

Multi-analytical approach for the study of an ancient Egyptian wooden statuette from the collection of Museo Egizio of Torino

Original

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eDRIVER

BEST PRACTICE BOOK
TRAINING ON ENERGY AUDITS AS
AN ENERGY EFFICIENCY DRIVER FOR
THE AUTOMOTIVE SECTOR

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AEN: Automotive Engineering Network – Das Mobilitäts cluster e.V.	Germany
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INTRODUCTION TO BPB

CHAPTER 1

CHAPTER 1

INTRODUCTION TO BPB

The Project E2DRIVER has been active for three years tackling the issue of energy efficiency in the automotive sector and particularly in the companies that belong to its complex manufacturing supply chains. By research results on this peculiar sector, it comes into evidence how the vast majority of the total European energy in production processes takes place in small- and medium-scale auto parts suppliers.



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Following the famous quote from Lord Kelvin, also known as William Thompson “If you can not measure it, you can not improve it.”, the improvement in energy efficiency must firstly go through its effective quantification by means of energy audits.

The goal of E2DRIVER is thus to train SMEs in the automotive sector in energy auditing and on energy saving measures for cost-effective energy efficiency improvements. To overcome the lack of knowledge, skills and awareness, often prevalent in this industrial segment, the project’s integrative approach aims at boosting capacity building programmes in energy auditing by establishing an innovative learning platform and methodology.

As vocational and continuous training are involved, the most effective means to transfer knowledge inside the companies must be found. Besides the technical contents, research on educational methodology must be carried out. During the project a learning platform that puts people at the centre through a creative training methodology has been created. The hallmark of this methodology is the customisation of the capacity building programme to each company’s needs and motivations (customized learning environment) and the use of most recent developments in training for instance using virtual reality techniques. Therefore, trainees take centre stage as they generate their own knowledge on energy efficiency and share it with their co-workers (ontological-flip teaching).

This book contains most of the results reached in the E2DRIVER project and traces a road to increase the energy efficiency of automotive industry highlighting the drivers and the barriers that can be met on this very important track to decarbonisation.



CONCLUSIONS

CHAPTER 6

CHAPTER 2

GENERAL OVERVIEW AUTOMOTIVE SECTOR

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The European automotive sector has several challenges to deal with. For years, it has had to manage an increasingly pressing environmental and social demand to adapt to a more sustainable model that makes it possible to meet European climate change targets. In line with this, the European institutions and the member states themselves have been issuing increasingly strict regulations on emissions, pollution, and energy use. Due to these issues, which have inevitably and necessarily changed the entire European economy, the EU aims to be one of the world leaders in the paradigm shift towards sustainable development, but, without denying their necessity, it is also necessary to stress that these measures have entailed considerable costs that different sectors have to assume.

In addition to these dynamics of change, other challenges have arisen in the last two years that are presenting a real challenge to the very survival of some of the companies that make up the European automotive sector: the health crisis caused by the Covid-19 pandemic and its economic consequences, the components crisis that has generated a global shortage of raw materials, the escalation of energy prices and the current geopolitical crisis in Eastern Europe, which still leaves a great deal of uncertainty as to its effects on the economy in general and the automotive sector in particular. Lately a decision process started within European Institutions to apply a ban on the sale of new petrol and diesel cars from 2035 is likely to have an additional large impact.

Finally, influenced by all the last explained factors, Europe has the need to find schemes to keep its automotive industry competitive with other markets (such as Asian ones) which, for various reasons, can offer similar products at lower costs. Therefore, energy efficiency and control of energy consumption in the plants can and must be seen as an optimization lever, an important tool in the reduction of expenses of manufacturers and suppliers while maintaining the same level of production or performance, or even increasing the quality of the finished product. Considering all this context, in this section of this deliverable we are going to carry out a general analysis of the main characteristics of the EU automotive sector and specifically in the four pilot countries of the E2DRIVER project (France, Germany, Italy and Spain). There are different sub-sections where it is addressed the characteristics of the sector, the main policies, and the impact that the current crises are having on their business fabric.

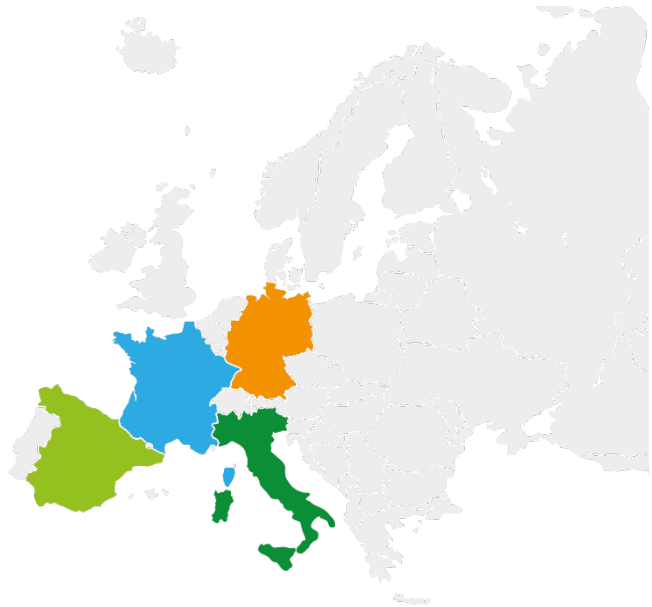
All this analysis will help us to evaluate the E2DRIVER experience and to see what potential is expected from now on in the solutions of this project.

2.1 STATE OF THE AUTOMOTIVE SECTOR IN EUROPE AND THE FOUR E2DRIVER PILOTING COUNTRIES

The European automotive sector is one of the largest and most competitive in the world, employing directly or indirectly 13.8 million people (6.1% of employment in this area), 2.6 million of whom work in direct vehicle production. The turnover of this industry represents 7% of EU GDP and the trade surplus exceeds € 84 billion in Europe.

If we look at the EU member state level, **Germany** stands out exceptionally, which in 2017 had as many vehicle exports as the three Asian exporters combined (Japan, South Korea, and China). In this country, the automotive industry is the largest sector of the manufacturing industry and by far the most important industrial sector in Germany in terms of turnover. In 2021, the companies in the sector generated a turnover of a good 411 billion euros and directly employed almost 786,000 people. Vehicle and engine manufacturers account for more than three quarters (318 billion euros) of the total turnover of the automotive industry. Of the sector's turnover, automotive suppliers generated just under one fifth (79.7 billion euros) and manufacturers of bodies and trailers around three percent (13.1 billion euros). With the increased division of labour and the demand for intermediate inputs, the supplier companies, which are primarily medium-sized, now generate the majority of the value added in the automotive industry (about 70 percent) in Germany. If we continue the detection of key countries in Europe, the rest of the E2DRIVER countries must be identified due to the fact they encompass the most relevant automotive industries in the continent.

In **Spain**, the automotive business is a strategic sector of the economy and has become one of the cornerstones of the country's industry. As a key sector, the Spanish automotive sector contributes more than 11% of GDP, generates more than 2.5 million jobs and around 18% of exports of the whole country. In 2021, Spain was the 2nd largest vehicle manufacturer in Europe, 1st manufacturer of commercial vehicles in Europe, 4th largest component manufacturer in Europe and 9th largest vehicle manufacturer in the world. It is a backbone industry in the Spanish territory, with a total of 17 plants spread over 10 regions of the country, which in turn are supported by a



network of suppliers and component manufacturers (more than 1,000 vehicle component manufacturing companies). The Spanish sector for equipment and components has a fundamental weight in the value chain of the vehicle, contributing to around 75% of its total. It is one of the sectors that exports the most, up to a total of 86% of production, to more than 170 countries.

Regarding **Italy**, the automotive sector accounts for about 10.5% of total manufacturing turnover, about 7.3% of employment and about 10% of research and development expenditure⁸. Based on statistical data for 2020 (latest available), companies in the sector generated a turnover of no less than 355 billion euro (19% of the national GDP) and directly employed almost 1,230,000 people with around 26 billion euro in wages and salaries. In January 2021 (latest available data), exports of motor vehicles (new cars and industrial vehicles) from Italy were worth €1.21 billion, while imports were worth €1.99 billion (+4.2%).

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In **France**, the automotive industry represents a major asset for France: €360 billion in sales, €67 billion in added value, €50 billion in exports and more than €7 billion in R&D per year. In 2019, the automotive industry is one of the main contributors to industrial production in France and the main contributor to the French budget. This significant industry represents 2,180,000 vehicles produced in France, including 1,890,000 units by French manufacturers. It also means more than 2.2 million induced jobs, i.e. 8% of the active population working directly or indirectly for the automotive industry. Despite the importance that transmit these numbers, Europe's relative importance compared to other regions has been declining (see Figure I) and, in fact, it is expected that an 80% of the sector's growth takes place outside the EU14, so EU is facing a challenging future for this industry to remain key and globally competitive.

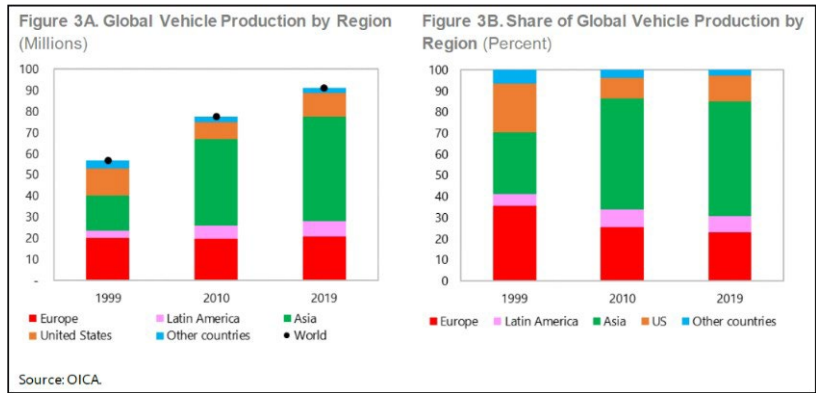


Figure I. Comparison of the EU automotive sector other regions.

