learners. The introduction of modular and/or unitised training structures[8] allows for easier updating of qualifications to incorporate new technologies or ways of working. It also highlights the potential of step-by-step certification provided by modularization to reduce the risk that learners will leave the system with only partial qualifications that are not necessarily needed or recognised on the labour market
Specific objectives covered	4.1.1 Ensure the communication of training and education needs and possibilities from industry to providers and vice versa
Action to be taken	1. Stimulate preparation of new modular trainings and education plans and curriculums

[7] *Manufacturing the future workforce; High Value Manufacturing (HVM) Catapult, November 2019*
[8] *The role of modularisation and unitisation in vocational education and training, CEDEFOP (2015)*

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5.1.5 KA 5: Focus on All Levels of Education and Training

KA 5: Focus on All Levels of Education and Training	
Description	The critical mass of the employees and workers have lower than tertiary level of education – their continuous upskilling and re-skilling is therefore critical. The education and training providers should also enable clear up-skilling paths for the lower skilled employees toward higher education levels. The more complex structure of the workforce in the automotive industry must also be reflected in the much broader scope of the education and training provided by the providers. That also means that the target groups of the education providers must be much broader, including: - Post-graduate institutes to offer high level education and training for the highest skilled workforce in the automotive (often very specialised one) - Universities providing new curricula for different levels of tertial education - VET providers covering wide range of training focusing on upskilling and re-skilling courses to ensure continuous training for the workforce in the automotive sector, which is key and necessary for the foreseen structural changes. - Apprenticeships – covering critical mass of the employment in the automotive sector (often seen as a fundamental "workforce input" to the employment in the sector), combined with the VET providers to ensure continuous upskilling of the entrants to the labour market. All those levels should be aligned with the needs of industry with regards to the methods of delivering the training or education. Such as training off the job, online training, virtual reality, and so on.
Rationales	The core of employment in the sector will be challenged by the drivers of change. The focus must not only be on the "leaders" but also on the much higher number of a general workforce with lower education levels. The challenges for these employees will be even higher. The share of these workers with lower than university degree is much higher and therefore the possible social consequences might be much higher too.
Specific objectives covered	5.1.1 Continuously oversee and identify new or emerging job roles and its linked skills and ensure clear progression pathways between different training levels 5.1.2 Continuously oversee and identify disappearing job roles and its linked skills 5.1.3 Continuously oversee and identify new or emerging skills (technical, soft, transversal, etc.) 5.1.4 Continuously oversee and identify disappearing skills
Action to be taken	1. Identify specific needs for workers with lower levels of skills 2. Develop specific training activities/programmes for workers with lower level of skills to upgrade their skills and ensure clear progression pathways between different training levels 3. Identify specific needs for workers with high levels of skills 4. Develop specific training activities/programmes for workers with high level of skills, to upgrade their skills and ensure clear progression pathways between different training levels

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5.1.6 KA 6: Improve Recruitment and Attractiveness of the Automotive Sector

	KA 6: Improve Recruitment and Attractiveness of the Automotive Sector
Description	Skills Agenda is closely linked to recruitment, which is influenced also by the attractiveness of the Automotive sector. Sector must be attractive for young talented workforce as well as for all possible workers. The key issues are to identify the challenges and possible methods to further support of attractiveness of the sector.
Rationales	The perception of the public of the industry was heavily damaged by the "Diesel Gate". With regard to value chain, this issue is all the more acute as there is the outdated perception that working for this industry is linked to dirty and heavy machineries. These comments come from the first interaction with stakeholders during the so called "Demand" survey where the company reputation was indicated as one of the main ways to attract (and retain) young and talented workforce[9] New, innovative ways of training, based of the certification and recognition such methods, could meet the expectations of young workers to polish their skills and promote personal development. In this sense, effective marketing for programmes providing both technical and more narrowly related automotive skills can also help.
Specific objectives covered	6.1.1 Identify and continuously update intelligence on challenges of attractiveness in the sector and document examples of good practice in relation to improving recruitment and attractiveness into the sector 6.1.2 Define ways on how to improve the attractiveness
Action to be taken	1. Improve and promote sector image (market the sector attractiveness to support new talented workers) 1.1. Conduct specific EU-wide communication campaigns and specific HR policies targeting each specific group of automotive workers to retain talented workers 1.2. Foster communication actions to disseminate modern automotive job profiles, integrating e.g. Green, technical and digital skills, as well as soft skills 1.3. In order to boost the attractiveness of the sector a clear "career path forecast" should be developed 2. Attract and retain young professionals in automotive 2.1. Develop initiatives in connection with guidance for young people as well as teachers and families 2.2. Carry out targeted outreach initiatives for the automotive industry to promote its attractiveness among youngsters and professionals coming from other sectors with relevant skills for new automotive activities.

[9] *Project DRIVES Deliverable 2.7 Forecasting dissemination report, https://www.project-drives.eu/Media/Publications/10/Publications_10_20191108_114724.pdf, April 2020*

5.1.7 KA 7: Actively Involve Key Players and Sectoral Intelligence Update

KA 7: Actively Involve Key Players and Sectoral Intelligence Update	
Description	Overall active cooperation between key stakeholders is a key issue for the development and update of the skills agenda in Automotive sector. It consists of international stakeholders, as well as national and regional stakeholders. There must be the same understanding of the skills agenda and its commonalities as well as specifics on national and regional levels. There must be overall understanding and commitment to actively support the identification and update of Sectoral Intelligence in Automotive Skills Agenda, such as skills needs, training offer, and so on. EU and the national/regional aspect must be taken into account. The regional aspects of education and training should be further explored within the scope of the Automotive Skills Agenda, possibly in a form of a pilot projects for the implementation of the EU framework. As already indicated, the regional level actions seem to be critical to mitigate foreseen structural changes. This will have implications on the education and training system and education and training providers as well, which must be implemented regionally/locally to tackle specific problems of the given regional cluster. The actions on the local, and even company-level, should be supported and endorsed by relevant tools (fiscal and other financial incentives as well) on the national and EU level.
Rationales	The regional aspect of the education and training is of extreme importance. As confirmed by many experts[10], the link between regional education and the regional labour market is critical. Matching gaps between trends and skills provided on the regional level would be critical to ensure sustainable development of the given region; moreover, the need to strengthen links with those regions with the most significant clusters of automotive activity is essential in order to support: • Mapping of existing provision • Identification of gaps/weaknesses in provision • Identify changing skill needs and implications for learning support It is clear that[11] the critical mass of employees will not migrate to another EU country or region – the regional automotive clusters (in some regions the employment in automotive is up to 25% of total employment) will remain regionally focused and any structural turbulences must be solved on a regional/local level. Therefore, providing sufficient training to mitigate structural changes will be essential from the regional perspective to keep employment in the automotive region. A number of regions with particular concentrations of automotive employment are developing their own responses to tackle fast changing skill requirements. Mechanisms should be put in place to share lessons learnt and actively engage these regions to support enhanced intelligence gathering and support the design of fit for purpose training
Specific objectives covered	7.1.1 Continuously oversee and clarify the structure and role of Automotive sector 7.1.1 Ensure commitment of social partners, decision makers at a European level 7.1.2 Ensure commitment of social partners, decision makers at a national/regional level 7.1.4 Ensure commitment of education and training providers at a European level 7.1.5 Ensure commitment of education and training providers at a national/regional level 7.1.6 Ensure commitment of industry at a European level 7.1.7 Ensure commitment of industry at a national/regional level 7.1.8 Ensure commitment of Institutions at a European level 7.1.9 Ensure commitment of Institutions at a national/regional level
Action to be taken	1. Optimise tools for data gathering and elaboration. 1.1. It means easy survey, working groups to easily collaborate on all levels. 2. Provide easily accessible data reflecting the current situation of the sector.

[10] *ETF (European Training Foundation), Good multilevel governance for vocational education and training, ETF, Turin, 2013-2018 and "European Sector Skills Council" - Automotive Industry report (2016)*
[11] *Annual Report on Intra-EU Labour Mobility (2018,2019)*

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3. Consolidate an active automotive community focused on skills with relevant participation of stakeholders, with particular reference to companies, national associations and VET providers.
4. Facilitate access to and involvement in the automotive skills community through direct active engagement and communication.
5. Keep sectoral intelligence constantly updated by sharing of information to the largest possible base of members of the automotive community focused on skills.
6. Organise events aimed at facilitating exchange between key stakeholders.
7. Organise and manage the community by innovative approaches as well as active working groups.
    7.1. Create “skills domains working groups” among (as minimum) VET providers and industry representatives to focus on the analysis of drivers of change and their consequences on VET evolution.
    7.2. Promote discussion within the “domains working groups” on the evolution of job roles and their consequences on VET and training, VET provision mechanisms and their effectiveness of skills recognition.
    7.3. Promote discussion within the “domains working groups” on the evolution of the sector, its technologies and drivers of change, which influences the sector.
    7.4. Identify automotive job roles linked to the identified changes in the sector.
8. Define changes of occupations / job roles in the near future.
    8.1. Present trends and future foresight to education and training providers for a better vision of the future needs and possible changes
    8.2. Ensure the feasibility of the activities listed in this Roadmap through the involvement of regional, national and EU institutions – this support should include also financial means.

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5.1.8 KA 8: Ensure Sustainable Approach

KA 8: Ensure Sustainable Approach

Description

The EU Framework should be implemented through the EU Automotive Skills Alliance to be to be the umbrella body for sectoral skills agenda, established under the sectoral Skills Pacts. It should represent the implementing body for the EU education and training providers in the automotive sector.

The Alliance should follow the mission, vision, values and ideas and should focus on the specifics of Skills Agenda in Automotive sector defined by this strategy, such as:

- Providing overall skills and job roles definitions applicable across the EU with respect to the automotive sector.
- Providing assessment and ensure high quality level for the training provided on the EU level
- Providing quality rules for the training providers allowing entry into the EU-wide level database of VET and training providers.
- Assessing development of the skills needed in the automotive sector on a regular basis.
- Sharing good practice towards creating an EU automotive sector apprenticeship market, understanding and promoting the apprenticeship marketplace and managing online EU apprenticeship recruitment tool.
- EU Automotive Skills Alliance should ensure constant contact with stakeholders to follow-up and update trends and definitions/qualitative criteria to enter the system. In principle the Alliance should set up a system of "working groups" where different tasks will be discussed and provide upgrade on a continuous basis.
- The upgrade should be based on in-depth analytical feedback from stakeholders in the automotive sector, such as the industry, training and educational providers (VET, academia) and expertise from the Commission, member states and regional authorities.
- This structure will also allow outputs from other Blueprints (e.g. ALBATTS) or other projects that are currently running.
- It would also allow a spill-over of the system to other sector, provided sufficient inputs from industry, education providers and policy-makers on EU and national levels.

Rationales

Approach to Skills Agenda in the Automotive sector, as one of major sectors for EU, must be sustainable and continuous with the involvement of key sectoral stakeholders. This will require collective action through a new 'Pact for Skills'[12] to contribute to up and reskilling and put focus on the Automotive sector that is undergoing the most significant change[13]. There are many initiatives on different levels to ensure that, previously GEAR2030, now followed with Blueprint project for Automotive sector DRIVES as well as ALBATTS a blueprint project focused on batteries for e-mobility. The continuous approach to cooperation requires a clear and sustainable structure and ecosystem including an update of the Skills Agenda[14] and the resulting recommendations on VET. This shall be achieved by introducing a new umbrella EU Automotive Skills Alliance, direct involvement of EU and national/regional stakeholders, to enable and facilitate continuous approach to Skills Agenda in the sector.

Specific objectives covered

8.1.1 Continuously oversee and clarify the structure and role of the Automotive sector.
8.1.2 Continuously oversee and clarify sectoral priorities.
8.1.3 Continuously oversee and clarify cross-sectoral boundaries and relations to other sectors (e.g. IT sector, battery sector, material production, economic models, etc).
8.1.4 Continuously oversee and identify impact of changes on the automotive value-chain.
8.1.5 Continuously oversee and update networks of sectoral skills agenda dialog partners at an international level.

[12] *New Industrial Strategy for Europe, COM (2020)*
[13] *25 ACTION For a successful restart of the EU's automotive sector, May 2020 (ACEA, CECRA, CLEPA, ETRMA)*
[14] *New Industrial Strategy for Europe, COM (2020)*

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	8.1.6 Continuously oversee and update networks of sectoral skills agenda dialog partners at a national/regional level. 8.1.7 Ensure commitment of social partners, decision makers at an international level. 8.1.8 Ensure commitment of social partners, decision makers at a national/regional level. 8.1.9 Ensure commitment of education and training providers at an international level. 8.1.10 Ensure commitment of education and training providers at a national/regional level. 8.1.11 Ensure commitment of industry at an international level. 8.1.12 Ensure commitment of industry at a national/regional level. 8.1.13 Ensure commitment of Institutions at European level 8.1.14 Ensure commitment of Institutions at a national/regional level
Action to be taken	1. Establish Automotive Skills Alliance 2. Harmonise a set of areas and base objectives and specific objectives that will reflect all elements of the skills agenda – update if there is another key action that should be analysed and put to strategy 3. Support implementation of the Key Actions 4. Define and assure financial sustainability of the alliance 5. Ensure overall sustainable support from key stakeholders 6. Act as a platform for the Automotive Skills Agenda and stimulate its further continuous development 7. Create links between automotive businesses and VET providers for a widespread sharing of results of intelligence update outcomes 8. Build a common dialogue platform to inform companies and VET providers about the different needs and create a common vision for the future

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6 AUTOMOTIVE SKILLS AGENDA ROADMAP

The Automotive Skill Agenda Roadmap takes into account the Key Actions identified and puts it to the perspective of stakeholders involved and timing, as it is pictured in Figure 5.

Figure 5 Automotive Skills Agenda Roadmap

For the purposes of the roadmap the stakeholders are grouped in the following categories:

- EC: European Commission
- Education and Training Providers: Accreditation, Certification or Qualification bodies, Colleges / Universities, Private companies and involved into EQF3 to EQF8 “activities”, Research institutes as well as research centres, VET schools whether or not organised and represented by Umbrella organizations and Sectoral VET associations
- Industry: Large Enterprise and Small and Medium Enterprise whether or not organised in sectoral/industrial or other associations at regional and/or European level.
- National Authorities: Education and Labour Ministries, Labour Market Intelligence Entities, National Statistics Labour Offices and Public Authority (Labour) Public Authority

(Employment), Chambers of Commerce, Public/Private Employment Services, Technology Centre.

- Trade Unions

The **Automotive Skill Agenda Roadmap, as proposed**, takes into the account the Key Actions identified and puts it to the perspective of grouped **Stakeholders**, with specific **Role** and **Timing. The** role of each group of stakeholders involved in each KA has been identified within:

- **K** (KEY ROLE), active contribution to achieve the Action
- **S** (SUPPORTING ROLE), supportive role to help to achieve the Action

And the time (the time execution for the specific action to be taken) has been identified by 2 colours:

- **SHORT/MID-TERM EXECUTION**: to be done in given timeframe because it is "urgent", and / or propaedeutic to other activities
- **CONTINUOUS EXECUTION**: activities to be carried out continuously, with methodology and constancy over time

KA 1: ESTABLISH EU REFERENCE RECOGNITION OF SKILLS AND JOB ROLES

Actions to be taken

	Industry	Education and Training Providers	National Authorities	Trade Unions	EC	Addressed in DRIVES scope
1.1. Define the importance of national/regional standards definitions and the rules for their recognition within EU ontology	S	S	K	S	K	✔
1.2. Define and assure coherence with ESCO definition	S	S	S	S	K	✔
2.1. Establish a common methodology to the harmonisation of skills ontology in order to facilitate identification and description of skills	K	K	S	S	K	✔
2.2. Establish a common methodology to the harmonisation of job roles ontology in order to facilitate identification and description of job roles	K	K	S	S	K	✔
2.3. Establish framework that functions as intermediary body facilitating encounters between different stakeholders	K	K	S	S	S	✔
3.1. Collecting and monitoring of EU Automotive vacancies in order to detect recruitment patterns and changing skill needs.	K	K	S	S	S	

3.2. Establish or connect with skills domain groups of industry experts tasked with updating new and emerging job roles	K	K	S	S	S	✔
3.3. Draw on and where appropriate collaborate with national examples of good practice in relation to skills intelligence gathering	K	K	K	S	S	✔
3.4. Work with research think tanks and data collection agencies focused on skills mapping	K	K	S	S	S	✔
3.5. Utilise existing automotive employer groups established at national and regional level together with national centres of expertise to undertake more detailed consultation on changing skill requirements	K	K	S	S	S	✔
4. Adoption of the reference framework by the key stakeholders, including large, medium and small industry	K	K	S	S	K	✔
5. Assure financial support and stimulation of the sustainable approach to reference definitions update (from EC, regional and national institutions, industry side, self-sustainable)	K	K	K	S	K	✔

KA 2: ESTABLISH HARMONIZED APPROACH TO EDUCATION AND TRAINING OFFER

Actions to be taken

	Industry	Education and Training Providers	National Authorities	Trade Unions	EC	Addressed in DRIVES scope
1. EU-wide database of education providers (focused on universities, VET providers and apprenticeships) to be established	S	K	S	S	S	✔
2.1. Set up training programmes with train-the-trainers approach focused to technical skills, digital skills and soft skills	S	K	S	S	S	✔
2.2. Update existing curricula to address the challenges and skills changes	S	K	S	S	S	✔
2.3. Formulate concrete recommendations on the integration of specific skills emerging from disruptive changes in the value chain and requiring urgent attention, e.g. software and big data competences	S	K	S	S	S	

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Actions to be taken

	Industry	Education and Training Providers	National Authorities	Trade Unions	EC	Addressed in DRIVES scope
2.4. Establish methods for comparing the mix of training (including apprenticeships) offered by skill area and in different nations	S	K	S	S	S	
3.1. Bring VET providers closer to understand needs and develop appropriate learning outcomes	S	K	K	S	S	✔
3.2. Ensure concerted effort to train-the-trainers, in order to expand the numbers of VET and training organisations able to provide skills according to the priorities defined by the sector	K	K	K	S	S	
3.3. Establish a systematic communications system between VET and automotive partners on the evolution of skills and their consequences on VET and training	K	K	K	S	K	✔
3.4. Support and stimulate development of education and training specifically focused on identified skill gaps	S	K	S	S	S	✔
3.5. Prioritise the adoption and development of the "training on the job" process with a harmonisation of national rules to permit an easy and quick procedure and facilitating the movement of students between countries	S	K	K	S	K	
3.6. Develop new and innovative contractual frameworks to promote a widespread adoption of mentoring practices	K	K	S	S	S	

KA 3: UNDERSTAND AND MAKE AVAILABLE INNOVATIVE METHODS OF DELIVERY OF TRAINING AND EDUCATION

Actions to be taken

	Industry	Education and Training Providers	National Authorities	Trade Unions	EC	Addressed in DRIVES scope
1.1. Define the most effective VET approach and appropriate implementation measures for different stakeholders in the Automotive sector	S	K	S	S	S	✔

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Actions to be taken

	Industry	Education and Training Providers	National Authorities	Trade Unions	EC	Addressed in DRIVES scope
1.2. Communicate broadly to VET providers the needs of industry in regards to preferred VET provision mechanisms	K	K	S	K	S	✔
2.1. Create a website to record good practices at EU level	K	K	S	S	S	✔

KA 4: MODULAR APPROACH TO THE TRAINING PROVISION

Actions to be taken

	Industry	Education and Training Providers	National Authorities	Trade Unions	EC	Addressed in DRIVES scope
1. Stimulate preparation of new modular training and education plans and curriculum	K	K	S	S	S	✔

KA 5: FOCUS ON ALL LEVELS OF EDUCATION AND TRAINING

Actions to be taken

	Industry	Education and Training Providers	National Authorities	Trade Unions	EC	Addressed in DRIVES scope
1. Identify specific needs for workers with lower levels of skills	K	K	S	K	S	✔
2. Develop specific training activities/programmes for workers with lower level of skills to upgrade their skills and create clear progression pathways between different training levels	S	K	S	S	S	✔
3. Identify specific needs for workers with high levels of skills	K	K	S	K	S	✔
4. Develop specific training activities/programmes for workers with high level of skills, to upgrade their skills and ensure clear progression pathways between different training levels	S	K	S	S	S	✔

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KA 6: IMPROVE RECRUITMENT AND ATTRACTIVENESS OF THE AUTOMOTIVE SECTOR

Actions to be taken

	Industry	Education and Training Providers	National Authorities	Trade Unions	EC	Addressed in DRIVES scope
1.1. Conduct specific EU-wide communication campaigns and specific HR policies targeting each specific group of automotive workers to retain talented workers	K	S	K	S	S	
1.2. Foster communication actions to disseminate modern automotive job profiles, integrating e.g. Green, technical and digital skills, as well as soft skills	K	K	K	K	S	✔
1.3. In order to boost the attractiveness of the sector a clear "career path forecast" should be developed	K	S	S	K	S	
2.1. Develop initiatives in connection with guidance for young people as well as teachers and families	K	K	K	S	S	
2.2. Carry out targeted outreach initiatives for the automotive industry to promote its attractiveness among youngsters and professionals coming from other sectors with relevant skills for new automotive activities	K	S	S	K	S	

KA 7: ACTIVELY INVOLVE KEY PLAYERS AND SECTORAL INTELLIGENCE UPDATE

Actions to be taken

	Industry	Education and Training Providers	National Authorities	Trade Unions	EC	Addressed in DRIVES scope
1. Optimise tools for data gathering and elaboration	K	K	S	S	S	✔
2. Provide easily accessible data reflecting the current situation of the sector	K	S	K	S	S	✔
3. Consolidate an active automotive community focused on skills with relevant participation of stakeholders, with particular reference to companies, national associations and VET providers	K	K	K	S	S	✔

Actions to be taken

	Industry	Education and Training Providers	National Authorities	Trade Unions	EC	Addressed in DRIVES scope
4. Facilitate access to and involvement in the automotive skills community through direct active engagement and communication	K	K	S	S	S	✔
5. Keep sectoral intelligence constantly updated by involving in sharing of information the largest possible base of members of the automotive community in sharing of information focused on skills	K	K	S	S	S	✔
6. Organise events aimed at facilitating exchange between key stakeholders	K	K	S	S	S	✔
7.1. Create "skills domains working groups" among (as minimum) VET providers and industry representatives to focus on the analysis of drivers of change and their consequences on VET evolution	K	K	S	S	S	✔
7.2. Promote discussion within the "domains working groups" on the evolution of job roles and its consequences on VET and training, VET provision mechanisms and their effectiveness for industrial stakeholders, skills recognition	K	K	S	S	K	✔
7.3. Promote discussion within the "domains working groups" on the evolution of the sector, its technologies and drivers of change	K	S	S	S	K	✔
7.4. Identify automotive job roles linked to the identified changes in the sector	K	K	S	S	S	✔
8.1. Present trends and future foresight to education and training providers for a better vision of future needs and possible changes	K	K	S	S	S	✔
8.2. Ensure the feasibility of the activities listed in this Roadmap through the involvement of regional, national and EU institutions – this support should include also financial means.	S	S	K	S	K	

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KA 8: ENSURE SUSTAINABLE APPROACH

Actions to be taken

	Industry	Education and Training Providers	National Authorities	Trade Unions	EC	Addressed in DRIVES scope
1. Establish Automotive Skills Alliance	K	K	S	K	K	✔
2. Harmonise a set of areas and base objectives and specific objectives that will reflect all elements of skills agenda – update if there is another key action that should be analysed and put to strategy	K	K	S	S	S	✔
3. Support implementation of the Key Actions	K	K	S	S	S	✔
4. Define and assure financial sustainability of the alliance	K	K	K	S	K	✔
5. Ensure overall sustainable support from key stakeholders	K	K	K	K	K	✔
6. Act as a platform for Automotive Skills Agenda and stimulate its continuous development	K	K	S	S	K	✔
7. Create links between automotive businesses and VET providers for a widespread sharing of results of intelligence update outcomes	K	K	S	S	S	✔
8. Build a common dialogue platform to inform companies and VET providers about the different needs and create a common vision for the future	K	K	S	S	K	✔

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APPENDIX A – AUTOMOTIVE SKILLS AGENDA ANALYSIS – METHODOLOGY

The appendix presents all steps that were followed to prepare this roadmap. It is schematized in figure 6. Desk-research activities have been combined with an engagement of stakeholders (in different steps) in order to verify the information acquired and through the workshops the foundations of the main project deliverables have been laid. The union of these documents and activities led to the creation of this roadmap (D2.9 Automotive skills strategic roadmap report) which is the first release after two years of the project. This document will be updated at the end of 2020 and 2021 with new information and interactions with stakeholders in order to make it more and more aligned with the real needs of the sector and revised with sector sectoral outcomes.

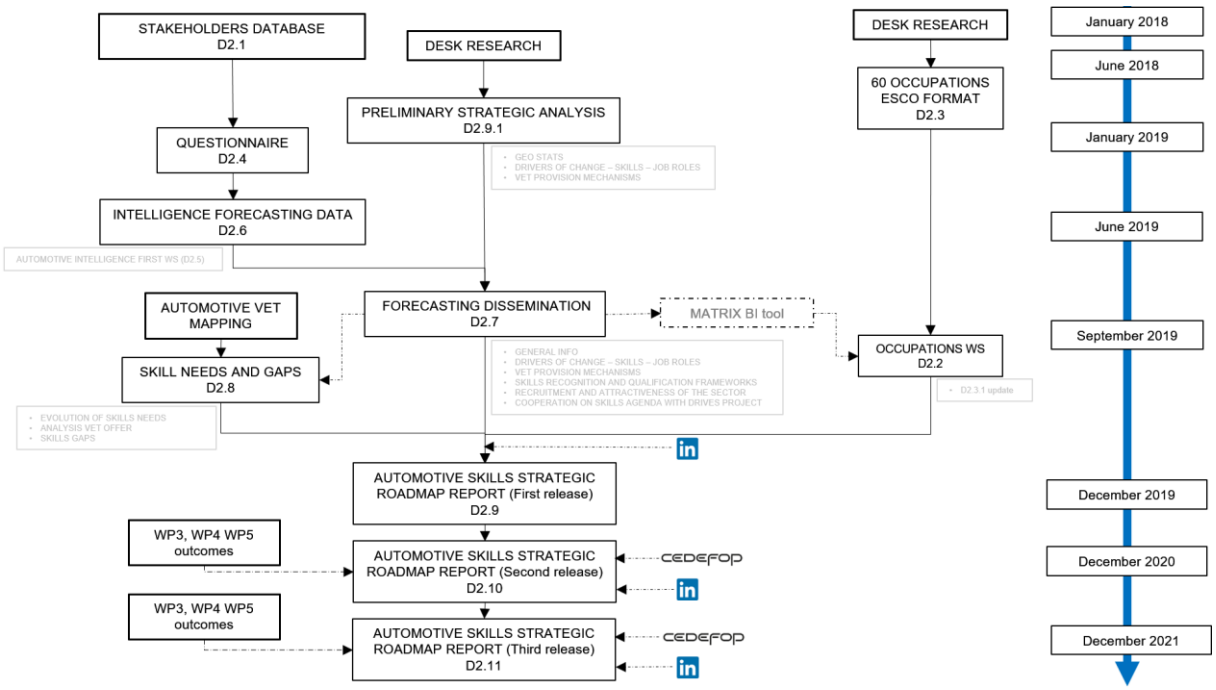

Figure 6 Scheme of activities and deliverables of DRIVES Work Package 2 Sectoral Intelligence and Roadmapping

Stakeholders have been engaged with a first survey to understand their vision of the sector (with the "Demand" survey), normalised and analysed results for the Deliverable D2.6 "INTELLIGENCE FORECASTING DATA" after a workshop (D2.5 "AUTOMOTIVE INTELLIGENCE FIRST WORKSHOP") and D2.7 "FORECASTING DISSEMINATION", also using the outcome from the previous desk-research D2.9.1 "PRELIMINARY STRATEGIC ANALYSIS". The preliminary strategic analysis compared the outcomes of

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the European Automotive Skill Council15 report and GEAR 2030 report16, with other available intelligence/reports related to the EU automotive sector in order to identify the main Drivers of Change within the European automotive sector.

After identifying the key Drivers of Change using the European Automotive Skill Council report and GEAR 2030 report, the wider literature review was undertaken in order to validate, review and add new Drivers of Change to this initial list. Through this approach five main 'macro' Drivers of Change have been identified, these being:

- New technologies and business models
- Climate goals, environmental and health challenges
- Societal changes and changes in the way that consumers access, purchase and use cars
- Structural change
- Globalisation and the rise of new players

Each 'macro' Driver comprises several more specific Drivers of Change that were identified as relevant. Analysis also focussed on the identification of emerging Drivers of Change. The literature review enabled the mapping of each initial macro Driver of Change against wider research evidence, based on the number of times each Driver was cited in those reports included in the review. This analysis enabled validation of the initial choice of Drivers of Change.