2.2 ENERGY CONSUMPTION OF THE AUTOMOTIVE SECTOR IN EUROPE AND THE FOUR E2DRIVER PILOTING COUNTRIES

According to ACEA, continuous work on improving energy efficiency in the automotive sector has led to a reduction in energy consumption during vehicle production of 28.1% between 2005 and 2020. Similarly, emissions have been radically reduced over the same period, with a 48.5% reduction in total emissions and a 33.1% reduction in emissions per unit produced.

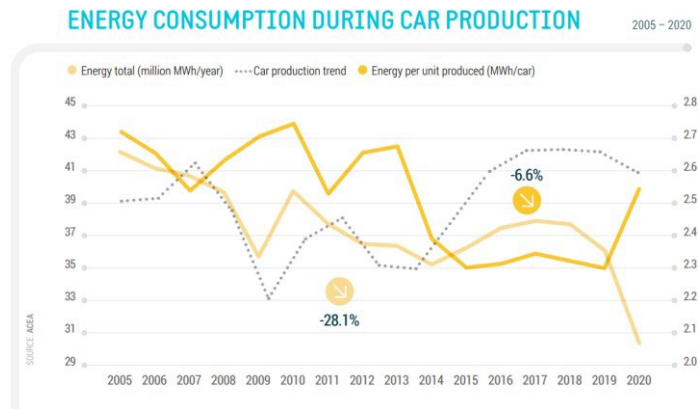


Figure 2. Energy consumption during car production.

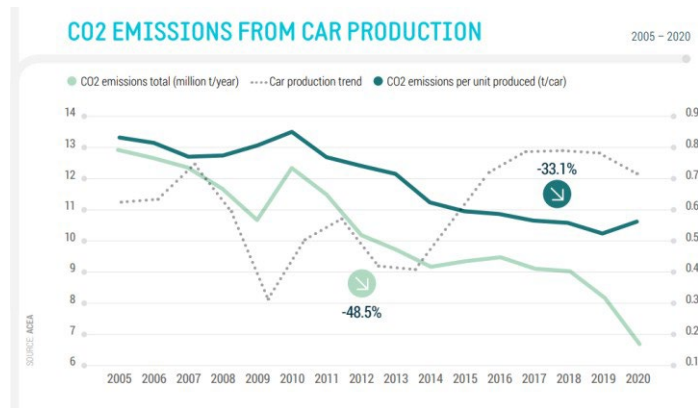


Figure 3. CO2 emissions from car production.

Going through the specific cases of the E2DRIVER pilot and replication cases, the automotive industry accounts for around 12% of **Germany** energy consumption in production in 2020/17. This puts the "manufacture of motor vehicles and motor vehicle tyres" sector in the middle as the seventh largest sector after the chemical industry and metal production as the most energy-intensive sectors of the economy. The share of renewable energies is still quite low but tends to develop further. With 5.6 million vehicles produced annually in 2018, the total final energy consumption in Germany is around 12.9 million MWh. Of this, about 50 per cent of the total final energy consumption is electricity-based, the other half consists mainly of gas and other energy sources, such as derived heat, petroleum products and a small share of renewable energy.

In **Spain**, the manufacturing industry stands out as the main consumer of electricity, natural gas and oil, accounting for slightly more than half of total energy, well ahead of the energy supply industries, which consume 64% of the natural gas consumed in Spain for electricity generation, and households, which consume 26% of electricity. Other sectors of great importance in the Spanish economy, such as HORECA services, closely linked to a key sector such as tourism, or the transport of goods, a major consumer of oil derivatives, are far behind the energy consumption of the manufacturing industry. Regarding energy consumption by type of energy source, the Spanish automotive sector can be considered intensive in electricity consumption, which represents 55% of the total. It is also a large consumer of gas, which accounts for 47% of total consumption, and lastly, oil, which only accounts for 3% of the total.

Regarding **Italy**, at national level, there is a lack of clear mapping of the energy consumption of automotive-related manufacturing companies but the total energy consumption of industry, based on the latest available data (2018) weighs 20%. If the automotive supply chain accounts for approximately 7.5% of Industry, this means that the national weight of the supply chain alone is 1.5% of the national total. Based on the type of activity, electricity consumption in Italy in 2020 was broken down as follows: 44.1% industry - of which 16.5% automotive - (125.4 TWh); 30.2% services (85.8 TWh); 23.3% domestic (66.2 TWh); 2.2% agriculture (6.3 TWh). Among the most energy-intensive sectors is manufacturing, responsible for 39% of national electricity consumption, followed by metallurgy and trade with 7.4% each.

Finally, in **France**, Industry represents 21% of the energy consumption. It is the third most energy-intensive sector, behind the residential-tertiary sector and transport. The automotive sector alone represents nearly 15% of the overall energy consumption of the industrial sector in France. Electricity (39%), in almost equal proportion with gas (38%), are the two energies most consumed by the industrial sector. The share of renewable energies remains quite limited but is tending to evolve. Between 2007 and 2016, the latter gained 2 points.

2.3 KEY POLICIES AFFECTING THE SECTOR

The European automotive sector is largely dependent on EU regulations on both levels: on the production level (the vehicles) and on the industry level (the production of the vehicles). Both European and national institutions have generated a regulatory framework and have approved a series of programs and policies that clearly impact on the automotive sector, such as the Energy Efficiency Directive, which can be considered key to the issue at hand. Among the most notable instruments in this regard, the following can be highlighted.

At European level, the Fit for 55 legislative package presented in July 2021 includes a revision of the regulation on CO₂ emissions from light vehicles (cars and vans), which is currently being processed by both the European Parliament and the European Council. The EC proposal puts forward higher emission reduction levels than the 2019 regulation. The Commission is also working on a proposal for a Euro 7 pollutant emissions regulation. The UE proposed an effective ban on the sale of new petrol and diesel cars from 2035, aiming to speed up the switch to zero-emission electric vehicles (EVs) as part of a broad package of measures to combat global warming. The European Commission proposed a 55% cut in CO₂ emissions from cars by 2030 versus 2021 levels, much higher than the existing target of a 37.5% reduction by then. It also proposed a 100% cut in CO₂ emissions by 2035, which would ban new fossil fuel-powered vehicles from the EU27 market. On May 2022, Lawmakers on the European Parliament's environment committee on Tuesday backed an EU plan to effectively ban new petrol and diesel car sales from 2035, while voting against proposals for tougher targets to cut car CO₂ emissions within this decade. The committee supported the proposal for a 100% cut in CO₂ emissions by 2035, which would make it impossible to sell new fossil fuel-powered vehicles in the 27-country members.

Having briefly described the situation at the European level, it will be now mentioned shortly some of the most relevant policies in each of the E2DRIVER countries.

In Germany, the promotion of energy management systems by the Federal Office of Economics and Export Control should be highlighted. The support program of the Federal Office of Economics and Export Control (BAFA) generally provides pro rata support for the costs of introducing an energy management system, technology investments, external management consulting, for example in the introduction of an energy management system, and costs for employee training. Of particular interest to SMEs, for example, are the federal funding for energy consulting in SMEs and federal funding for energy and resource efficiency in business (with the various modules), as well as grants and loans. In addition, there are also federally funded grants and loans for energy and resource efficiency in companies.

In the case of Spain, the main policies to be highlighted are “The Recovery, Transformation and Resilience Plan, España Puede”, which is the fundamental instrument for the development of the European Next Generation EU recovery funds and represents the most important boost in Spain's recent economic history²⁸ and where the automotive sector has been chosen in its implementing elements as key area due to its knock-on effect in the rest of the Spanish economy. Another key element is the Spanish Circular Economy Strategy, Spain Circular 2030, lays the foundations for promoting a new production and consumption model in which the value of products, materials and resources is maintained in the economy for as long as possible, in which waste generation is minimized and those that cannot be avoided are used to the greatest extent possible. The Strategy thus contributes to Spain's efforts to achieve a sustainable, decarbonized, resource-efficient and competitive economy.

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In Italy, in the area of Industry 4.0, since 2017, the Italian Government (Ministry of Economic Development – MISE) has launched an ambitious plan of tax incentives for private investments in I4.0 technologies made by Italian industries (LEs and SMEs) called “Industry 4.0 Plan” (Piano Industria 4.0). In the following year the Plan changed in “Enterprise 4.0 Plan” (Piano Impresa.4.0) and “Transition 4.0 Plan” (Piano Transizione 4.0) which provided tax incentives for companies called “Training 4.0 tax credit”. This measure is aimed at supporting companies in the process of technological and digital transformation, supporting investments (capex), R&D activities (opex) and training programs to create or consolidate skills in the enabling technologies needed to implement the 4.0 paradigm. Furthermore, other initiatives with objectives in this same area have been launched by regional administrations like Piedmont Region.