The normalised output of deliverable D2.6 have been used to create the main structure of the second survey to VET providers (also school and universities and training centres) to understand their offer of education (the "Offer" survey). Merging the D2.3 "OCCUPATION PROFILE" created with a desk-research at the begin of the project with the occupations outcomes of the D2.7, presented during a workshop (D2.2), the D2.3 has been update (called D2.3.1) and presented to WP3, WP4 and WP5 to permit them to proceed with their activities. All the intelligence followed the strategy introduced into Section 3.

The timeline of the sectoral intelligence and relatives Deliverables is showed into Figure 7.

[15] *European Sector Skill Council: Report, Eu Skill Council Automotive Industry, 2013*

[16] *GEAR 2030, High Level Group on the Competitiveness and Sustainable Growth of the Automotive Industry in the European Union, 2017*

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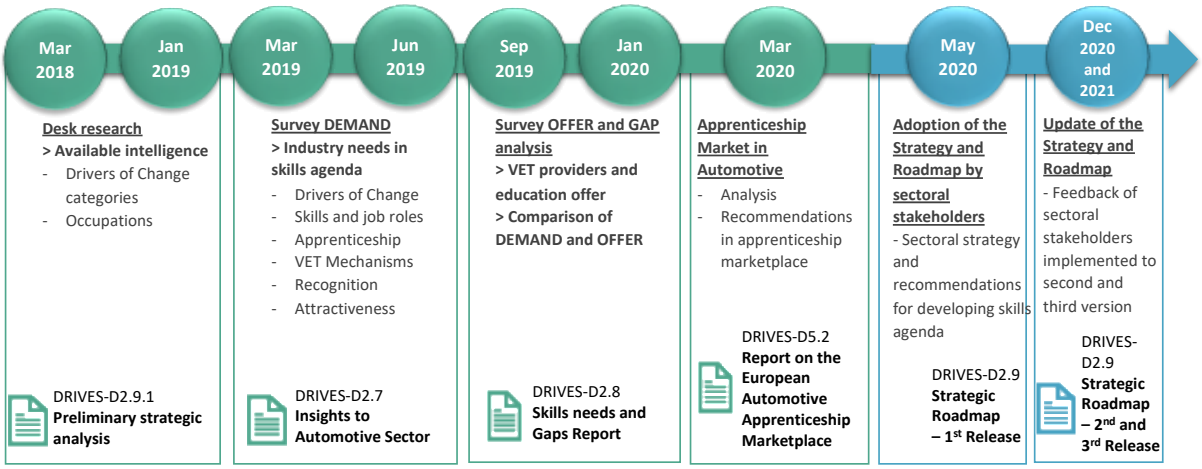

Figure 7 Deliverables within for the sectoral intelligence process

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APPENDIX B – AUTOMOTIVE SKILLS AGENDA ANALYSIS – KEY RESULTS

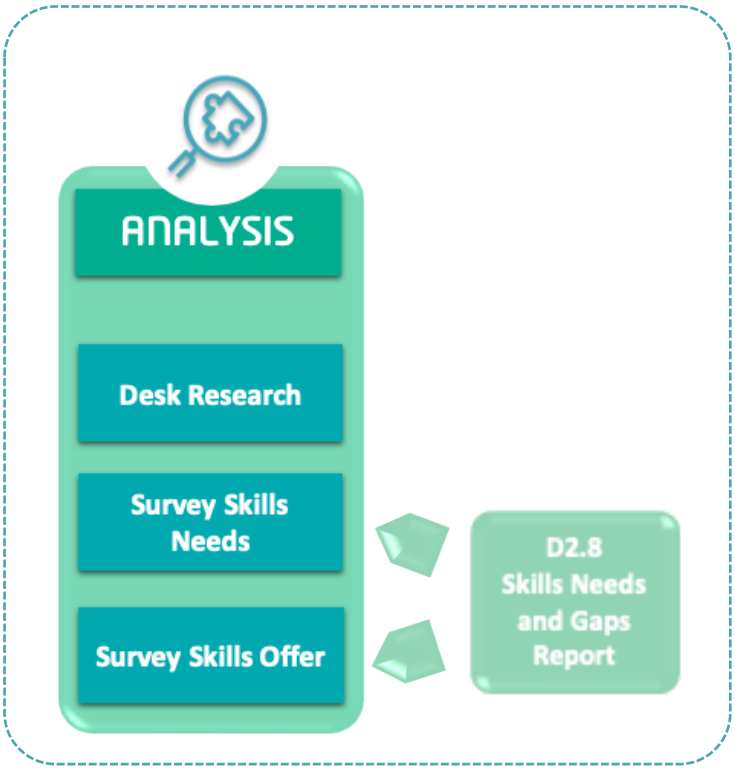

Figure 8 Scheme for the Skill Agenda Analysis

The overall approach to Automotive Skills Agenda is described in Appendix A. Key finding were described in the series of reports produced by DRIVES project. As Figure 8 shows, the report D2.8 Skills Needs and Gaps Report focuses on comparison of survey focused to skills needs by industry (the "Survey Demand") and survey focused on offer from VET providers and other stakeholders in Automotive Industry (the "Survey Offer"). The key results and findings are summarised in this section.

B.1 REPRESENTATION OF THE SECTOR

Based on DRIVES preliminary desk-research analysis[17], in relation to the TOP 5 countries measured on fiscal income are:

1. Germany – €92 billion
2. France – €79 billion

[17] *DRIVES Deliverable D2.9.1 Preliminary strategic analysis report*

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3. Italy – €74.4 billion
4. United Kingdom – €56.3 billion
5. Spain – €28.1 billion

The coverage of the European countries during the investigation was substantially adequate even if the redemption was not considered enough. As shown in Figure 9, some countries responded more actively than others and the distribution between "Demand" and "Offer" is unbalanced. In the next project activities, a strong involvement and dissemination actions must be put in place to allow greater redemption and uniformity of responses between countries for the stakeholders of the "Demand" and the "Offer".

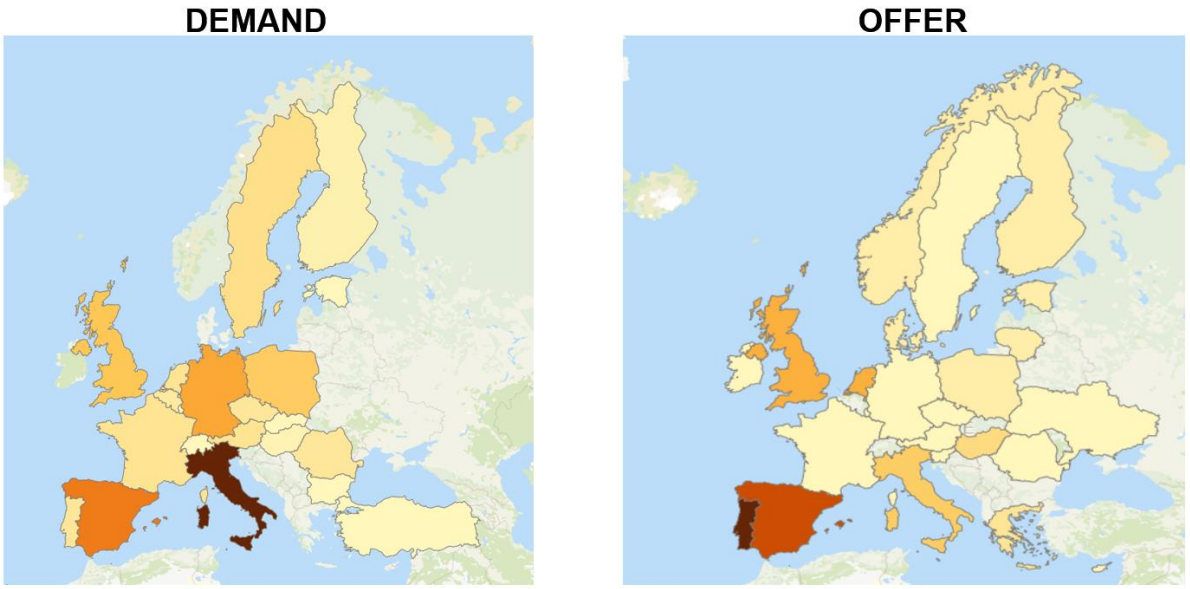

Figure 9 Geographical distribution in EU between engaged stakeholders into the 2 surveys

In Figure 9 the distribution of numbers of replies into Demand and Offer surveys is indicated with a different colour. A darker colour represents an higher redemption of replies[18].

B.2 STAKEHOLDERS

Interaction with stakeholders has always been considered a milestone activity for the success of the project. DRIVES launched 2 online questionnaires (so called “Demand” and “Offer” questionnaires)

[18] *DRIVES Deliverable 2.8 Skill Needs and Gaps*

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during these two years supporting the creation of this strategic roadmap for the sector. This activity and related data elaboration were essential to understand the current vision of the sector by the stakeholders (industry and service providers).

The structure of the 2 questionnaires was based on the 8 KA introduced into Section 3 (Figure 2) and used also for the roadmap:

- Representation of the sector
- Stakeholders
- Drivers of Change
- Target occupations
- Target Skills
- VET provision mechanisms
- Skill recognition and qualification frameworks
- Recruitment and attractiveness of the sector

The Demand survey left relatively open ended in order to gather as much information as possible to support understanding and analysis of the sector's skills agenda and needs. A harmonisation process was therefore necessary to prepare a structured map to properly aggregate information and accurately reflect stakeholder responses. The questionnaire was designed for two different categories of stakeholders: Companies and Organisations, with differences in the wording of questions to reflect these two different categories of respondent. The Offer survey was a multichoice questionnaire, based on the outcomes normalised replies of the Demand one. The stakeholders targeted in relation to the surveys together are outlined in Figure 10.

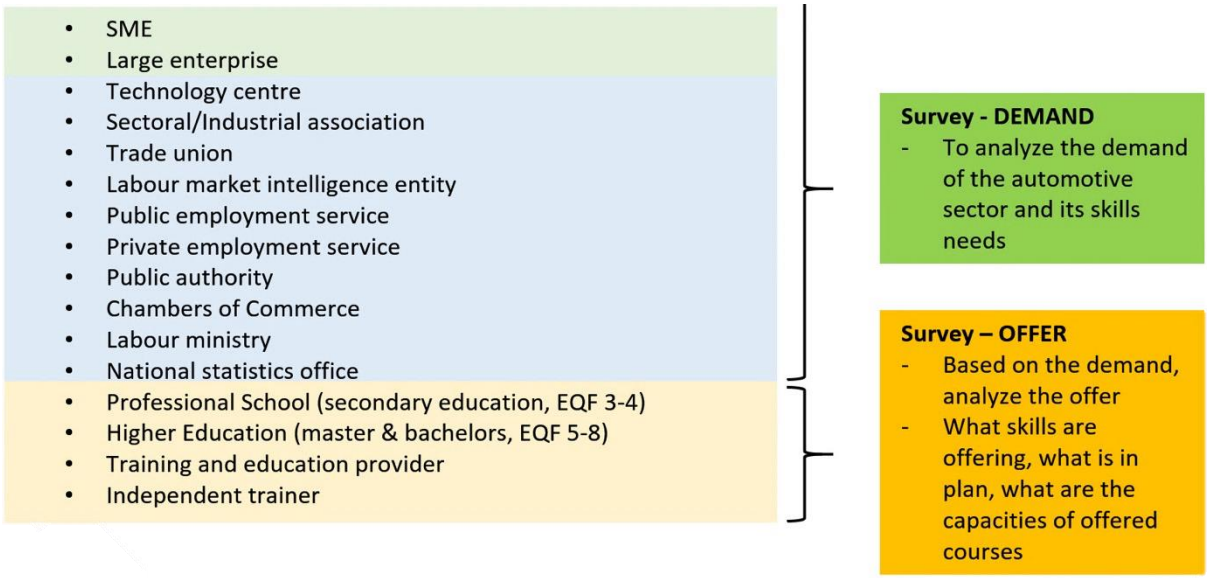

Figure 10 List of stakeholders engaged in the Work Package 2 questionnaires

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Even if the stakeholders in both surveys are different, WP2 tried to address the questionnaires to decision-maker such as Directors, CEO and Managers. Into the Offer survey we also involved professors and Trainers, as they are considered the "material performers" of the training activity.
A detailed description of difference between Demand and Offer has been outlined into the Deliverable 2.8 "Skills need and gap".

As per Figure 11, the main decision maker in both "Demand" and "Offer" survey are predominant in replies. In further stakeholder interactions it will be important to maintain an high percentage of respondents according to this picture.

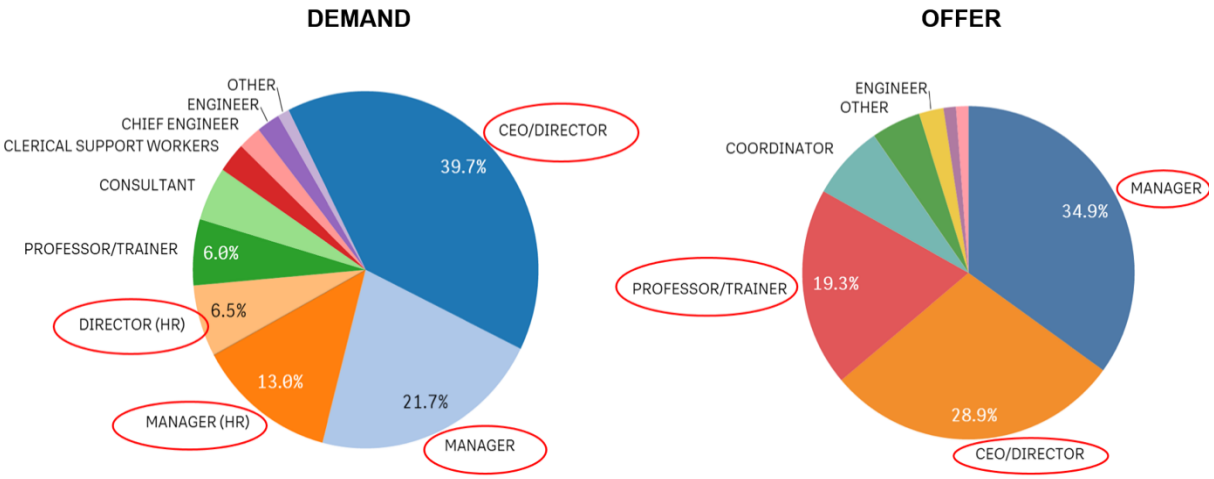

Figure 11 Stakeholders job roles

B.3 DRIVERS OF CHANGE

As analysed and detailed discussed into previous DRIVES Deliverable D2.9.1, five main 'macro' Drivers of Change have been identified as:

- New technologies and business models
- Climate goals, environmental and health challenges
- Societal changes and changes in the way that consumers access, purchase and use cars
- Structural change
- Globalisation and the rise of new players

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A detailed description of difference between Demand and Offer for each Driver of Change has been outlined into the Deliverable 2.8 “Skills need and gap”.

To map the gap the current sectoral view is presented with a comparison of the five macro Drivers of Change with reference to the IMPORTANCE and URGENCY, using also the PRIORITY INDEX[19]

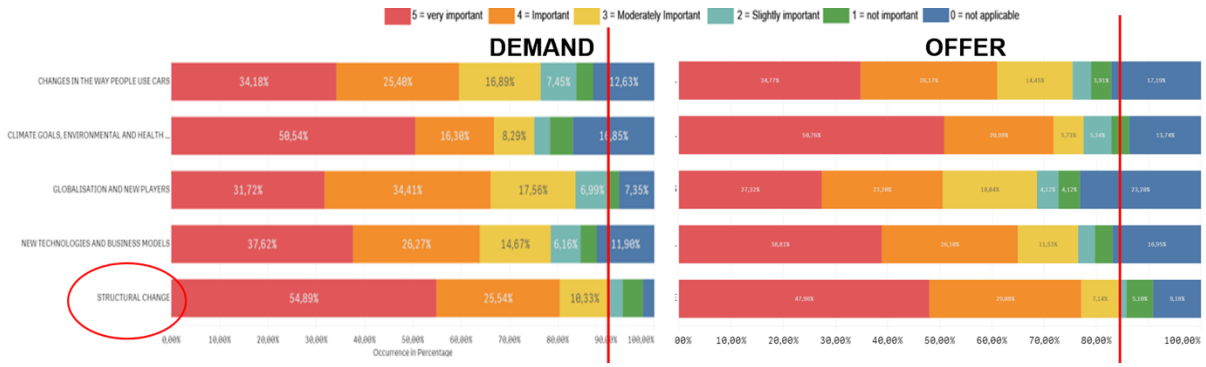

Figure 12 DoC IMPORTANCE comparison between the 2 surveys

The relative importance attached to different Drivers of Change by respondents to both surveys (Demand & Offer) were quite similar in many respects in Figure 12. However, “STRUCTURAL CHANGES” (55% citing this as very important, with “ACQUISITION OF NEW SKILLS” and “CONTINUOUS TRAINING” as most important drivers) was ranked first in the Demand survey based on the overall sample, while with respect to overall responses to the Offer survey “CLIMATE GOALS, ENVIRONMENTAL AND HEALTH CHALLENGES” (51%) was ranked first on this basis. Comparison of the two sets of responses with respect to “STRUCTURAL CHANGE” (restructuring, acquisition of new skills, continuous training) points to a difference of 7% between overall demand and offer survey responses identified as very important.

[19] *The DoC PRIORITY INDEX is stated as: Priority (1 to 5) x Timeframe (2020=5, 2025=3, 2030 and further=1). More details are available into DRIVES Deliverable D2.8*

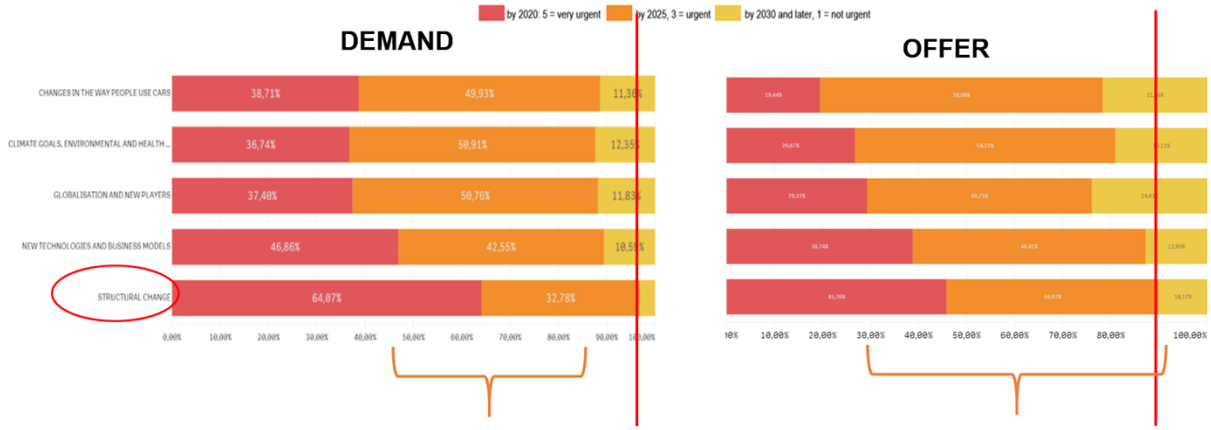

Figure 13 DoC URGENCY comparison between the 2 surveys

With regards to the urgency, even if the ranking between Demand and Offer is similar in terms of position in Figure 13, with "STRUCTURAL CHANGE" identified by both as very urgent (by 2020), the real main difference between Demand and Offer is that respondents of the Offer survey are more likely to cite a longer term urgency (by 2025) for all specific Drivers of Change.

B.4 OCCUPATIONS / JOB ROLES

Due to the fact that DRIVES interact with a heterogeneity of stakeholders and most of them are not aware of the language-technicality related to ESCO classification[20], the partnership agreed to prefer a clear message instead of a technically precise information.

An occupation is a grouping of jobs involving similar tasks and which require a similar skill set. Occupations should not be confused with jobs or job titles. While a job is bound to a specific work context and executed by one person, occupations group jobs by common characteristics (Occupations can be used as job titles); nevertheless, for the DRIVES project Occupation is used as synonymous per Job Role as many stakeholders involved use the both terminology with the same meaning (most of the time Job Role is preferred to Occupation).

A specific question into the "Offer" questionnaire was not implemented regarding this topic (DRIVES Project preferred an approach based on "skills" instead of "jobs" for VET providers) it is still possible to analyse, as per Figure 14, the current Demand of Job Roles and open a clear discussion on this issue with stakeholders:

[20] *March 2020, https://ec.europa.eu/esco/portal/escopedia/Main_Page*

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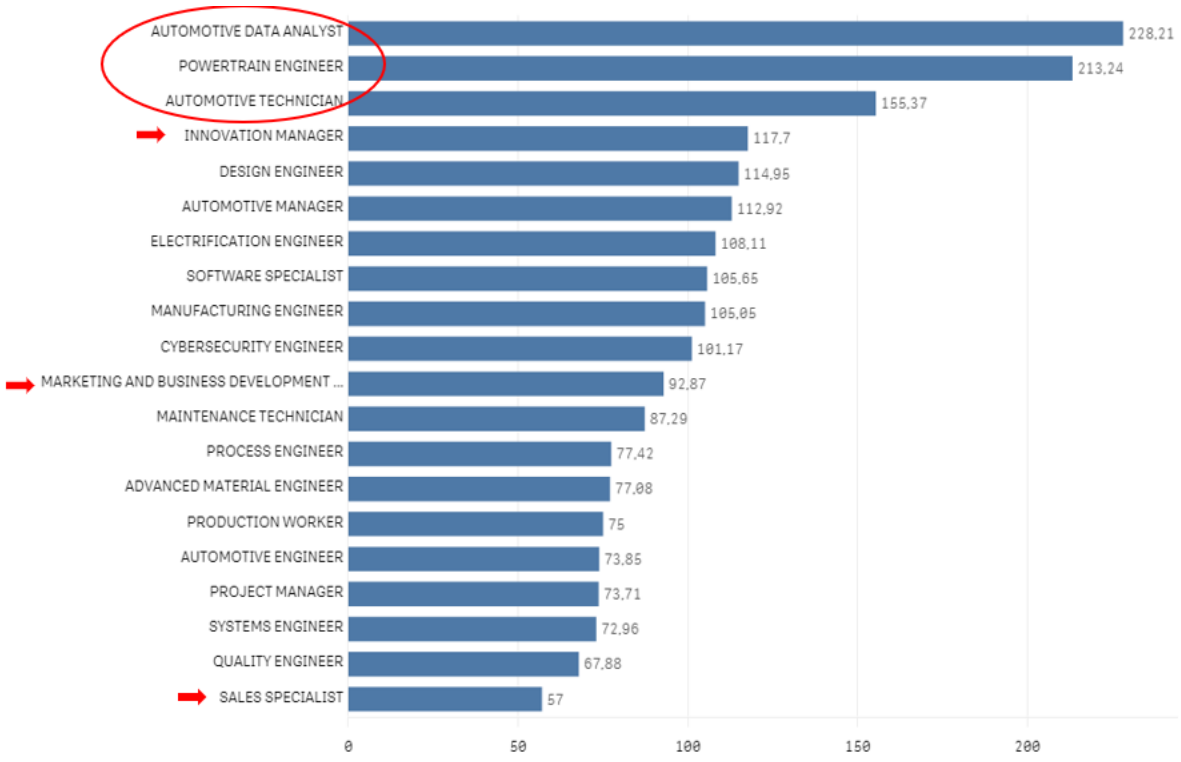

Figure 14 Job Roles INDEX (Demand survey) TOP 20 list

Figure 14 shows the top 20 JOB ROLES INDEX[21]. Based on this, the positions ranked first, second and third are all automotive specific roles, these being "AUTOMOTIVE DATA ANALYST", "POWERTRAIN ENGINEER" and "AUTOMOTIVE TECHNICIAN". The first non- Automotive specific Job Role is ranked 4th and is "INNOVATION MANAGER". Only two sales job roles are in this list at 11th and 20th as "MARKETING AND BUSINESS DEVELOPMENT MANAGER" and "SALES SPECIALIST".

B.5 SKILLS

The WP2 Skills normalisation process was a challenging activity requiring several steps and iterations. Responses in relation to skills were often not identified as action verbs[22] but, more commonly, as a group of jobs, or complex activities and through intensive discussions with those partners involved in the normalisation process, 5 main categories, or clusters of skills have been identified, according to DRIVES Deliverable 2.7: 4 of these being "technical" and the 5th related to previously identified "soft skills". Specific job roles comprise different combinations of these skills.

[21] The JOB ROLE INDEX is stated as: Occurence (of each JobRole) x Priority DoC Index (average of each JobRole). More details are available into DRIVES Deliverable D2.8

[22] According to ESCO: a skill is the basic talent (described with action verb) necessary to categorise all the Occupations, March 2020, [https://europass.cedefop.europa.eu/documents/european-skills-passport/certificate-supplement/action-verbs-glossary]

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A detailed description of difference between Demand and Offer has been outlined into the Deliverable 2.8 “Skills need and gap”.

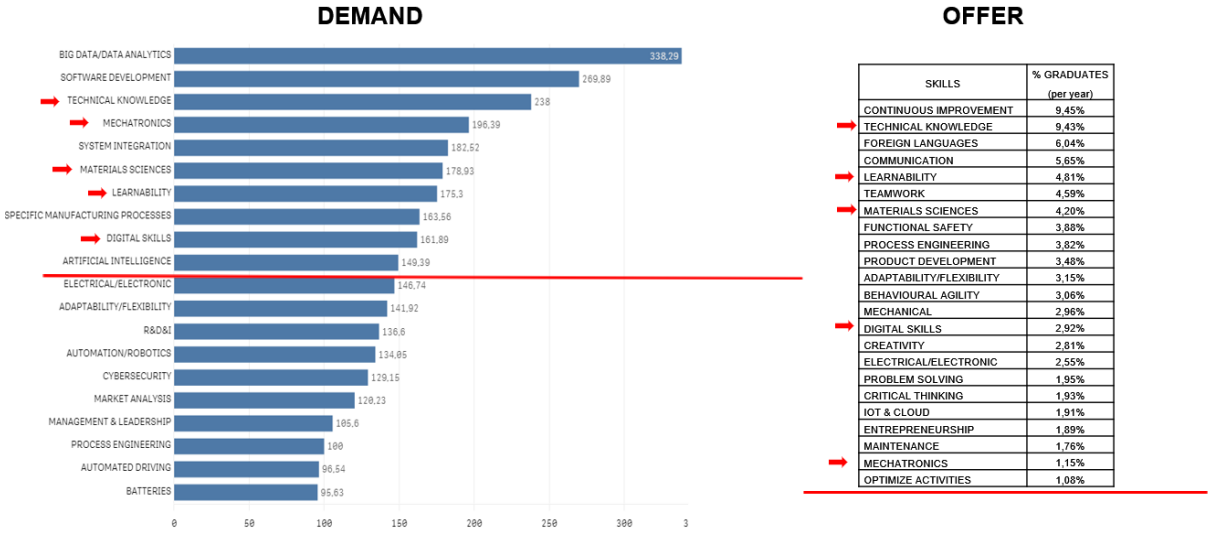

Figure 15 Skills comparison between the 2 surveys

Comparing TOP 10 Demand (of skills) with the Offer as per Figure 15, it is necessary to increase the range from TOP 10 to TOP 20 into the Offer list to find at least 5 similarity.

“TECHNICAL KNOWLEDGE” (3rd in Demand and 2nd in Offer), “MATERIAL SCIENCES” (6th in Demand and 7th in Offer) and “LEARNABILITY” (7th in Demand and 5th in Offer) are comparable. “MECHATRONICS” (4th in Demand and 19th in Offer) and “DIGITAL SKILLS” (9th in Demand and 14th in Offer) are relative not aligned. More than before, now the difference between Demand and Offer is evident and it is important to better evaluate this situation.

B.6 VET PROVISION MECHANISMS

Vocational Education and Training (VET) aims to equip people with knowledge, know-how, skills and/or competences required in particular occupations, or more broadly within the labour market.

The 3 most relevant types of VET in the context of the DRIVES project are: CVET[23], IVET[24] and TVET[25].

The “Demand” survey was in <<open format>> and most of replies were not guided by a multichoice menu; the analysis has been done only to the main (normalised) replied in terms of occurrences. In “Offer” survey, multichoice replies were available with all the normalised replies coming from the “Demand” - with also small (occurrences) replies from “Demand”.

[23] March 2020, http://www.cedefop.europa.eu/files/3070_en.pdf
[24] March 2020,https://www.eqavet.eu/eu-quality-assurance/glossary/initial-education-and-training-(ivet)
[25] March 2020, https://unevoc.unesco.org/go.php?q=What+is+TVET

A detailed description of difference between Demand and Offer has been outlined into the Deliverable 2.8 “Skills need and gap”.

The Demand and Offer both highlight the importance of “TRAINING ON THE JOB” as the most effective VET approach as per Figure 16. Even if in both vision “MENTORING” and “DUAL SYSTEM/APPRENTICESHIPS” are present, they are rated high importance on the Demand side as opposed to a low rated in the Offer side. DRIVES Partnership recognise the situation with COVID-19 and it impact to the Automotive sector. Obviously face-to-face mechanisms are harder to implement and it therefore raises the importance of online training.