In the field of the energy audits, there is a joint program funded by the Ministry of Economic Development - MISE and the former Ministry of Environment (now Ministry of Ecological Transition - MITE) and performed by the Italian Regions, to co-fund SMEs for the realization of energy audits or for the adoption ISO 50001 management system. There is also the so called “Tradable White Certificates” (Certificati Bianchi) mechanism, calculated on the savings of primary energy with the detailed analysis of the different types of actions approved. White Certificates give proof of end-use energy savings achieved through projects aimed at increasing energy efficiency in the final uses of energy. The mechanism, which came into force in 2005, is one the main instrument for promoting energy efficiency in Italy, mainly in the industrial, infrastructure, services and transport sectors, but also cover civil and behavioral measures. White certificates are negotiable certificates certifying the achievement of savings in energy end-use through energy efficiency measures and projects. One certificate is equivalent to saving one ton of oil equivalent (TOE).

Finally, it is important to highlight the National Plan for Recovery and Resilience 2021-2026 where an important support measure is envisaged with the creation of a fund of 1 billion a year until 2030 to “encourage green transition, research, conversion and requalification of the automotive industry”.

In France, the Recovery Plan – National Low-Carbon strategy can be highlight. It allows accelerating the ecological, industrial and social transformations of the country. This French roadmap for fighting climate change and achieving carbon neutrality by 2050 has been created by the Law of Energy Transition for Green Growth (LTECV), the National Low-Carbon Strategy (SNBC). The French Recovery Plan includes an ambitious section dedicated to decarbonizing industry and, funded with €1.2 billion by 2022, in order to meet the climate challenge and act on this may issue in the medium term. ADEME is providing this new support to industrial companies through investment grants in the framework of a call for projects (energy efficiency projects across processes and/or utilities, low-carbon heat production from biomass and solid recovery fuels, etc).

2.4 THE NEW SCENARIO: NEEDS AND OPPORTUNITIES

The EU automotive sector, even before the COVID-19 pandemic, was already undergoing transformation dynamics brought about by new mobility schemes, digitalisation, electrification and competition with emerging markets. However, to close the analysis of the European automotive sector, it is necessary to make a specific mention of the whole set of successive crises that have been impacting the European economy over the last two years.

Firstly, at the beginning of 2020, a historic phenomenon was experienced with the COVID-19 pandemic which, emerging in China, quickly spread globally, giving rise to restrictions, lockdowns, limitation of non-essential activities, etc. As could not be otherwise, this health crisis affected all sectors, including the automotive sector. In 2020, vehicle production on the continent was reduced by 1/5 and, during the critical phase of lockdowns at the start of the pandemic in the early part of the year, almost half of the jobs were impacted. In fact, as can be seen in the graphs below, it can be considered the event with the greatest impact in recent years.

In addition to the above crisis, there is the so-called component crisis or semiconductor crisis, or simply the chip shortage crisis, which has led to a problem in the supply of key components in many industries. At this point, we must specifically consider the problems being experienced by car manufacturers, which globally have seen production of passenger vehicles fall by 1.3 million, while in Europe production has also been affected, with a fall of 18.2% between November 2020 and March 2021.

Finally, the third negative factor impacting the automotive sector is the exponential growth of energy prices caused by different factors such as the global rise in gas prices as a result of increased demand and reduced supply, a longer heating season between 2020 and 2021 and weather conditions that reduced renewable production.

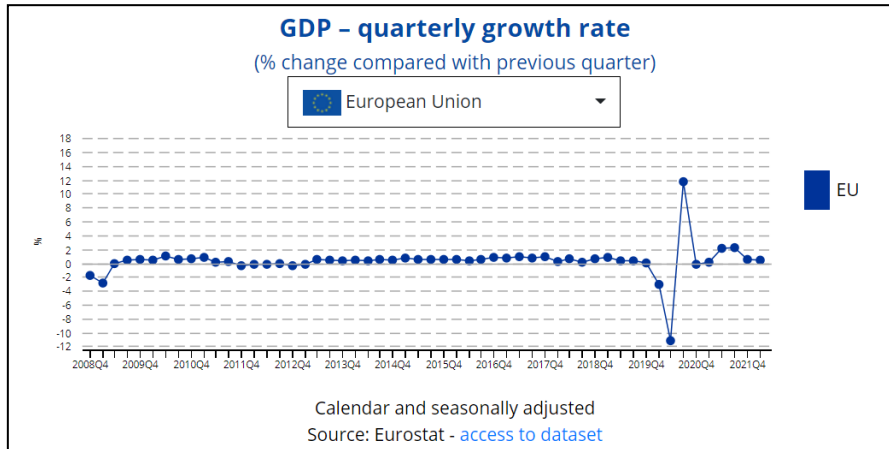


Figure 4. GDP - Quarterly growth rate.

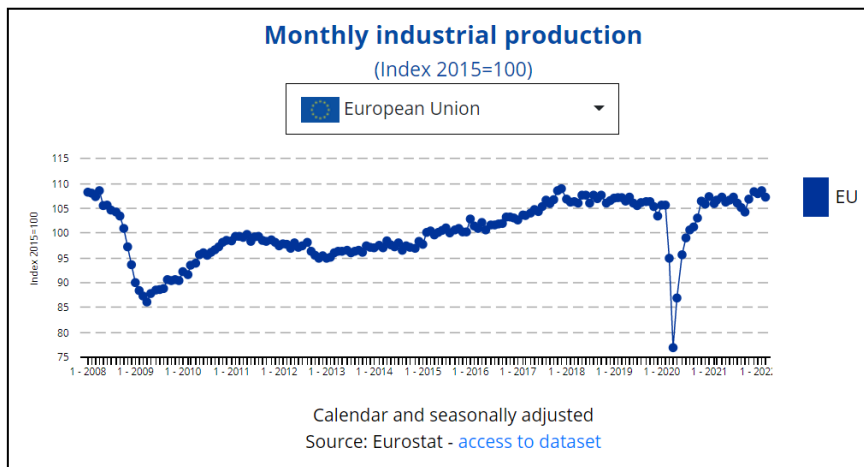


Figure 5. Monthly industrial production.

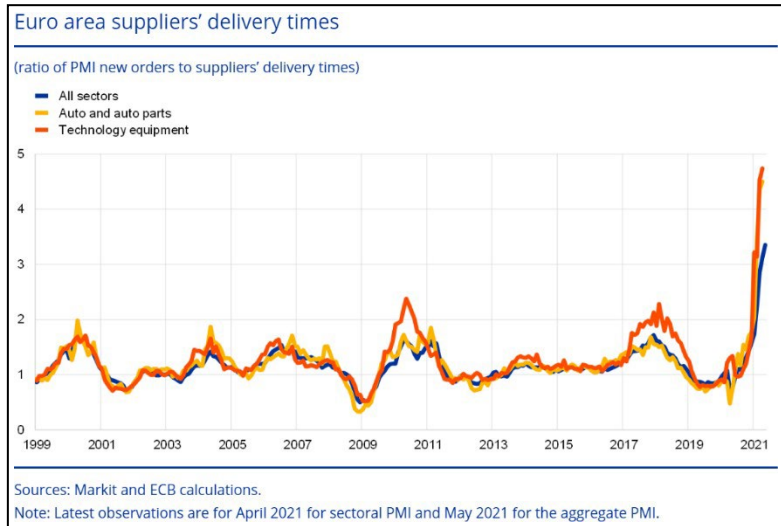


Figure 6. Semiconductor crisis.

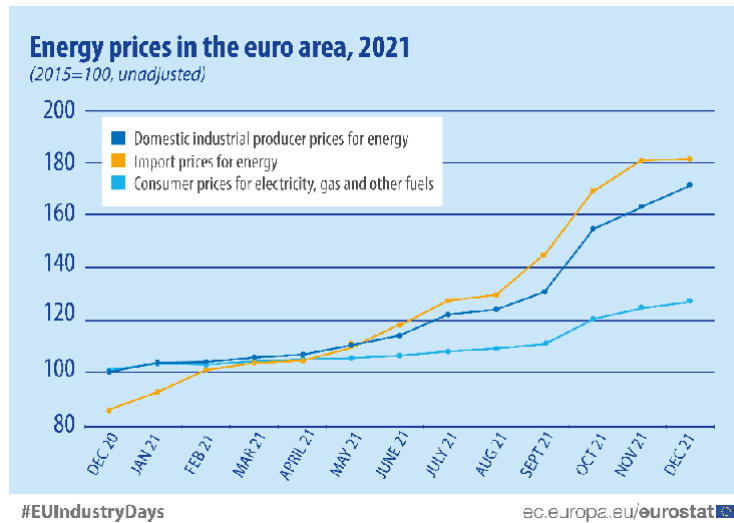


Figure 7. Energy prices in the euro area, 2021.

This price rise has also been aggravated by the conflict in Eastern Europe between Russia and Ukraine which, although there are no concrete data on the real impact it will have in the medium and long term, has led to a change

in relations between the European Union and Russia, the country from which a significant proportion of the gas consumed on the continent originates. This situation further complicates the energy price situation, which has an inflationary effect on prices as a whole.

All these factors are having an extreme impact on the economy and the automotive sector. In fact, the “instability” claimed by the industry is real, and some energy intensive industries are temporarily shutting down their plants waiting for lower energy prices or producing during lower energy price periods (e.g. night shifts, weekends). Industry is also trying to reduce energy bill with “quick win” actions, while the Payback period of energy efficiency investments has been reducing dramatically since the previous period.

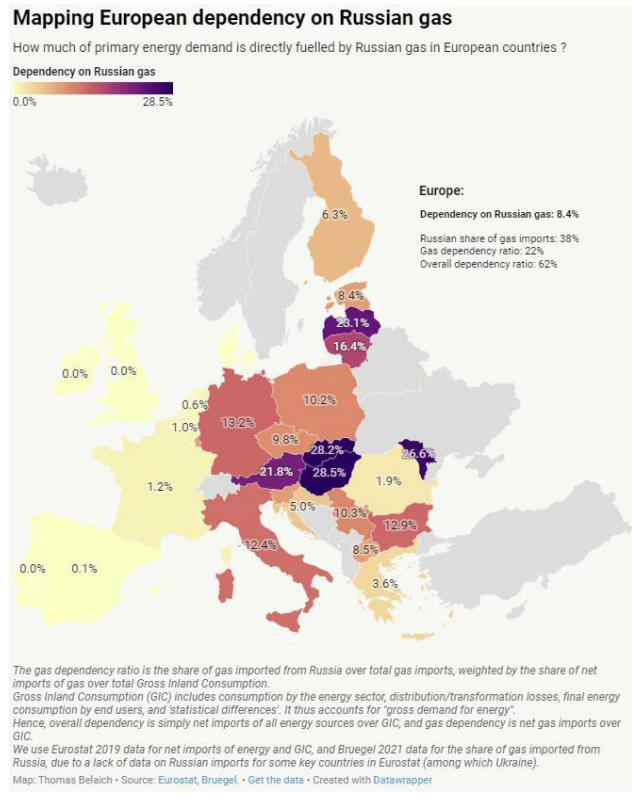


Figure 8. Mapping European dependency on Russian gas.



**EXPERIENCE ACQUIRED FROM THE
E2DRIVER PROJECT
CHAPTER 3**

CHAPTER 3

EXPERIENCE ACQUIRED FROM THE E2DRIVER PROJECT

The theoretical approach of E2Driver has been proposed in four European countries: Spain, Germany, France and Italy and has been tested in practice by different stakeholders belonging to the automotive supply chain.

The three main sections of the chain interacting with the project are:

- National associations: they are represented in the project by AEN (Germany), MESAP (Italy), MOV'EO (France) and SERNAUTO (Spain) and are those entities that, being associations of the automotive sector, have been in charge of contacting the companies in order to involve in the project those companies that have received the E2DRIVER training.
- Companies: are those enterprises in the automotive sector that, having been contacted by the national associations, have received the “training + consultancy” of the E2DRIVER project. The sections where the impressions of these companies are expressed have been composed by the training entities and the associations of each country (which are the ones that have been most in contact with the companies) taking into account the impressions received by these enterprises receiving the training.
- Trainers: are those people who have carried out the implementation of the "training + consultancy" of the E2DRIVER project. These people belong to each of the training entities participating in the project: CIRCE (Spain), EPROPLAN (Germany), ENGIE (France) and SINERGIE (Italy).

Even their different roles, all of them joined the E2DRIVER methodology that is the implementation scheme of the E2DRIVER Solution which has been created in the context of the E2DRIVER project and which allows the customised implementation of training programmes in automotive companies.

The E2DRIVER Methodology is divided into five phases: four related to the training programme and a fifth one emphasising the support to be given to SMEs for the identification, implementation and monitoring of energy efficiency measures.

Phase I: Characterization:

This phase consists of a first step in which we seek to get to know in depth the company we want to help by implementing the E2DRIVER Solution. Meetings are held with the company, they are required to provide data on consumption and the process, they are asked to identify the key people in the process, etc. This is also the phase in which the needs and interests of the entity are identified, as well as the dates on which it would be available to carry out the training of workers.

Phase II: Customization:

Once all the necessary company data is known to adapt the training to their requirements, customisation is carried out through two main mechanisms:

- On the one hand, the trainer will adapt the academic work and practical exercises to be carried out in the face-to-face classes.
- On the other hand, the platform will adapt to the requirements of the students automatically through the implementation of an algorithm that considers the academic and professional background of the user.

Phase III: Implementation:

Once the training experience has been fully “tailored” to the company and its employees, the implementation of the training programme, which will have a blended learning format, can begin. Although there can be customisation in time and format, in general, the programme will consist of 4 weeks of online training through the E2DRIVER e-learning platform, 1 week of autonomous work where the trainee will be asked to try to identify potential energy efficiency measures (link activity) and one last week where the face-to-face sessions will take place, which will have an eminently practical component and will seek to identify the best energy efficiency measures. Particularly importance has been given to the introduction of new educational techniques like Virtual Reality (VR).

Phase IV: Evaluation:

Once the training has been completed, a double evaluation process begins: on one side, the extent to which the trainees have obtained sufficient knowledge and how the company has improved in terms of energy efficiency is evaluated; on the other side, a report is also requested from the company to identify possible improvements in the methodology in order to achieve a continuous improvement of the training and consultancy process.

Phase V: Consultancy:

The consultancy phase would be the last stage of the implementation of the E2DRIVER Solution. In this phase, a collection of all identified potential energy efficiency measures would be carried out and an analysis would be made as to which of these measures could be implemented. In addition, the company would be supported in the process of estimating the impact of these measures, as well as in the process of strategically defining the implementation.

3.1 FEEDBACK FROM STAKEHOLDERS

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Having analysed the situation of the European automotive sector, the document will now go on to detail the impressions of national associations, companies and trainers when implementing the E2DRIVER methodology that aims to improve companies' competences in the field of energy efficiency. Both analyses (the one of the automotive sector and the impressions of the main users of the project methodology) will allow to receive the necessary inputs to assess, comparatively, the extent to which the project methodology and the actions carried out by the project are appropriate to meet the challenges of the sector. This deduction of the suitability of the E2DRIVER approach will be further developed in chapter 4 on drivers and barriers.

To understand the perspective shown by each of the profiles represented in this chapter of impression gathering, it is relevant to recall the profile played by each of the entities that are going to show their vision of the project and its methodology. As already defined the stakeholders are:

- National associations.
- Companies.
- Trainers.

Experience from the National Associations

GERMANY - AEN

The project start-up in the acquisition of pilot companies and later replication companies was a challenge. The promotion of the E2DRIVER project refers to automotive suppliers as small and medium- sized enterprises (SMEs) with up to 250 employees. This company size is almost no longer found in the automotive supply sector in Germany. The structure of the sector has changed through mergers and acquisitions from SMEs to groups of companies. Automotive Engineering Network then made the proposal to extend the SME definition to the German definition of "Mittelstand", i.e. up to 500 employees, in order to be able to acquire sufficient replication companies for the project in the implementation phase.

We will briefly give an overview of the most important activities:

- Existing customers: Offer to the network and members of aen e.V. to participate in the E2DRIVER project free of charge. The feedback from many companies focused on the statement that energy efficiency will not be the focus in 2019/2020/2021, but rather the topics of transformation, digitalisation and the Covid-19 pandemic impact.
- New customers: Automotive Engineering Network built up a comprehensive address pool of companies in the automotive supplier sector as well as the manufacturing industry, especially metal processing. These new customers were also offered free membership of aen e.V.
- Requests to state energy agencies, chambers, associations and energy advisors to arrange interested pilot companies were not successful. The combination of E2DRIVER requirements from SMEs and automotive suppliers were considered "very restrictive". The IHK (Chamber of Commerce) itself offers its own training programme for "energy scouts", which could be in competition with E2DRIVER. Business development agencies showed little interest in the topic of energy efficiency programmes for SMEs, as the focus was on "task force programmes" for retailers, cultural workers and start-ups due to the pandemic.
- Networks in the ecosystem: aen e.V. intensified the exchange with various regional networks such as Fokus.Energie, which operates an energy accelerator for start-ups. The cooperation with energy network energieforum, which is also a member of the E2DRIVER Advisory Board, has turned out to be very positive. Several events have been held jointly. Likewise, participation as an exhibitor at events of the energy networks fokus.energie and energieforum drew attention to the E2DRIVER project. The following events and trade fairs were successfully held: Energy4You, annual energy day of the Fokus. Energie network and information days on electric mobility of the Karlsruhe public utility company. The project map and a PowerPoint presentation with the added value of the E2DRIVER project were very helpful.
- The communication and public relations work on E2DRIVER was mainly carried out via the aen e.V. newsletter, the aen website and the newsletters of the City of Karlsruhe Economic Development Department, TechnologieRegion Karlsruhe and energieforum.
- Enquiries at the industrial schools in Karlsruhe, Heinrich-Hertz and Carl-Benz, led to great interest in the E2DRIVER platform. However, the current content is far too extensive for the industrial trainees and is also formulated too technically in terms of language.
- Enquiries with SMEs via the in-house energy company network of the project partner eproplan GmbH from Stuttgart were successful. Here, the basic interest in energy efficiency was already present.

SPAIN - SERNAUTO

For SERNAUTO, it has been very positive to participate in the European project E2DRIVER, as the entity has been able to contribute with their knowledge of the automotive sector in Spain and also involving new SMEs in the world of energy efficiency.

With the e2DRIVER project, it is looked for raising awareness of the benefits of energy efficiency audits among the industrial sector and, also, to provide them with the necessary tools and training to implement energy efficiency measures in their companies. One of the most important aspects of the project for SERNAUTO has undoubtedly been the involvement and engagement of SMEs in the E2DRIVER ecosystem.

During this task we have encountered several difficulties, the first one being the lack of time of this type of companies to allocate to external projects that are not part of their own activity. In addition, covid-19 has meant that many of the potential replicators were not working at 100% or were partially closed, so that participation in a European project was not possible at that time.