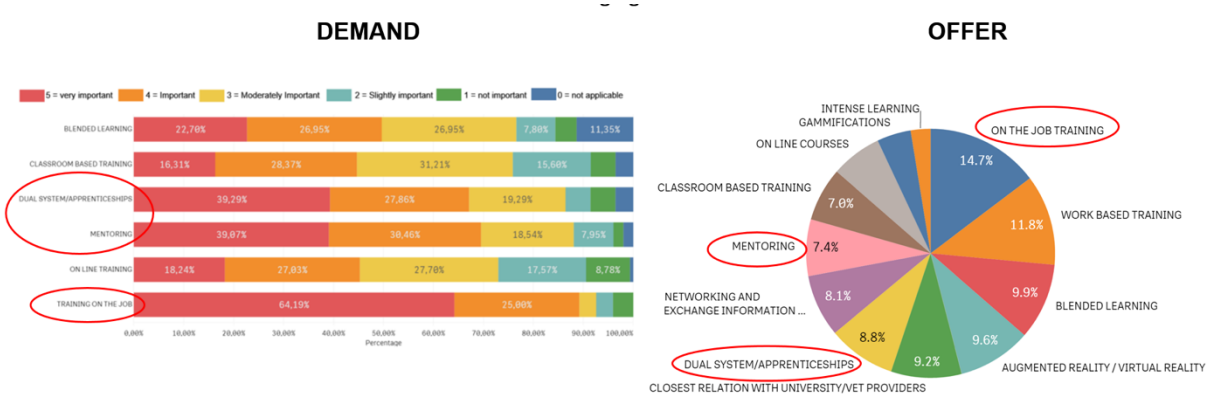

Figure 16: Stakeholders preferences in relation to the most appropriate VET mechanisms to meet changing needs

It is clear that the pace of technological change within the automotive industry is increasing rapidly, which in turn impacts on the rate of skills change. With the fast pace of industry change, the demand for specific skills is growing very quickly with a recent analysis showing the half-life of skills is now only five years. This means the skills learned today are only half as valuable in five years from now.

This underlines the need for the apprenticeship offer to be flexible enough to respond to these changes. These changes also imply:

- It is difficult for providers to keep abreast of changing skill requirements
- Future skill requirements are difficult for employers to predict

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It has also been pointed out that across a wide range of different sectors, the pace of technological change highlights the need to adapt learning programmes to reflect the critical importance of an interdisciplinary approach to innovation in the workplace[26].

A detailed description of difference between Demand and Offer has been outlined into the Deliverable 2.8 “Skills need and gap”.

Even if it is not possible to assess the difference between overall Demand and the provision ‘Offer’ with respect to Apprenticeships directly from the survey, it is clear that a “LINK WITH EDUCATIONAL INSTITUTES OR TRAINING PROVIDERS” is essential from Demand point of view as the main methods used to recruit apprentices as per Figure 17.

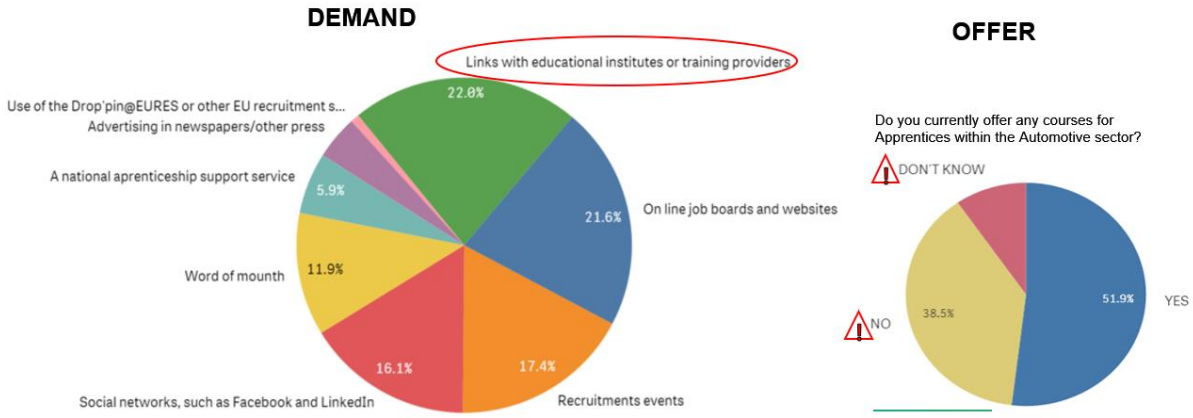

Figure 17 The main methods used to recruit apprentices

From Offer point of view, only 52% of interviewed offers courses for Apprentices. It also true that the increasingly globalised nature of the automotive sector contrasts with apprenticeships that tend to be focussed nationally, which poses particular challenges for employers when choosing whether to participate in the apprenticeship systems of those countries they operate in and for the mobility of apprentices seeking employment across national boundaries.

B.7 SKILLS RECOGNITION AND QUALIFICATION FRAMEWORKS

This section is fundamental to obtain structured information on the current use of specific Recognition and Qualification frameworks and on the perceived importance of harmonisation activity at an EU

[26] *The Future of Work Jobs and Skills in 2030; UKCES; Z_punkt and the Centre for Research in Futures and Innovation (CRI-FI)*

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level. The activity has been undertaken with reference to 5 key qualification frameworks listed in the questionnaire (VDA-QMC[27], ECQA[28], TUV SUD[29], BUREAU VERITAS[30], IATF[31])

A detailed description of difference between Demand and Offer has been outlined into the Deliverable 2.8 “Skills need and gap”.

There are now clear and evident differences in relation to the results of the Demand and Offer surveys as per Figure 18.

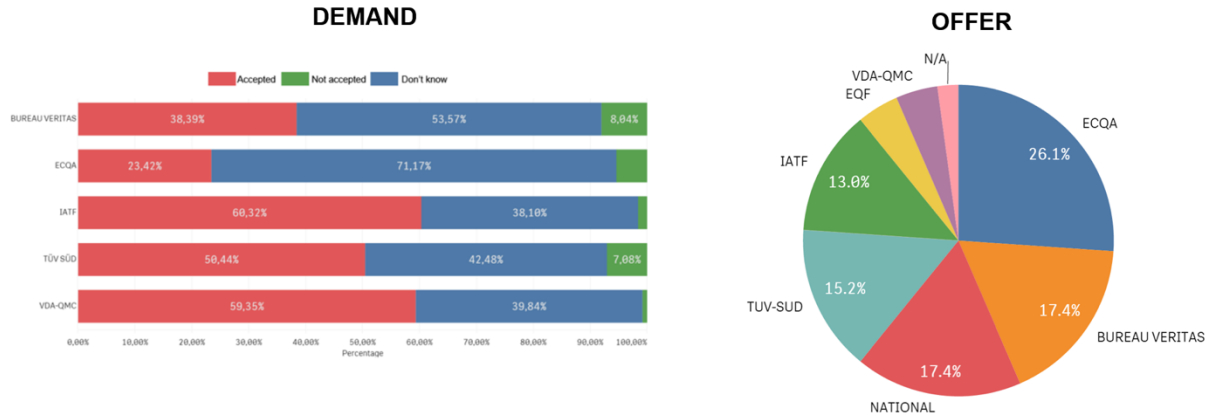

Figure 18 Most important skills recognition and qualification standards accepted

“ECQA” is the most frequently recognised by providers (respondents to the Offer survey) but the least recognised by respondents to the Demand survey. On the other hand, “VDA-QMC” is widely accepted (and “IATF”) by Demand survey respondents but recognition is negligible in relation to the Offer survey respondents. Also, of particular note is the importance attached to “NATIONAL” standards by VET stakeholders, ranked 3rd: to better investigate if “national” means <<only valid / recognised in a specific country>>.

B.8 ATTRACTIVENESS OF THE SECTOR

A greater understanding of stakeholder views relating to the attractiveness of the sector is a necessity into a skills anticipation process and a list of possible methods to recruit people into the automotive sector was listed based on normalised outcomes from the “Demand” survey.

A detailed description of difference between Demand and Offer has been outlined into the Deliverable 2.8 “Skills need and gap”.

[27] March 2020, https://vda-qmc.de/en/
[28] March 2020, https://www.ecqa.org/
[29] March 2020, https://www.tuvsud.com/en
[30] March 2020, https://group.bureauveritas.com/
[31] March 2020, https://www.iatfglobaloversight.org/

Respondents from both the Offer and Demand surveys identify in Figure 19 “COOPERATION BETWEEN THE INDUSTRY AND EDUCATION” as the most important method, but other priorities differ significantly between these two different sets of stakeholders.

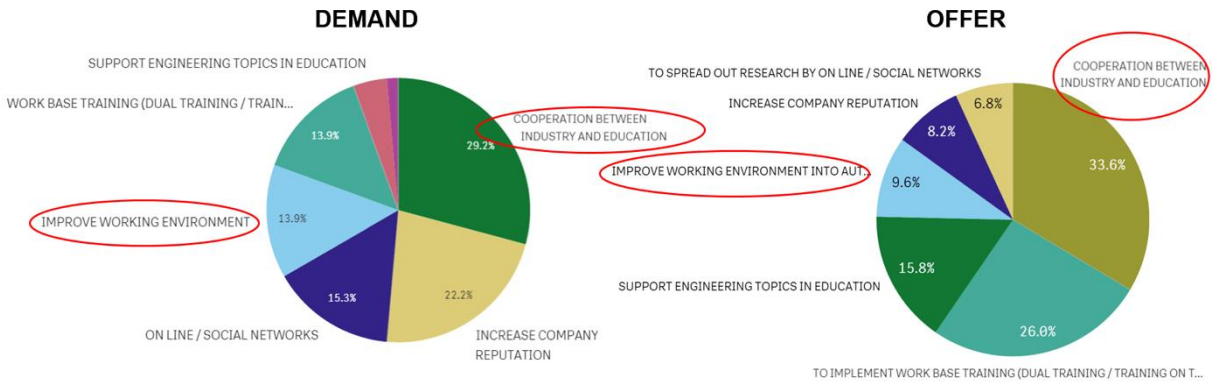

Figure 19 Best recruiting method to attract new and talented (young) workforce

The differences are most obvious with respect to a visible in “ONLINE/SOCIAL NETWORK”, with respondents to the Offer survey consistently placing these methods as the least important, while respondents to the Demand survey place a somewhat higher level of importance on these methods (A combined total of 15.3%). Company Reputation (“INCREASE COMPANY REPUTATION” as a means of attracting workers into the sector) is also perceived as more important on the Demand side, ranked second at 22.2%, while respondents to the Offer survey placed it between 4.3% and 10.3%. While support for engineering topics is seen as very important from the perspective of respondents to the Offer survey, Demand side respondents – interestingly - rank this as the least important.

B.9 LINKEDIN ANALYSIS

During the first two years, the DRIVES project benefited from the collaboration with LinkedIn[32] and some findings can be summarized below. It was focused on analysis of the LinkedIn network and the data available within it. It brings another perspective to the analysis performed by DRIVES project.

The partnership with LinkedIn enables:

- Comparisons between hundreds of countries and cities
- Breakdown by location, industry, function, etc.

[32] *May 2020, www.linkedin.com*

- Members constantly update their profiles
- Monitor data over time (mitigation patterns)

The data has been aggregated and anonymized to uncover new information on the EU automotive industry and its recent evolution with the analysis based on job position information of automotive workers defined as LinkedIn members:

- Who either have a current position or started a position in the automotive sector (as defined by LinkedIn's industry taxonomy) between 2015 and 2019 (industry transitions and skill analysis)
- Who are located (i.e. working) in one of the EU28 member countries

It is important to underline that:

Location

LinkedIn determines a member's location by the location they have indicated in their members' profile summary. When a new location is added, LinkedIn uses these signals to uncover members flows.

Industry

Members indicate their current and previous employers in the experience section of their profile. The industry in which a member works is determined by the classification of the company in LinkedIn's taxonomy of industries.

Skills

Members indicate their expertise within the skills section of their profile. LinkedIn standardises the tens of thousands of individual skills that members choose to display on their profile into a skill taxonomy.

Share of automotive workforce

Focusing on LinkedIn members who currently list at least one position in the automotive industry, they look at the share of overall workforce they make up for each country (this analysis is based on number of members).

Industry transitions

Focusing on automotive positions that started or ended between 2015 and 2018, LinkedIn look at the industries of either previous or next position on members' profiles (this analysis is based on number of positions).

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Industry Skills Needs

Using a frequency–inverse document frequency (TF-IDF) weighting scheme applied on skills added in 2015, 2016, 2017, 2018 and 2019 LinkedIn compute the top represented skills for each macro region, industry and year. This provides a time series to discern changes in skills needs of an industry over time and compare an industry's most representative skills across regions (this analysis is based on skills associated with positions).

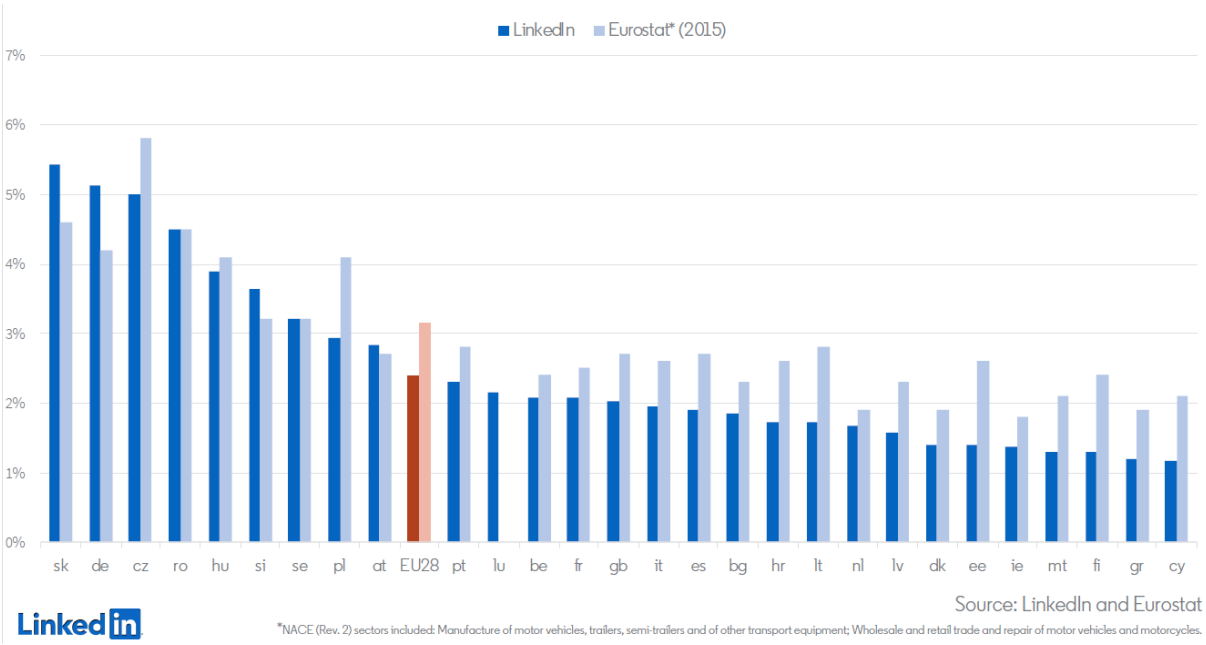

Figure 20 LinkedIn's representation of EU automotive workforce

Based on Pictures 20 the share of the LinkedIn workforce employed in automotive is similar to the share of automotive employment in Eurostat data[33].