However, from SERNAUTO we have worked to improve the dialogue with the companies and how we transmit them the objectives and benefits that the E2DRIVER project can offer to these companies. We have also organized several webinars with the collaboration of CIRCE to attract more companies and make them curious about the project. Due to the crisis of the sector, unfortunately one of the pilot companies had to cease its activity and went bankrupt so it could not complete the training although we were able to make a first energy audit and visit their facilities. On the other hand, there have been several SMEs that have been very close to participate but the semiconductor crisis and other internal problems have prevented them from being part of e2DRIVER. We hope to count on them in a future exploitation phase of the project.

FRANCE - MOVEO

The recruitment process has, since the beginning of the process, been quite challenging due to various factors and elements that slightly varied from one company to the other but presented common challenges. The subject of energy consumption and energy savings per se, wasn't the true problem: hearing on the opportunity to understand more about their energy consumption and learn how to manage it more effectively, while implementing actions that would lead to financial savings, generally made a bell ring for the companies' representatives and made them want to have more information about it. The fact that training was completely free of charge, and financed in the framework of the project, was an additional positive aspect that contributed to the motivation to take part to the training.

However, pretty regularly, various limits and challenges were mentioned from the companies, that impacted negatively their intention to become E2Driver participants: the target of the project indeed, being small and medium companies, forced us to face the main challenges of this category of companies, namely the lack of time and human resources.

The positive feedback from the contacted companies was mainly in link with the following three aspects:

- The desire to do energy savings, in order to do financial economies: energy's price has regularly increased during the last years and above all on the last two years due to the Covid-19 crisis, as well as to the lack of raw materials
- The intention to show, both to their clients, investors and partners, their interest and their engagement in the energy transition and the respect for the environment: by attending this training, they would confirm their interest to have a lower environmental impact and therefore their positive contribution for the planet
- The benefit of the costs reduction in relation to the energy experts to conduct the audits: for a small SME it can be quite a budget to plan, but at the same time a necessary action. With this training, the knowledge would be developed internally and the companies could avoid any costs to hire external experts, by conducting the audit themselves

However, despite these promising points, various difficulties have come between the companies and their potential participation to the training.

During the recruitment phase for the pilot companies, one of the conditions to be selected for the participation, was the fact of never having an energy audit performed: this was considered as a common aspect among small companies from the partners and would have assured a higher impact of the training on the participants. However, once the process had started, this turned out to be more an obstacle than a benefit for the recruitment, because most of the companies contacted already had performed at least one audit in the past.

This represented a good trend on the one side, as this confirmed the intention and above all the need of SMEs in the automotive sector to control, improve and decrease their energy consumption, but on the other side, this significantly limited our potential targets. For this reason, an internal discussion among the partners of the E2Driver project and notably with the project coordinator, led to the decision to perform a slight deviation to the criteria established at the beginning of the project and, taking into account this new discovery, to accept during the replication phase also companies who had performed energy audits in the past, with the condition of having the certainty of the impact that the training would have on their energy management.

Small industrial companies have a significant challenge linked to their moderate size, which is the limited number of employees who are active on well-defined tasks during their entire working time: for such small companies, involving even a small part of their employees in a training course means having tasks stopped or even negatively influencing the production and therefore the company's revenues.

An additional difficulty that has been added to the limited number of employees and their overbooked calendars it is the challenging period they went through both with the sanitary crisis and the raw material crisis that characterized this and many other sectors on the last years. These two crisis combined lead to a reduction of the workforce,



together with internal repositioning and great efforts focused on “surviving” instead of “developing”: for these reasons any activity that didn’t contribute merely to their revenue, production or didn’t bring direct and concrete measurable results on the very short term didn’t enter in their priorities.

Despite these negative factors, the companies that participated in the training had a certain awareness of the importance of the subject of energy efficiency, but they did not necessarily have the knowledge or the means to find solutions to this problem. In some cases, because of growing consumption, companies had decided to rely on an external expert to carry out an energy audit, but in the medium and long term, this approach was not enough to significantly reduce their consumption. In other cases, company managers had actually begun to become aware of the issue, but without necessarily having made decisions in this regard.

For this reason, the three essential actions that the participants learned throughout the training and which allowed them to change their approach to this issue, can be summarized in the following three points:

- Precisely identify the issues and be able to structure them
- Know how to quantify and control energy expenditure on a regular basis
- Identify the collaborators within the team in charge of energy issues as well as their precise role

Energy efficiency and the reduction of the energy impact of industrial companies has always been a crucial topic, but nowadays it should be even more at the heart of our work for two main reasons: the European Union and the major international players are increasingly committed to reducing environmental impact and are setting increasingly ambitious targets for the 2030 and 2050 horizons, which could not be achieved without the contribution of companies involved in energy-intensive production processes. Secondly, the price of energy has risen exponentially over the last period, due to various factors and this trend puts at risk a large number of small companies, which are now struggling to survive and limit their costs as much as possible: the idea of being able to monitor and reduce their energy use could in many cases make the difference between survival and bankruptcy.

ITALY

The involvement process was implemented by carrying out an internal analysis of MESAP's members. The automotive market is transversal among the member companies and thanks to this large pool of companies we had a potentially large number of pilots at our disposal. The analysis started with the sharing of a questionnaire to companies on the subject and a call for interest through the Cluster's communication channels.

The preliminary response was less than we expected, due to the target company required by the project, tier 2 or 3 manufacturing SMEs in the automotive sector. This type of company, especially in Piedmont, is characterised by entities with a low number of employees and consequently little or no staff dedicated to energy-related activities.

In order to overcome these obstacles, MESAP has set up a partnership with AMMA - Aziende Meccaniche Meccatroniche Associate - a territorial association that brings together more than 600 companies with over 50 employees in various transversal sectors such as automotive, production machinery and systems, automotive components, electronics/electrotechnics, mechanics/metallurgy and aerospace. One of its representatives was

involved in the project Advisory Board and thanks to this we reached the last company to complete the pilot of 3 companies. The feedback from the 3 companies involved was positive, all of them were ready to tackle the pilot activity. The activities were supposed to start in March 2020, but due to the pandemic one of the three selected companies had to drop out due to problems with the orders (and not to lose more turnover).

Fortunately, the other two companies involved continued the activity and completed it with some delays caused by the pandemic. The pilot phase ended with only two companies involved. We can say that the reduction in orders caused a delay in training to make up for the damage that the health crisis brought to the automotive sector. In Italy alone, there was a 98% drop in registrations in April 2020. Globally, there has been a collapse in light vehicle production of around 11 million units. These figures have caused a collapse in training activities across the board.

Phase 2 of the recruitment (replication) started well in advance in order to avoid the classic delays or last-minute cancellations. For this phase, in addition to the various communication activities, we organised webinars with some national territorial associations (Confindustria - Piccola Industria and Assindustria) in order to extend participation to other Italian areas. The response was positive and we managed to involve 4 companies from Piedmont and 4 from Veneto. It should be underlined that one of the Piedmontese companies was the one selected for the pilot phase and had to give up. The interest it had shown was confirmed by its participation in the replication phase. The activity was disseminated nationwide, and we were impressed by the interest it aroused in different areas of Italy, which shows how the topic of energy efficiency is strategic in order to overcome potential energy shortages and increases in energy costs. Raising employee awareness of this issue has gone from being relevant to essential.

As a Cluster involved in this activity we will be available to evaluate future project developments, with a possible phase 2, and active from a dissemination point of view. We have started a collaboration with the ESG (Environmental, Social and Governance) office of the Unione Industriali di Torino and included the activity of this project in the sustainability report. The topic will be developed in the near future with thematic webinars and tailor-made events, in collaboration with related bodies and energy experts (EGE).

Experience from Companies

GERMANY

All participating pilot and replication companies were very interested and open minded to this new innovative learning methodology of the E2DRIVER programme from the very beginning. It was remarkable how the topics of energy costs, energy saving potentials, resource and climate protection are now expected to play a considerable role even in SME in the future.

With the exception of the participants from two larger replication companies, all participants had little to no exposure to the topics of energy efficiency and energy audits/management before the training began, and thus the expectations of gaining valuable insights from the training programme were correspondingly high. The training

methodology was seen as a cost-effective way of building up know-how in the company, which fitted well into the companies' competitive strategy in terms of content and into the digitalisation strategy in terms of methodology. The prospect of saving energy costs and CO2 emissions by identifying energy efficiency measures by own employees was evaluated as attractive in advance and the potential of such savings was considered as generally high.

The easy access to the methodological tools and the intuitive handling of the training content and functions were rated positively by all participants. The leadership, guidance and training provided by the trainers was found to be helpful and professional. The regular exchange between trainees and trainers as well as the support in developing the link activity was well received. In addition, participants exchanged information in the framework of the academic work, discussed questions and problems in the company with the trainers and thus gained new information and insights from their employees and got to know their company with its individual processes even better. In a few cases the training content was judged to be too theoretical and too technology heavy. Especially in those cases everybody considered the link activity to be a useful and practical addition. Likewise, the on-site session and the VR session were a welcome change that rounded off the overall picture of the training methodology very well.

All participants felt comfortable with the pre-event questionnaires and the energy assessment. The social questionnaire was not completed by all participants and was seen as extra work by some, but there was an understanding for this. In conclusion, it can be said that in most of the companies a positive effect on the energy awareness of the employees could be seen. This was shown not only by the results of the 2nd energy assessment but also by the link activity, which was partly worked out in great detail. This helps the participating companies to identify and implement energy efficiency measures in the future to save a larger amount of rising energy costs and to enable employees to get access to a growing treasure trove of learning materials via the training platform.

SPAIN

The involvement and availability of the Spanish companies participating in the European e2DRIVER project has been remarkable. Despite being in a very difficult situation due to the various challenges in the sector, in addition to covid and other geopolitical problems, they have worked hard to adapt their schedules and working hours to implement the e2DRIVER training and get the maximum benefit from the project.

The involvement of the change agents has been fundamental to involve the rest of the workers in their companies. In addition to the training received, some of the participating SMEs have taken significant measures such as hiring a person specialized in energy efficiency, creating an energy committee or making energy consumption one of the priorities of the strategic plan.

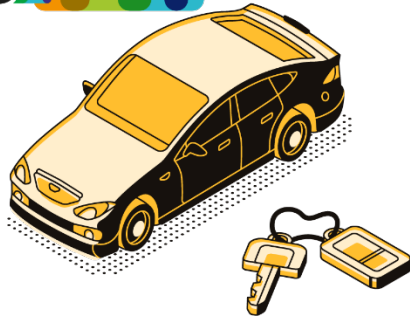
In particular, all companies have used the results of the project to change the energy culture and migrate towards a new more efficient and sustainable production model. One of the most important attractions is the possibility of knowing with certainty the savings that can be generated in order to be able to present them to management and speed up the implementation of new energy saving measures. In short, many companies were

unaware of their real potential and due to the E2Driver training they have now been able to optimise their processes and reduce their energy costs.

In the interviews carried out with the pilot and replicator companies, a notable improvement was detected between the initial feelings and those transmitted after the training was carried out. Although the participating companies were already aware of the need to improve the energy efficiency of their processes, they had not participated in any interactive training with direct application in their companies, such as the E2Driver training.

Due to the above mentioned, initially not all the trainees took the training with high expectations, however, based on the final sessions and the detected results this idea was changed obtaining a positive thought of practically 100% of the trainees.

e2DRIVER



Another key aspect of the success of the training was that it coincided with periods of record energy prices in the Spanish electricity and gas market, with energy costs for production being observed to be up to five times higher in many of the replicator factories. As a result, participation skyrocketed and the opportunities detected were much greater than expected. Many of the ideas for improvement and energy efficiency were detected because they were already ideas prior to the training, however, in the absence of an energy culture, there had never been the possibility of proposing and discussing them. Sometimes, only for fear of it not being

a good idea or believing that they do not have enough experience or rank to propose measures.

The virtual reality session was a success in the pilot companies and helped them to start installing their own energy meters and to get a real distribution of energy consumption.

Finally, from the feedback we have received during these 3 years working hand in hand with Spanish companies, SERNAUTO, together with the collaboration of CIRCE Foundation, wanted to give a twist and create a different content that could give a more visual example of the work that has been developed in Spain during the e2DRIVER project. The result has been a specific video of e2DRIVER in Spain, in which, in addition to showing the fundamental aspects of the project, such as its general objectives, the partners or the training carried out, we have focused its content on showing the experience of the Spanish companies through their own comments.

FRANCE

Considering the online training in the E2DRIVER platform, most often feedback on the use of the platform is rather mixed, having some trainees who consider that this method of learning is a bit difficult. The theoretical content is not questioned, but it is sometimes thought to have a high weight, especially in relation to the use they will make of it later in the audit and management system.

It should be noted that for engineers and technical managers, who do not necessarily have the same university curriculum, the level of ownership of materials and knowledge on the different technologies is not the same. In these conditions the appropriation of knowledge takes more time for the technical managers. In addition, the

people trained do not necessarily have the necessary knowledge in energy efficiency. However, there was no need for the trainer to repeat certain modules from the e-learning phase and provide additional explanations. During the intermediate points there were no questions about the content and requests for explanations of the different technologies where processes.

Despite these rather critical remarks, the platform is an interesting and rich tool to build competence in the field of energy efficiency. It will probably have to be adjusted in some parts so that it is more in line with the level of knowledge of some target groups trained and their initial educational level.

There was no use of messages and chats on the platform, as most students preferred to email teachers directly. Most often the link activity between the self-learning phase on the platform to the training phase on site has been rather limited. Most often, it is the lack of time to devote to training by trainees that is the cause of this weak formalisation of the link activity. However, it does not call into question the involvement of companies in the participation in training

Regarding the virtual reality experience, on average, 2-3 people per company were able to use the virtual reality tool. To get as many participants as possible we used the help mode without going to the mode to evaluate the limited time and battery life. This virtual reality training was very much appreciated, and some companies consider for some production acts to use this technology in order to improve the learning of specific gestures to the production.

ITALY

After interviewing pilot and replicating companies in the various pre- and post-site sessions, we found positive feedback beyond expectations. The companies were extremely interested in understanding the requirements and good practices related to energy audits and in learning more about the energy system in general, in order to analyse savings and investment in renewable energy.

At the beginning of the training course, some companies were sceptical and others saw it as a useful tool for their employees. At the end of the project, they unanimously confirmed that it was a crucial activity to raise awareness among their employees and to start implementing real savings actions.

The project came at the right time. Since its inception, it has faced historical periods (new Green Deal, energy crisis, ...) that have made it attractive to national entities.

The participation was large and the project target was respected (10 companies - 2 pilots and 8 replicants) despite the defection of one company towards the end of the course due to internal problems (drop in turnover, downsizing with employee turnover). The latter participated in almost all the course phases and will soon take part in the VR testing session through the desktop version.

Some companies participated with the direct involvement of the national association and others took part in the webinars or delved into the news published on the various digital channels. The common interest was to approach the issue of energy in the company with the aim of improving business processes and avoiding energy waste. This was made possible by the involvement of staff at a cross-sectional level (blue/white collars). The

possibility of learning new methods of energy efficiency management has given companies the opportunity to invest resources to enhance the continuous training needed in all companies dealing with this issue.

Obviously, the topics covered encouraged companies to take part in this initiative. The main interest was in the evaluation methods to be learned and used in industry. Saving money and protecting the environment made the methodology studied and implemented strategic. The possibility of understanding how to explore and discern the causes of consumption and consequently obtain economic savings, without having a negative impact on the quality of production, made participation in the courses provided by the project attractive. The professionalism of the energy experts involved in the project was highly appreciated and consolidated the participation of the companies involved.

The concerns found in all participations are the same: pollution and high costs. The fluctuating costs of electricity and gas have raised the threshold of attention for these consumptions. In many cases the high cost of energy causes production stoppages or company downsizing, especially in small and medium-sized companies.

The implementation phases of the methodology were widely appreciated, although the effectiveness of the in-house sessions was unanimously underlined. Certainly, after two years of pandemic, where remote working has become a practice, the F2F sessions have involved more the workforce and technical figures who would have had more difficulties at a distance.

The companies also appreciated the simple and intuitive access to the methodological tools. The experts provided excellent guidance and training, and thanks to their helpfulness, an open and stimulating relationship was created with the participants. Various suggestions for improving the different processes were appreciated.

A key feedback requested was whether there were any unnecessary activities in the training plan, to see if the course met the expectations of the participants. The feedback was more than excellent and some suggestions were collected to improve future actions on the topic. Some reported an excessive theoretical part while others would have preferred a more cohesive initial group training but this did not affect the quality of their feedback which was always more than excellent.

As regards the evaluation of the change in behaviour and improvement in the company, it is generally still early days for concrete feedback, but the first reactions are comforting. There is a gradual interest in the energy issue even with small daily gestures (reduced lighting in offices,...) and some companies are considering obtaining energy certifications, in particular ISO 50001. Although it is too early to understand whether the course has had an impact with concrete results, it can be said that the attitude of the workforce has improved after the course thanks to a strong awareness of the issue.

Experience from Trainers on methodology implementation

GERMANY

In this section we summarize the conclusions obtained from the opinions of the German trainers for both the pilot and replicator phases, plus the observations made by those who successfully passed the “training of

trainers“. Compared to other more conventional trainings and methodologies the E2DRIVER ontological flip teaching model is modern and fits perfectly into the digitalisation strategies of many companies.

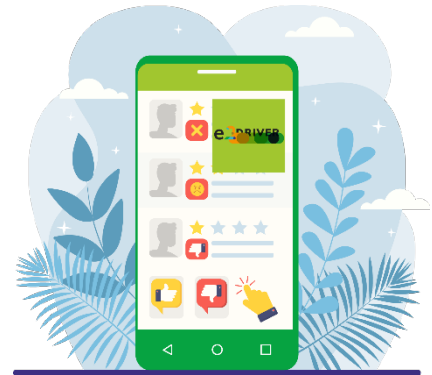
The lessons at home via e-learning on the platform allows a more flexible time management for the trainees. This means an individual division and repetition of the training stages between the tutorial sessions. The trainees can check their knowledge by performing tests/final exam and exercises on the platform independently from the trainers. Online sessions and Video conferencing allow meetings to be more time-efficient, more flexible (for example an additional meeting can be easily organized) and allow meetings to be carried out during a restricted pandemic situation. The link activity leads from the theoretical part to the practical part. It provides a detailed exchange between the trainees and the trainer on potential energy efficiency projects in the company and which steps are necessary to get things done.

The developed guide for trainers within the framework of this methodology was very helpful for the trainers to know how to teach and to proceed in a consistent and a goal-oriented way. For a successful implementation of the E2DRIVER methodology in the SMEs from the automotive sector it was important that all participants got a clear idea about the goals, the entire training plan and the possibility of having their individual wishes taken into account. So all employees felt involved and appreciated. By presenting an individual timetable, the existing training paths and the associated training content the participants knew what to expect.