The attractiveness of the sector is another important element that can be analysed and mapped over the time through LinkedIn users, as per Figure 21, where it is possible to see that more than 40% of workers starting a job in automotive came from another industry. The sector is losing attractiveness with a -7% over the 2015-2018 period.

[33] *See also Appendix into DRIVES D2.9.1 report*

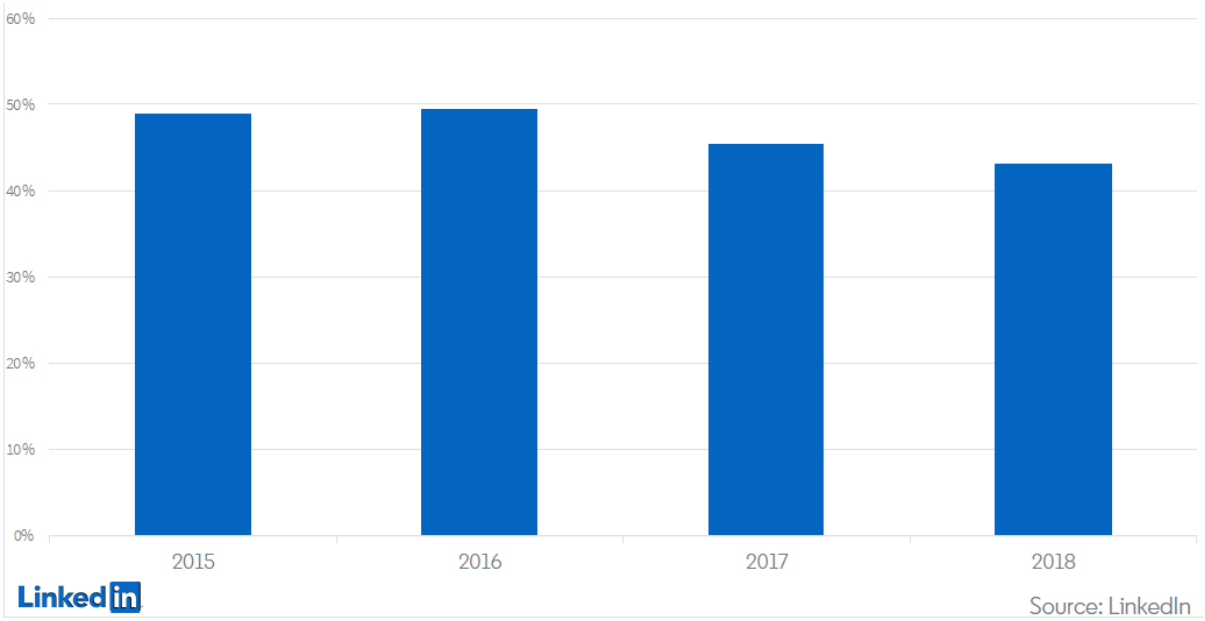

Figure 21 Transitions from another industry to automotive as a share of all positions

And the following Figure 22 shows the composition of this 40%.

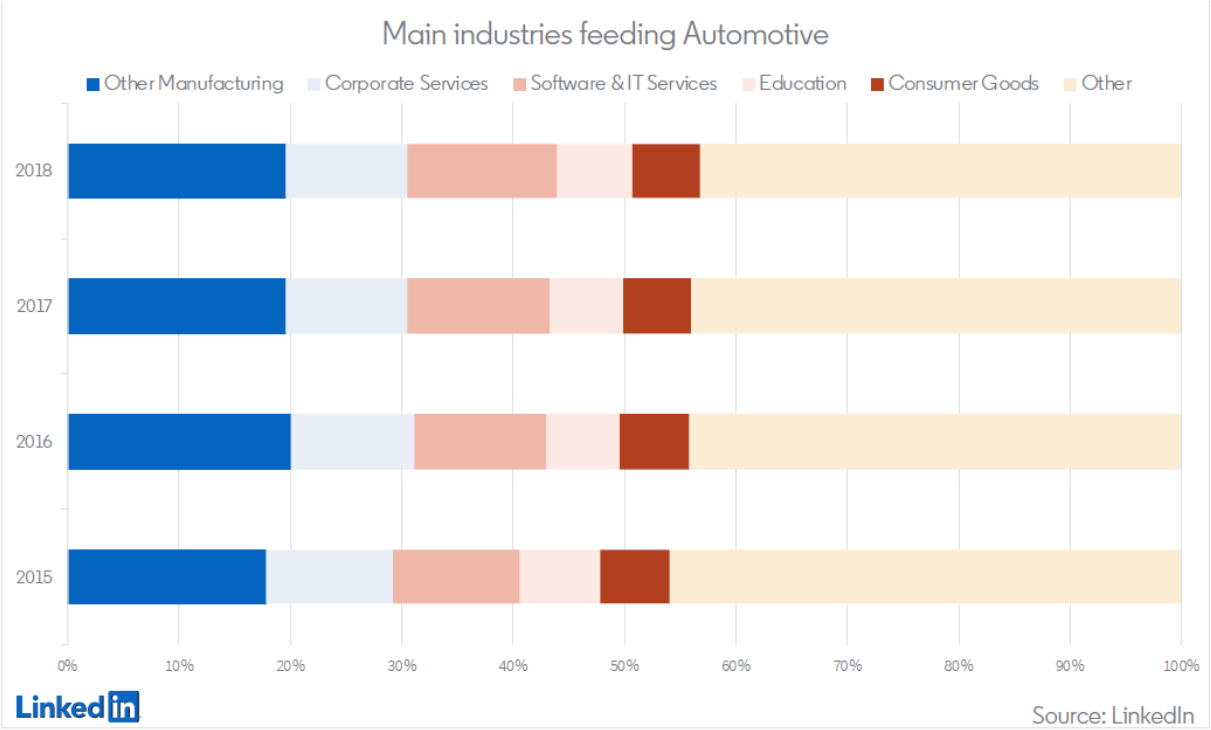

Figure 22 From which industry workers come from

Figure 22 shows an evident predominant of "MANUFACTURING" (not considering the macro-aggregation of "Other"), followed by "SOFTWARE & IT SERVICES" and "CORPORATE SERVICES".

From the other side, it is also possible to analyse the rate of exit from the sector, as indicated in the Figure 23.

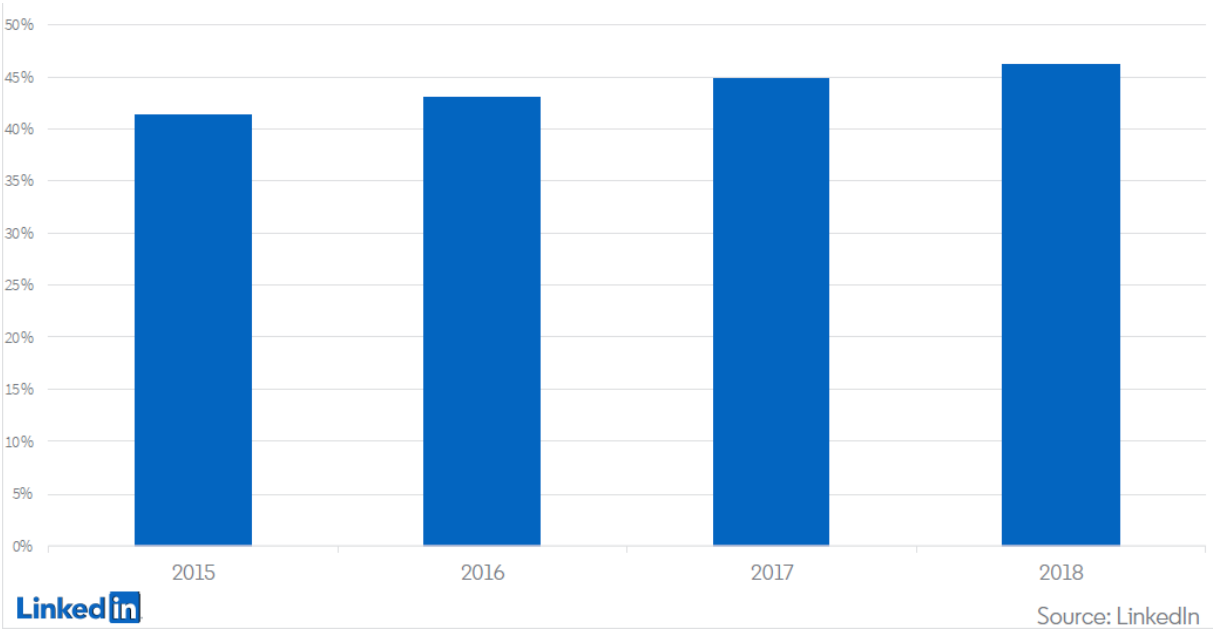

Figure 23 Transitions to another industry from automotive as a share of all positions

In this regard, the Figure shows an increasing share of members leaving an automotive job transition to another industry with more than 5% in the period 2015-2018.

As seen before, it is possible to analyse which sectors are more attractive for automotive workers, as showed in the next figure 24.

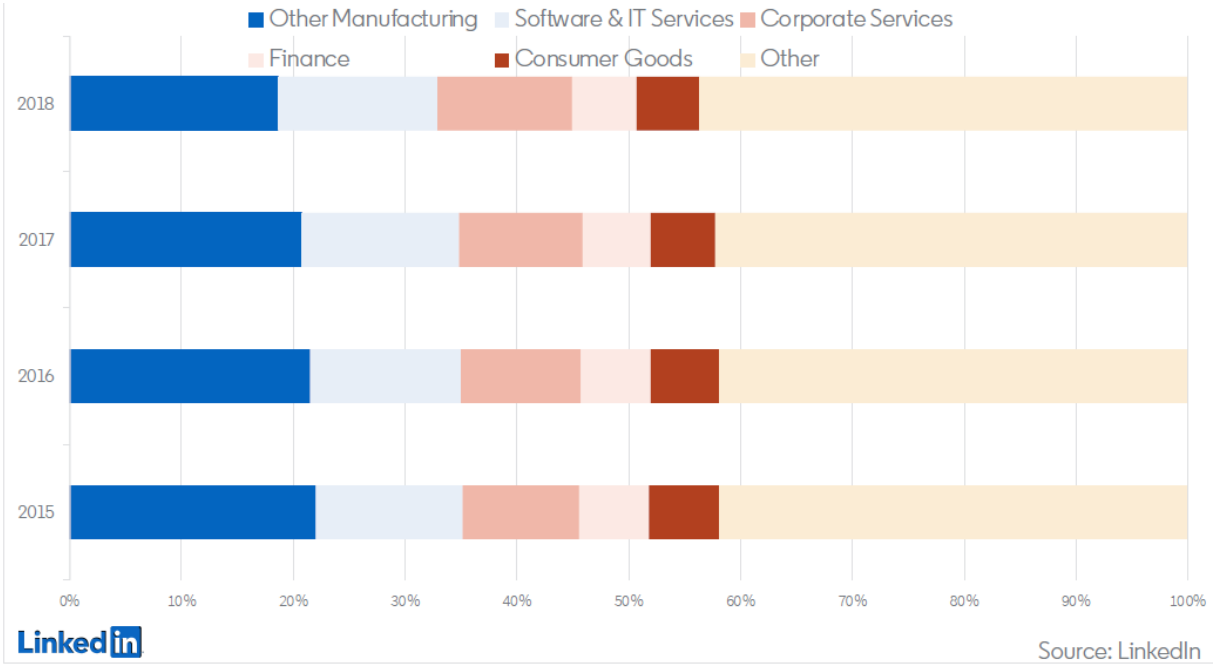

Figure 24 Main industries drawing from Automotive

In Figure 24 the "MANUFACTURING" sector is the most relevant in terms of attractiveness compared to the Automotive sector, followed by "CORPORATE SERVICES", "SOFTWARE & IT SERVICES" and "CONSUMER GOODS" and "FINANCE". The "Other" bucket in the industry transitions analysis is mainly made of transition to and from: Finance, Media & Communications, Retail, Recreation & Travel, Transportation & Logistics, Health Care, Construction, Energy & Mining.

Another important analysis made by LinkedIn is the Automotive Industry Skills Needs based on their Database. Skill requirements are constantly changing, and the aim of this analysis was to know what skills workers were most likely to add in automotive each year since 2015.
The followed methodology was:

1. Looked at all the positions with a start date between 2015 and 2019 listed on LinkedIn globally and the skills associated with them.
2. Using a frequency–inverse document frequency (TF-IDF[34]) weighting scheme applied on skills added in 2015, 2016, 2017, 2018 and 2019 LinkedIn computed the top represented skills in each industry (incl. automotive) for each macro region[35] and year.

As a result of this methodology is a time series of top represented automotive skills in EU28 to discern changes in skills needs of EU28 automotive over time and a top represented skill for each macro region to compare an industry's most representative skills across global automotive hubs today.

[34] TF-IDF methodology highlights skills that are "unique" to automotive in each macro region, while discounting those that are common across other industries and regions as well.
[35] Macro regions included in addition to EU are taken from the World Bank classification: East Asia & Pacific, European Union

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2015	2016	2017	2018
Automotive	Automotive	Automotive	Automotive
Automotive Engineering	Automotive Engineering	Automotive Engineering	Automotive Engineering
Automotive Aftermarket	Failure Mode and Effects Analysis (FMEA)	Failure Mode and Effects Analysis (FMEA)	Failure Mode and Effects Analysis (FMEA)
Failure Mode and Effects Analysis (FMEA)	Automotive Aftermarket	Automotive Aftermarket	Powertrain
Advanced Product Quality Planning (APQP)	Production Part Approval Process (PPAP)	Continuous Improvement	Automotive Aftermarket
Production Part Approval Process (PPAP)	Lean Manufacturing	CATIA	Dealer Management
Continuous Improvement	Advanced Product Quality Planning (APQP)	Lean Manufacturing	Continuous Improvement
Kaizen	Continuous Improvement	5S	CATIA
Lean Manufacturing	Kaizen	Powertrain	5S
5S	5S	Advanced Product Quality Planning (APQP)	Lean Manufacturing

Figure 25 EU28 Automotive Industry Skills Needs over time

Figure 25 confirms the DRIVES project survey results based on the JOB ROLES INDEX, where the first 3 positions are automotive specific roles.