As far as the pilot and replicant phase is concerned the organisation and communication was generally well manageable during the entire training period due to the mobile number of participants. In the pilot phase there were a few technical problems with the registration and the classifier test, so that the registration and classification for some profiles (e.g., manager) had to be done directly by the developer/administrator of the platform. All participants went through the online training without larger problems and were able to successfully complete their training paths with the final exam (pilot and replicant phase).

The link activity was particularly important for the practical calculation, planning process and implementation of energy efficiency projects in company. During the elaboration of the link activity, the trainer provided assistance with ideas on energy and CO₂ saving potentials, empirical values on savings quantities as well as investment costs. The results of the link activity serve SMEs as a basis for future plans and contributes to the pool of best practice examples on the platform as an impulse for other SMEs in the automotive sector.

The participants were quickly enthusiastic about the visualized and immersive approach of the virtual reality session. Some of the trainees who were qualified with control cabinet access authorisation said that the implemented details like following the directional arrows of the coils for correct attachment were valid and the instructions were clearly comprehensible. This makes it suitable for training prospective electricians.



To conclude the mixed character of the E2DRIVER methodology allowed trainers to design the programme in a flexible and adaptive way by using a mixed character of meeting online and face to face. For the trainees, this meant an individual time-independent self-study part, the chance to connect theoretical and practical knowledge by producing a link activity and to experience live a state-of-the-art training via VR performing measurements on a control cabinet. This mix of innovative training methods makes it so attractive and easier for trainers to train successfully employees in small and medium sized enterprises on energy efficiency, energy audits and the awareness towards energy management.

ITALY

SINERGIE interviewed both the trainers of the Italian pilot course and the participants in the “Training of the Trainers” course. In the following paragraph, a summary of their comments and observations will be provided and both groups will be generally referred to as “trainers”.

First of all, trainers were consulted in order to investigate the difference between E2DRIVER methodology and more traditional forms of company advice in terms of energy efficiency. The overall impression is that E2DRIVER methodology offers the right mixture between online training and operational guidance on the ground, by involving trainees in identifying the topics that are most relevant to them and that succeed in filling in their knowledge gap as far as energy management is concerned.

The second question concerned the importance of a professional energy efficiency consultancy for small and medium enterprises (SMEs). According to the trainers, this is key to SMEs because they often lack the relevant methodological skills among their staff, and sometimes they are not even aware of how an efficient energy management could positively impact on the company. Thanks to the training, in fact, SMEs can look at their everyday activities from a different point of view and discover new opportunities for enhancing energy efficiency.

When asked about how E2DRIVER methodology could be implemented in the SMEs from the automotive sector, trainers observed that the first step is to make some aspects of the project much leaner, so that notions can be spread as fast and efficiently as possible. Offering a very operational approach right from the start, in fact, is essential because it ensures that all the managers and employees feel involved and motivated, and this is true both for companies in the automotive sector and for any kind of SME. Once companies are aware of the benefits stemming from the integration of energy management at the different levels, E2DRIVER methodology will support them to create their own training path, according to their different needs and to the peculiarities of their sector.

Trainers also had the chance to learn something new from their experience in E2DRIVER: first of all, they got to know companies that, though not big, were characterised by an interesting vision and the ability to act and take decisions. Secondly, they underlined the importance of creating a flexible training path and providing the opportunity to go more in depth only if and when required by the company.

Furthermore, they noticed that in most cases the operational staff and technicians were much more involved in the training and interested in learning than the management. Finally, trainers remarked that it is important for them to adapt to the company they are working with, by keeping the focus on the goal to be achieved and by finding the right way to convey the message.

Generally speaking, E2DRIVER project managed to provide both theoretical knowledge and practical tools to the companies involved in the training – both elements that could bring an immediately visible positive impact without requiring major investments. It also succeeded in building awareness among all the employees of a company on the importance of energy management, whose successful implementation can be achieved thanks to a complex balance between different factors: the right operational choices, the investment in adequate technology and, most importantly, the development of a sense of responsibility on the part of employees, and the adoption of positive behaviour at all levels of the company.

To conclude, trainers provided some final suggestions for an optimal implementation of E2DRIVER methodology. It is important that trainers are very flexible and adaptable, but at the same time able to convey a sense of professionalism, enthusiasm and motivation. When presenting the course, they should emphasise the benefits stemming from an increased awareness towards energy management among all the company's levels. A trainer always has to remember that E2DRIVER course is targeted to small and medium enterprises, not large companies, and therefore all suggested solutions and energy efficiency measures should be easy and immediate to apply, with immediately visible results.



DRIVERS AND BARRIERS TO MORE ENERGY AWARE SMES

CHAPTER 4

DRIVERS AND BARRIERS TO MORE ENERGY AWARE SMES

4.1 DRIVERS

The main drivers for companies to be increasingly aware of the implications of energy and its management on their entire process and bottom line as a company can be divided into two dimensions: regulatory and economic-contextual. Addressing the first of these, in regulatory terms the EU is at the forefront of environmental policy and action on climate change. In recent decades, companies have had to internalise different regulatory schemes in order to adapt to a model based on sustainable development. With each new programme approved, the EU targets for reducing emissions and increasing energy efficiency are higher, which translates into specific policies that oblige companies to reduce their own environmental and climate impacts in an ever more demanding way.

In the field of energy audits, SMEs are not yet impacted by an obligation to carry out energy audits as is the case for large companies. However, it is not unthinkable that in the medium term, especially after contextual factors such as the different crises that SMEs are currently suffering, the situation may change. In fact, it is expected that there will be a change towards a model in which the condition of being an SME or a large company will no longer be so relevant, but rather a model in which the obligation to carry out energy audits will be determined by energy consumption. Considering that many SMEs in the automotive sector are energy intensive, this factor should definitely be taken into account. On the other hand, the other major driver pushing SMEs towards a more energy efficient model are the four crises explained in chapter 2 and which are currently particularly represented by the component crisis and price escalation. These are key factors that in some cases even jeopardise the activity of certain companies, so appropriate energy management can be a further tool to manage these challenges.

Finally, it is also important to highlight two drivers that can also bring about significant changes in certain companies and that, in fact, have been shown to be effective in certain entities: the dragging effect that some large companies have caused in their suppliers by establishing certain criteria in energy or climate matters; as well as the area of corporate social responsibility and the image of a clean company which, in a social context that is increasingly aware of environmental issues, has become highly relevant.

All these factors combined – mainly the impact of increasingly stringent regulations and the impact of successive crises that are compromising the performance of many companies - are pushing companies to take energy-related issues very seriously, as they can have critical implications for their business. Also from them, and especially a key regulatory factor such as the non-obligation of energy audits for SMEs, the need for incentives for training and awareness-raising actions can be deduced.

4.2 BARRIERS

The main barrier identified, together with, of course, the fact that audits are not mandatory, is precisely the inability to see the weight that energy has on companies and their results. This means that many of the SMEs have limited knowledge of the implications of not controlling their consumption for their process, for their financial results at the end of the year and for society and the environment as a whole.

In fact, the set of crises mentioned in chapter 2 produces a paradoxical effect in some companies that, without seeing the potential for improvement in the energy aspect because they have not been able to measure it or consider it with energy audits, enter into a "flight forward" where they finally start to consider attacking more easily identifiable expenses, such as the cost of personnel and the cost of opting for higher quality materials.

In short, the big barrier that encompasses the rest can be summed up as the inability to see that the company has the capacity to improve in energy terms and that energy can be managed in more ways than simply resigning itself to the arrival of a new bill and devising cuts in other areas to deal with this expense. Once the company is able to see that the bill can be reduced through concrete measures that they themselves can implement, it is the first step towards an energy-conscious company and a real interest in carrying out energy audits.





POTENTIAL E2DRIVER PLATFORM

CHAPTER 5

CHAPTER 5

POTENTIAL E2DRIVER PLATFORM

5.1 GENERAL DESCRIPTION OF THE E2DRIVER PLATFORM.

E2DRIVER Platform is the second pillar of the E2DRIVER solution (together with the Methodology). It is an e-learning tool that has been adapted to the characteristics of the project and its pedagogical approach. The platform is available in five languages: English, German, Spanish, French and Italian. Next, the link to the platform can be found: <https://e2driver.uv.es/>

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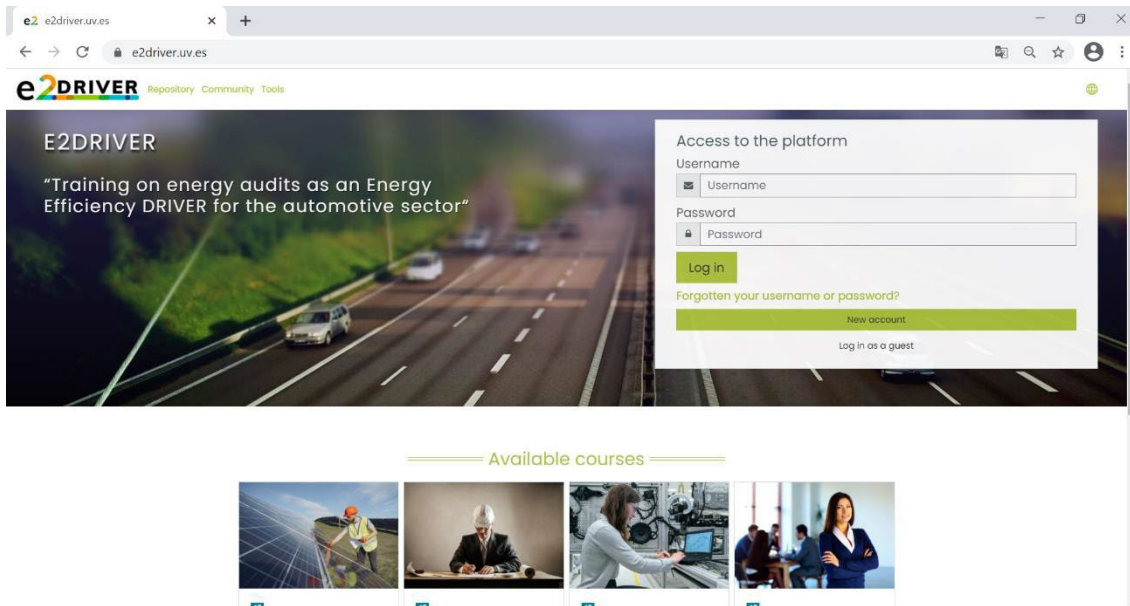


Figure 9. Log in page of the E2DRIVER Platform.