Using this methodology is also possible to have an overview of the European data compared to the other Macro Regions.

EU	East Asia & Pacific	North America	Latin America & Caribbean	South Asia
Automotive	Automotive	Automotive	Automotive	Automotive
Automotive Engineering	Automotive Engineering	Automotive Aftermarket	5S	Production Part Approval Process (PPAP)
Failure Mode and Effects Analysis (FMEA)	Manufacturing	Automotive Repair	Continuous Improvement	CATIA
CATIA	CATIA	Automotive Sales	Kaizen	7 QC Tools
Automotive Aftermarket	Advanced Product Quality Planning (APQP)	Customer Retention	Lean Manufacturing	Kaizen
Continuous Improvement	Production Part Approval Process (PPAP)	Customer Satisfaction	Failure Mode and Effects Analysis (FMEA)	Failure Mode and Effects Analysis (FMEA)
Lean Manufacturing	Continuous Improvement	Manufacturing	Advanced Product Quality Planning (APQP)	Manufacturing
5S	Failure Mode and Effects Analysis (FMEA)	Lean Manufacturing	Production Part Approval Process (PPAP)	Automotive Engineering
Production Part Approval Process (PPAP)	Automotive Repair	Continuous Improvement	Manufacturing	Advanced Product Quality Planning (APQP)
Manufacturing	Automotive Aftermarket	Root Cause Analysis	PDCA Cycle	Mechanical Engineering

Figure 26 Global automotive hubs industry skill needs (2019)

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Looking at the EU28 automotive skill needs between 2015 and 2018, as per Figure 26, we find a constant focus on specialised technical skills related to automotive engineering, failure analysis etc., more service-oriented skills such as automotive aftermarket feature prominently, while dealer management enters the top ten only in 2018. The prominence of service-oriented skills in North America stand out, while regions like the EU have a more technical skill mix, which is more like the one for East Asia.

In the project lifespan, all this information will be updated and more deeply analysed.

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APPENDIX C – ONGOING CHANGES IN THE AUTOMOTIVE SECTOR

In a world that is evolving more rapidly towards new technologies and where the security and use of Big Data are becoming an essential element in the development of commercial strategies, the automotive sector is going to experience a new epochal change, perhaps greater than was experienced in the early 20th century, with industrial automation in U.S. factories. Given this, it is necessary to anticipate the R&D needs and associated changes in skills and competences that training institutes in Europe will need to teach to (young) people who want to develop a career path within the automotive sector[36].

The Representation of the sector has been developed through desk-based research analysis using existing studies of the Automotive sector, together with information derived directly from DRIVES partners. This activity was necessary to understand and clarify the framework for the whole process and to prepare a clear picture of the main elements and priorities[37] in terms of sector / subsectors importance and geography, supply chain structure, companies organisation and value chain, turnover and numbers of employees. Based on DRIVES Deliverable D2.9.1, the main outcome of this statistic work, using also the desk-research activities, can be summarised with the PricewaterhouseCoopers' acronym that describes the vision for sector – **EASCY** - to indicate a vehicle[38]:

- **Electrified**: In the transition to a decarbonised and emissions-free individual mobility gradual and full electrification of the powertrain will play a significant role beside alternatives like the use of synthetic fuels or the use of hydrogen in fuel cells. All such solutions will require substantial investments in infrastructure and require a joint approach of policy makers, industry and consumers. Independent from the technology the use of CO2 neutral electricity from renewable sources will be key to ensure real "emissions-free" and CO2-neutral mobility.
- **Autonomous**: The rapid progress made in areas such as artificial intelligence, machine learning and deep neural networks make it possible to achieve what until recently seemed utopian – namely the development of autonomous vehicles, which require no human intervention even in complex traffic situations. This will completely redefine

[36] *DRIVES project, Deliverable 2.9.1 "Preliminary strategic analysis", March 2020, https://www.project-drives.eu/en/publications*
[37] *D2.9.1 preliminary strategic analysis, DRIVES Project, March 2020, www.project-drives.eu*
[38] *Five trends transforming the Automotive Industry, PricewaterhouseCoopers, 2017-2018*

the use of individual mobility platforms. New application scenarios are emerging that would have been unthinkable just a few years ago[39].

- **Shared**: For several years, many big cities have offered car-sharing facilities. While these are currently often run as pilot projects or citizen initiatives, sharing concepts will become economically viable with the introduction of autonomous vehicles. It will no longer be necessary to search for a shared vehicle in the surrounding area: instead it will be possible to order vehicles to wherever the user happens to be via a convenient "on Demand" service.
- **Connected**: This term covers the Car2Car and Car2X communication. Such ability to communicate with the vehicle and its users allow a variety of new use cases making mobility more efficient, safer, more comfortable and allow intermodal mobility solutions. While communication with the infrastructure (such as traffic lights) might reduce congestions the seamless interaction with the driver and the vehicle will lead to complete new mobility services also have an impact on existing business models.
- **Yearly updated**: The development topics of electrified, autonomous, connected and shared will lead to a clear increase in the rate of innovation within the automotive industry. Model cycles of five to eight years, which have always been common in this sector, could soon be a thing of the past. Instead, the range of models will be updated annually in order to integrate the latest hardware and software developments. As customers will naturally not want to buy a new vehicle every year due to the high purchase costs, the short innovation cycles will enter the market primarily through regular upgrades of shared vehicles.

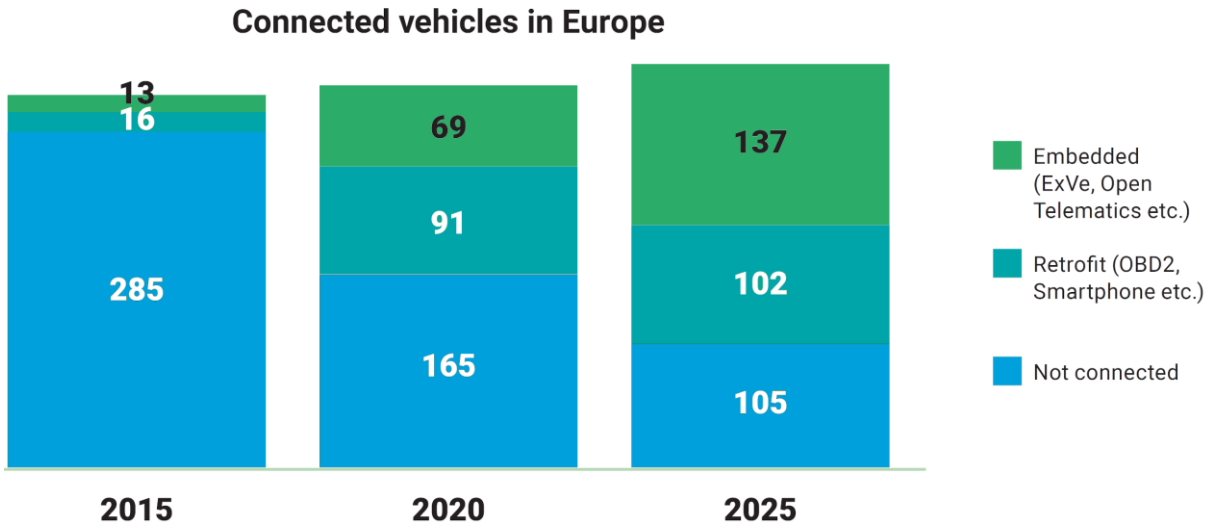

Figure 27 Connected vehicles in Europa 2015-2025

[39] *Amazon dives into self-driving cars with a bet on Aurora, March 2020, www.wired.com, https://www.wired.com/story/amazon-aurora-self-driving-investment-funding-series-b/*

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The shift towards connected vehicles in Figure 27 shown is fast growing: in 2015, only 9% of vehicles were connected. In 2020, it is expected that this would increase to 49% and to arrive to 70% in 2025[40]. The overall vision of the sector is moving from the vehicle to the integration of services around the product itself. The vehicle of the future will no longer functions solely as a mode of transportation, but also as a place for work, relaxation and social interaction. Therefore, the driver can choose to drive themselves or be driven, meaning that the time spent in the car can be used for whatever the customer chooses. Today, more than half the world's population lives in major cities[41] and this trend is growing. Mobility services like car-sharing and ride-hailing will be increasingly important, as the increase in traffic means mobility has to become more individualised. Coupled with this, younger generations no longer want to own a car[42]; parking has become an issue in more crowded in cities and the use of congestion-taxes is increasing. In the literature there are several acronyms to explain the future vision of the automotive sector, even if all of them share the same basic elements. These milestones, related to the direction of the development of the "vehicle" product will influence all related automotive sectors and its value chain:

- **Transit time for personal activities**

  The vehicle of the future will be "a place to do activities" and to take advantage of the transit time to allow personal activities. The necessity of connection (V2X) will be more and more important. This is not just as a result of growing amount of information that a vehicle, by its nature, generates for technical reasons, or data currently imported from external sources (for example the mobile phone interaction with vehicle's infotainment systems or information transmitted by roadside units, other vehicles or vulnerable road users),[43] but the huge amount of information that is expected to be exchanged.

- **Infrastructure**[44]

  Public charging points that refill EVs will have to rise significantly to meet the global EV-adoption increases forecast by 2030[45]. Even if the direction seems to be clear, the speed

[40] *Luc Hoegaerts, Brit Schonenberger: Connected and Automated Mobility, Tyre Industry Use Cases that Require Direct Access to In-Vehicle Data. ETRMA, June 2019* https://www.etrma.org/wp-content/uploads/2019/09/20190716-etrma-report-web-final.pdf
[41] *March 2020,* https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html
[42] *Global Automotive Consumer Study - The changing nature of mobility, exploring consumer preferences in key markets around the world, Deloitte, 2014*
[43] *What kind of data can my car share?, CarDataFacts.eu, 2017,* http://cardatafacts.eu/data-can-car-share/
[44] *Forces of change: the future of mobility, Deloitte, 2017*
[45] *Three surprising resource implications from the rise of electric vehicles, McKinsey, 2018*

of the transition is still uncertain: a fundamental shift is driving a move away from personally owned, driver-driven vehicles and toward a future mobility system centred around driverless vehicles and shared mobility, with an electrified engine in order to conform with the European CO_2 targets. "According to the European Environment Agency (EEA) report[46], specific incentives for electric vehicle charging points were found in only 10 out of 28 EU countries. The European Automobile Manufacturers' Association (ACEA) cautions that investments will need to be stepped up, as future reductions of CO_2 emissions from cars and vans are strongly dependent on increased sales of electric and other alternatively-powered vehicles"[47]; in 2019 a new analysis made by ACEA, with a specific focus on truck sector, has underlined that in EU28 no suitable infrastructure are still available[48].

- **Car as a service**

With a "rethinking ownership" paradigm where it will no longer be necessary to own an automobile due to the fact that new mobile devices, their diffusion, GPS technology and big data transfer are driving consumer behaviour "to use a vehicle only as needed and foregoes the responsibilities of ownership[49]". New generations are not devoted to their "own car" and so do not need a driving licence to use it[50]. This paradigm shift has consequences for all parts of the vehicle, such as tyres, which are becoming increasingly service based. In this context, next to the concept of "car as a service", that of Tyre as a Service (TaaS) has also been recently introduced. TaaS fuses innovative telematics solutions with tyre technology. It includes small micro services (apps or devices) and vehicle monitoring for individual drivers to fully-fledged service packages for fleets enabling the creation of large universal vehicle data platforms for third parties. These services can verifiably help drivers and fleet operators to save fuel, increase safety, increase vehicle uptime, and reduce congestion and harmful emissions from transport.

[46] March 2020, https://www.eea.europa.eu/themes/transport/vehicles-taxation/appropriate-taxes-and-incentives-do/table-1-summary-of-the/view
[47] *Insufficient support for electric vehicle charging infrastructure hampers uptake, new report shows, ACEA, 2018, ttps://www.acea.be/press-releases/article/insufficient-support-for-electric-vehicle-charging-infrastructure-hampers-u*
[48] *Truck CO2 targets: no public charging points for electric or hydrogen trucks available, data reveals, ACEA, 2019, https://www.acea.be/press-releases/article/truck-co2-targets-no-public-charging-points-for-electric-or-hydrogen-trucks*
[49] *A road map to the future for the auto industry, McKinsey, 2014*
[50] *Global Automotive Consumer Study - The changing nature of mobility, exploring consumer preferences in key markets around the world, Deloitte, 2014*

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With an extensive service network and customer proximity, the transformation from selling a single product to a wide array of mobility services has already started.[51]

These innovations will also need to be factored in when looking at how to deal with the traffic increase in the major European capitals, which will require a new approach to mobility.

- **Product standardisation**

Within a more complex and diversified mobility industry landscape, incumbent players will be forced to simultaneously compete on multiple fronts and cooperate with competitors[52]. No wonder, for example, that BMW, Volkswagen and Daimler, the maker of Mercedes-Benz cars, are in talks on a formal collaboration to work on key technologies and industry standards for autonomous driving. Major parts suppliers, including Bosch, Continental and ZF, are also known to be taking part[53] in this project. The ability of tyres to provide real-time diagnostic and prognostic services linked to tyre behaviour analysis also depends on efforts towards vehicle data format standardisation.

- **Value chain**

Several scenarios and visions have been found on the transformation of the automotive value chain. May OEMs will manage the transition to Mobility Solution providers. Altenatively IT actors have the potential to drive the change and force OEMs into a role of a hardware platforms provider[54]. At the same time, innovative aftermarket players are already fielding a variety of telematics-based platforms with functional or entertainment-related applications that make intensive use of vehicle/driver data. Tyre makers have also developed and made commercially available large-scale telematics solutions (e.g. maintenance, smart repair, mobile tyre fitting) in order to meet customer requirements and enhance customer experience. The IoT should allow a precise monitoring of the performances of vehicles and of all the components[55].

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[51] *Luc Hoegaerts, Brit Schonenberger: Connected and Automated Mobility, Tyre Industry Use Cases that Require Direct Access to In-Vehicle Data. ETRMA, June 2019* https://www.etrma.org/wp-content/uploads/2019/09/20190716-etrma-report-web-final.pdf

[52] *Automotive revolution – perspective towards 2030, McKinsey, 2016*

[53] *VW, BMW and Daimler hold talks on cooperation in self-driving cars, Handelsblatt Today, 2019,* https://www.handelsblatt.com/today/companies/autonomous-plans-vw-bmw-and-daimler-hold-talks-on-cooperation-in-self-driving-cars/23909322.html?share=mail&ticket=ST-50130-CAVWtuUQ361p6LtTeMWh-ap1

[54] *The future of the Automotive Value Chain – 2025 and beyond, Deloitte, 2017*

[55] *A road map to the future for the auto industry, McKinsey, 2014*

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- **After sales**

Continuous technological progress has transformed the modern automobiles into real "traveling laboratories", equipped with electronic driver assistance systems developed to protect the safety of driver and passenger or vulnerable road users as much as possible. These electronic aids are referred to by the acronym ADAS[56] (Advanced Driver Assistance Systems) encompassing all the devices on the car to increase driving comfort and safety levels. ADAS and autonomous vehicles are expected to reduce aftermarket revenues[57] and a shift between car-damage-repair to car-predictive-maintenance is expected; access to in-vehicle data and advanced analytics will allow aftermarket players to store and process vehicle, customer, and vehicle usage data to optimize the value chain end-to-end based on predictive maintenance[58] as well as to improve vehicle and road safety, sustainability and infrastructure quality in the future. The real innovation for brands will be to invest in an efficient and effective after-sales service that exceeds customer expectations[59] as well as in capillary of full end-to end lifetime supplies and expanded services to include maintenance, smart repair, mobile tyre fitting etc. This will allow:

- A satisfied customer with associated positive word of mouth feedback
- Increasing the sales of original spare parts and services
- Optimization of processing times to benefit the whole supply chain (person-hours)

With the increased electrification of vehicles, the aftermarket volume for wear and tear parts like brake pads, filters and engine parts will further decrease.

- **Raw material**

Battery manufacturers and OEMs in the automotive industry will need to develop financial and economic strategies to ensure a stable supply of raw materials[60] (e.g. lithium, cobalt or graphene). This need requires car manufacturers to adopt medium-term strategies and strong key agreements with some nations. A long-term strategy that analyses and evaluates new technologies and potential new raw materials for batteries should also be considered, with the European Commission and in general Governments and public

[56] *https://www.automobile.it/magazine/come-funziona/adas-sistemi-avanzati-assistenza-guida-3382*
[57] *Ready for inspection – the automotive aftermarket in 2030, McKinsey, 2018*
[58] *Ready for inspection – the automotive aftermarket in 2030, McKinsey, 2018*
[59] *Il vero motore dell'automotive? L'assistenza post vendita, LinkIesta, 2018*
www.linkiesta.it/it/blog-post/2018/04/17/il-vero-motore-dellautomotive-lassistenza-post-vendita/26816
[60] *Lithium and cobalt: A tale of two commodities, McKinsey, 2018*

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administrations playing a fundamental role in the elaboration of policies and strategies. This is also the case when considering the use of more "traditional raw materials" such as Natural Rubber (key, for example, for tyres), for which the European industry is 100% dependent on imports and which is listed as a critical raw material, since 2017[61]. Additionally, to the current issues, going forward, there will be the need to ensure the sustainability of the sourcing of this raw material.

The automobile and parts sector in Europe are responsible for 27% of the region's total R&D spending and over 8,700 automotive patents were granted by the European Patent Office in 2017. 13.3 million people (6.1% of the EU employed population) work directly and indirectly in the sector and 3.4 million jobs in automotive manufacturing representing over 11% of total EU manufacturing employment. Motor vehicles account for some €413 billion in tax contributions in the EU15 alone. The automobile industry exported 5.9 million motor vehicles in 2017, generating a trade surplus of €90.3 billion for the EU. The integration of these two strands of work provides the foundation (**BASE**[62]) of the WP2 project. Results of this work are summarised as:

- **B**: Big Data
- **A**: ADAS and After sales
- **S**: Supply chain and Sharing
- **E**: Electrification

And in details:

- ***BIG DATA***

"Big Data" refers to the possibility of collecting and managing a huge set of heterogeneous information. Along with many other sectors it is clear that the Digitization of the automotive sector and the collection and analysis of related (big) data will lead to new sources of value generation and forecasting efficiency as well as impact on operations and performance. With the collection and analysis of data variables such as cybersecurity and transfer speed (of data) come into play, together with new ways of managing data. The exchange of information and data analysis will cover every aspect of the sector (and related supply chain) and is already pivotal to the transformation of the sector itself. Big Data players like Google, for example, are already working to integrate their platforms directly into the car from the current "projected solution" (Android Auto App) with a "Native Android

[61] https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en
[62] *DRIVES project, Deliverable 2.9.1: "Preliminary strategic analysis", March 2020,* https://www.project-drives.eu/en/publications

Auto" technology integrated into the vehicle[63], similar initiatives are taking place also within the tyre sector, where several manufacturers are developing their own applications[64]. Furthermore, work is also ongoing to arrive at an 'in-vehicle interoperable, standardised, secure and open-access platform' (OTP) and its inherent security[65].

- ***ADAS***

Advanced Driver-Assistance Systems will be a mandatory part of a car: By 2030 vehicles will be able to drive autonomously in safety and be covered by EU legislation[66]. All the ADAS technology is software-based and its importance will increase rapidly in the next years; according to McKinsey, "software represents 10 percent of overall vehicle content today for a D-segment or large car with the average share of software expected to grow at a compound annual rate of 11 percent, to reach 30 percent of overall vehicle content in 2030. Not surprisingly, players across the digital automotive value chain are attempting to capitalize on innovations enabled through software and electronics"[67]. The Automation driving levels will increase during the 2020-2030. In the last century only a few active automation innovations have been introduced. The automotive industry is changing from "hardware" to "software", where the content of software and electronics in vehicles is increasing rapidly; in this scenario, Artificial Intelligence and IoT are driving the transformation. In coming years, the self-driving vehicles' market is expected to grow exponentially, creating new jobs and developing profits for the EU automotive industry of up to €620 billion by 2025[68].

- ***AFTER SALES***

As seen from the previous points, the future scenarios of the sector show a vision where AI and ADAS will be increasingly effective and efficient. It is therefore logical to presume a trend in which autonomous driving leads to fewer accidents. The after-sales activity will pass from a "passive repair" to an "active maintenance" service. Current and future analysis systems, combined with IoT, will be able to process large amounts of data and provide analytical methods and precognitive models,

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[63] *The head of Android Auto on how Google will power the car of the near future, The Verge, 2019, https://www.theverge.com/2019/1/25/18196234/google-android-auto-in-car-systems-apple-carplay-interview*
[64] *Two examples can be found at this link, March 2020,: https://youtu.be/xwbPg_5H7oq and https://youtu.be/EH9lVGJ23_I*
[65] *March 2020, https://www.etrma.org/wp-content/uploads/2019/12/Manifesto-for-Fair-Digitalisation-Opportunities-2019-EN.pdf*
[66] *March 2020, https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/setting-the-framework-for-car-connectivity-and-user-experience*
[67] *Reserve a seat, the future of mobility is arriving early, McKinsey, 2018*
[68] *Self-driving cars in the EU: from science fiction to reality, European Parliament, 2019, http://www.europarl.europa.eu/news/en/headlines/economy/20190110STO23102/self-driving-cars-in-the-eu-from-science-fiction-to-reality*

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identifying potential errors and failures in advance, offering opportunities for the development of repairs and solutions. This will also make maintenance of the vehicle more preventive, as monitoring on all systems will clarify the problems before a failure occurs. All this helps to keep vehicles at optimum performance, increase efficiency and reducing costs. In addition, by increasing sharing services and mobile apps (see the following "Sharing" point below), after-sales service will move to a "fleet management approach".

In this context, it will be key for non-OEMs to be able to count on an extensive network of service centres throughout Europe and to enter into new fields such as vehicle telematics. In order to meet the customer requirements and enhance customer experience, after sales operators will have to expand their service offering (e.g. maintenance, smart repair, mobile tyre fitting). Examples for digital use cases in after sales include 'Tyres as a Service', 'green repair', digital periodic technical inspection, predictive alerts that avoid breakdowns, remote diagnostics optimising roadside patrol assistance and thus consumers journeys, smart leasing and shared mobility services, 'talking parts' communicating their health status for an optimised aftermarket production and distribution chain, 'Pay How You Drive' insurance policies and driver coaching.

More than in the past, an excellent post-sales strategy will be essential to the positioning of the brand and the perception that customers have, particularly in relation to standardisation of the product[69]: an "important brand" will always offer a high-level after-sales service as this aspect has implications on the profitability for the companies involved, but also economic benefits for the customers, who receive an improved content and value from the product over time.

- ***SUPPLY CHAIN (DISRUPTION)***

This aspect of the Automotive sector is likely to experience major disruptions by 2030 and this is summarised by Deloitte as "with increasingly better possibilities of data analysis, predictive analytics is developing into a powerful tool allowing for an enormous boost in forecasting efficiency as well as operations and performance"[70], with the value chain subjected to OEMs platform standardisation and industry consolidation and integration[71].

This disruption will turn into an opportunity for those operators – other than OEMs – that will be able to have direct and real-time access to in-vehicle data. In the case of TaaS, tyre manufacturers will shift from standalone tyre selling to providing a wide range of tyre related services that deliver outcomes

[69] *Dealer di successo, le sfide delle concessionarie auto del futuro, tra mobilità sostenibile, digital e profittabilità, Bain & Company, 2018*
[70] *Cracking the code for global supply chain management, extract from "Big data and analytics in the automotive industry", Deloitte, 2015*
[71] *Perché FCA ha venduto Magneti Marelli ai giapponesi di Calsonic, IlSole24Ore, 2018*

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and data-based solutions. In its most narrow sense, this would mean focusing on tyre optimality and developing cloud-based services around it; in its broader sense, this goes even beyond tyres and today tyre makers have already developed a diversified pool of telematics solutions[72].

The mentioned above disruption along the value chain will not only be driven by existing operators in the sector, but also by new outsiders such as software component manufacturers, new electric vehicle manufacturers (for example BYD, BAIC or ZhiDou) and multinational companies that until recently had a different core business (for example Apple and Google). Moreover, the growth of e-commerce platforms will change the traditional business of spare parts distributors and workshop activities will see the proliferation of specialized players (also linked to the standardization of the product and the proliferation of Plug & Play spare parts). These changes in the nature of the value chain will be reflected in an increased transparency of prices for customers along the value chain and a shift from private to business needs, due to an increased share of operators of professional fleets in the after-sales market. It is not only technical occupations and skills that will be influenced by this transformation. The role of salespeople and dealers will change: car-buying behaviour is changing in ways that will force a radical and disruptive revolution in auto sales[73].

- ***SHARING***

Carsharing is a way to explain an emerging class of "mobility services" that draw on modern technology to enable access to car-based mobility without the consumer owning the vehicle. In contrast to the traditional approach of selling cars to end users, this requires new value propositions, new organisational structures, and new ways of interacting with the public sector[74]. Carsharing has continuously seen double-digit growth over last year and in Europe represents over 50% of the total car sharing market, with 5.8 million users[75]; new technologies applied on smartphones, the IoT and the analysis of big data related to the speed of data transfer have led to rapid growth and an expected upward future trajectory. This has been reflected in a growth of operators not belonging to automotive core business entering the sector with many others expected to enter as the product (car) drops to second place compared with the services offered and the flexibility of using the service itself. On the one hand, competencies linked to big data and IoT will be more and more important while, on the other, it will be necessary to increase the "fleet experience" skills.

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[72] *Examples: Goodyear Proactive Solutions, Michelin DDI, Michelin Track Connect, Pirelli CyberFleet, Bridgestone MySpeedy, Tirematics, FleetPulse, Tom Tom Telematics, Toolbox. From Luc Hoegaerts, Brit Schonenberger, ETRMA June 2019*

[73] *The Future of Car Sales Is Omnichannel, Bain & Company, 2017*

[74] *Carsharing: Evolution, Challenges and Opportunities, ACEA SAG report, 2014*

[75] *Automotive car sharing in Europe, Deloitte, 2017*

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- ***ELECTRIFICATION***

Automakers are preparing to phase out cars powered solely by internal combustion engines as governments look to tackle fuel emissions. The growth in electric vehicles (EVs) and hybrid electric vehicles (HEVs) is set to climb. By 2025, EVs and HEVs are expected to account for an estimated 30% of all vehicle sales. By contrast, in 2016 just under 1 million vehicles or 1% of global auto sales came from plug-in electric vehicles (PEVs)[76]. The transition to an all-electric future will require sizeable investments in R&D, the acceleration of vehicle charging infrastructure and potential legislation for the installation of charge points in new homes. Linked to this will be the necessity to create new skills for a new mobility concept, as this transition to EVs gains momentum. Whilst electric cars and lorries may account for a tiny percentage of vehicles on the road today (4 million electric vehicles versus over one billion petrol and diesel cars), adoption is accelerating fast. It took over 20 years to sell the first million electric cars. Now, more than one million electric vehicles have been sold in just one year[77]. It is important to underline that "all-electric" doesn't mean it is necessary for a vehicle to have a huge battery pack that stores energy like a fuel tank: the 2030 electric engine may also be powered by other energy sources like hydrogen as outlined under new start-up[78].

These elements will impact directly and/or indirectly on the sector, most of them as Drivers of Change and others as core aspects of the change itself. The **BASE** scenario has been integrated with the stakeholders' vision of the sector as the basis for this DRIVES strategy roadmap.

The **BASE** scenario provides one forecast of number of jobs created set against the number of jobs lost: A study from the European Association of Electrical Contractors (AIE) has assessed job creation in a number of sub-sections of the electromobility production process and concludes that by 2030 a total of nearly 200,000 permanent jobs will be created. This is based on a moderate uptake of plug-in vehicles amounting to around 35% of new car sales by 2030. Of these 200,000 jobs, 57% will come from the installation, operation and maintenance of charging points. It then compares this with a study by Germany's Fraunhofer research institute into the impact of electrification on jobs. Based on this research an estimated total of 306,000 jobs in the automotive manufacturing sector will be lost by 2030, but only 27% of these (so around 84,000) are specifically due to an increase in electromobility, the rest are the result of productivity improvements.

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[76] *Driving into 2025: The Future of Electric Vehicles, J.P.Morgan, 2018*
[77] *Strong policy and falling battery costs drive another record year for electric cars, IEA (International Energy Agency), 2018*
[78] *Electriq~Global Says Its Water-Based Fuel Can Power Your Car, But Details Are Thin, Forbes, 2018*
https://www.forbes.com/sites/jeffkart/2018/11/14/electriqglobal-says-its-water-based-fuel-can-power-your-car/#390a34ee45ab

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A detailed description of difference between Demand and Offer has been outlined into the Deliverable 2.8 “Skills need and gap”.

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