The E2DRIVER Platform is composed by four main parts:

1. Repository of contents, where all the training materials are collected in order to facilitate that trainees and trainers consult them
2. E-learning part, where trainees can consult the units of their E2DRIVER Training.
3. E2DRIVER Community, where the participants are able to share ideas, news and create net- working.
4. There are two tools for pedagogical and methodological purposes included in the platform: The Energy Audit Self-Assessment Tool and the Financial Tool.

Furthermore, the Platform has been designed considering an Ontological Flip Teaching approach. This design allows trainers to access the educational and study lessons, while also allowing them to upload materials to be included as contents.

Finally, E2DRIVER consortium created an algorithm embedded in the Platform for a customized training. This customization mechanism reassembling a questionnaire considers the data from the sector, the company and the trainees (their academic and professional background, specific fields where there is a lack of knowledge, etc.). Therefore, the first time a trainee logs in in the platform, the result showed by this questionnaire enrolled him/her in one of the four training paths that exist in the platform.

5.2 STRENGTHS AND WEAKNESSES OF THE E2DRIVER PLATFORM.

Having observed the main features of the platform, this sub-section analyses the main strengths and weaknesses of the platform to further analyse the potential of this tool in the future. To be synthetic, the main points of strength and weaknesses are presented below in a table format and grouped by thematic issues. They have been defined taking into account the opinions and considerations of the platform administrator, trainers and trainees.

In terms of the materials and contents included, the powerful repository of materials created can be highlighted, but there is a real risk that in the medium term the currency of these ways will be compromised (regulatory changes for instance) if an appropriate updating scheme is not identified in the coming years.

In addition, it can be confirmed that the platform has managed to adapt to the methodological and innovative requirements that were requested in the Grant Agreement (Ontological Flip Teaching approach and customisation). However, this may mean that the platform structure is very adjusted to the E2DRIVER methods and that it loses flexibility and adaptability to be used in other modalities.

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TOPIC	STRENGTHS	WEAKNESSES
Platform administration	The consortium is interested in maintaining ownership and management of the platform beyond the end of the project.	Due to the specificity of the platform and its high customisation and adaptation to the project, it is not possible to open the administration to other users. The administration must be unique.
Access	It is an open access platform, and anyone can register, take the classifier test and access their personalised course.	If you want to have a complete experience where teachers and students can communicate, you need the support of the platform administrator.
Hosting	Hosting is assured until 2025.	
Usability	The usability of the platform has been generally acknowledged by trainees and trainers	Due to their specific characteristics, it is sometimes difficult to understand the platform approach, especially until you manage to complete the classifier test.
Ontological Flip Teaching	It proves to be a very powerful methodology for training in companies due to its capacity to provide theoretical knowledge and to be able to identify real efficiency measures in practice.	The link activity that was methodologically considered sometimes did not match the requirements of the companies' reality. Companies do not have the time to generate quality documents that would allow them to subsequently generate new material. So we used this exercise to extract suggestions for energy efficiency measures from the companies.
Self-assessment tools	Two free tools are included in the platform where energy self-assessment and financial self-assessment exercises can be carried out. As they are included as uploaded documents on the platform, they can be downloaded and used by individuals on their own devices. This allows the user not to fear that there is a record of sensitive data about their company on the platform.	

Customization tool	The classifier test has made it possible to generate personalised courses, which has made it possible to fully adapt the training, not only to the companies, but also to each of the students, taking into account their academic and professional background.	The classifier test takes into account the current position of the employee to suggest the training that will improve his or her skills. In case the company strategically wants to train an employee in a profile that he/she does not occupy now (but he/she could eventually occupy in the future), it is necessary to include this student in the desired training manually.
Training materials	It is a powerful repository of training materials.	There is a risk that materials will become outdated over time.
Languages	The platform and materials are available in five languages: English, German, French, Italian and Spanish.	Replication limitations in countries that do not speak these languages or whose general population does not generally speak English.

5.3 POTENTIAL OF THE E2DRIVER PLATFORM.

Considering all that has been explained above, the E2DRIVER Platform can be considered a powerful tool that constitutes a key piece for the implementation of the E2DRIVER Methodology. It is a tool made using Moodle software, but fully customised to the needs of the project. It is safe to say that this tool has achieved all the necessary requirements established in the Grant Agreement:

1. it is a tool that allows the implementation of a training scheme based on Ontological Flip Teaching,
2. it has an integrated algorithm that allows the automatic customisation of the training based on the needs and interests of the students,
3. it allows the hosting of an extensive content repository,
4. it is the place where the key tools of the project are hosted and,
5. in short, it allows the complete realisation of the online part of the training.

Thanks to that, the platform became the ideal tool for implementing the E2DRIVER Methodology and the training capacity programme with the E2DRIVER methods. However, it is also true that the radical adaptation of the tool

to the established requirements has caused it to be more rigid than desired. Despite that, the potential of adaptability of this tool to other scenarios remains mainly due to the following factors:

- Being an open access platform allows all those interested to access it: from interested auto- motive companies to companies from other sectors, as well as academics, students and teachers.
- Despite being a platform fully adapted to the Ontological Flip Teaching scheme, it has the potential to be an online tool to use, as well as a tool similar to the so famous nowadays plat- forms that facilitate Massive Open Online Courses (MOOC).
- Even with an automatic customisation tool based on an algorithm, the administrator can pro- vide credentials directly to the users making it unnecessary for them to perform the classifier test and directly providing a learning experience determined manually.
- Despite having implemented high protection parameters to protect authorship and the recognition of funding by the European Union, all training materials are downloadable from the platform and can be used both in the context of the platform and in other spaces.

Thanks to all these factors, different formulas for the use of the platform are proposed and explained in the following paragraphs as a potential scheme of usage.

E2DRIVER Platform in an E2DRIVER capacity building programme

Obviously the most common usage scheme that should be considered for the E2DRIVER platform is in the context of a training that implements the E2DRIVER Methodology. This is 4 weeks of online training using this tool, 1 week of autonomous work where the trainee can carry out academic work and several face-to-face sessions where the trainer will carry out a series of practical exercises aimed at identifying energy efficiency measures that could be considered in the consultancy phase.

However, this implementation can also contemplate variations in terms of time, as well as in some of the methodological aspects considered. For example, it is possible to consider the possibility that the students do not have to take the classifier test and that they are directly provided with a training itinerary agreed with the company.

E2DRIVER Platform in a fully presential training

The platform also has a clear potential for those trainers who prefer to implement fully face-to-face training without using the tool as such.

In these cases, the E2DRIVER platform can be used as a content repository from which the trainer can extract different materials using the search filters according to topics, as well as using the self-assessment tools that can be freely downloaded. In the same way, for the design of their training, trainers can draw inspiration from the itineraries present on the platform which show contents to be consulted in a desirable way according to the specific profile of the learner.

E2DRIVER training materials are highly protected against modification to protect their authorship and the recognition of the European Union as the institution that enabled their generation thanks to its funding. In any case, the materials can be used for presentations and lectures, although they cannot be printed.

E2DRIVER Platform in a fully online training

With the necessary support from the platform administrator, the platform can also be used to implement 100% online training. Although it is recommended to have the support of a videoconferencing tool for tutorials with the students, the trainees will be able to consult all the contents and take a final evaluation test. In the same way, teachers will be able to observe the mark achieved by the student.

E2DRIVER Platform as a MOOC-like platform

Similar to other platforms where Massive Open Online Courses are held, the E2DRIVER platform can be used autonomously by anyone who wants to be trained in energy efficiency and energy audits. Being an open access platform and giving freedom for students to take the classifier test and access their personalized course, anyone can access, consult and learn for free. However, it is true that they will not have access to key issues of the E2DRIVER Methodology, such as continuous assistance from a trainer who will help them identify specific energy efficiency measures for their company and a final consulting phase.

E2DRIVER Platform as a consulting tool

Finally, the E2DRIVER Platform can be used as a support tool for both students and teachers who are involved in major training schemes such as a university degree. The materials of the E2DRIVER platform can be used as a consulting material for preparing academic papers as well as for conducting specific classes. However, it is important to emphasize that they must always be properly referenced.





CONCLUSIONS

CHAPTER 6

CONCLUSION

In conclusion, we can highlight, firstly, the fact that the European automotive sector continues to be a key sector for the continent, with considerable weight at a global level. However, it should be noted that at present, due to rising prices, the components crisis and other factors that have been dragging on for years, the European automotive sector is facing major challenges in continuing to maintain its global weight.

In line with this aspect, and highlighting the importance of energy in terms of total costs of a company, it has been possible to see how the E2DRIVER project and its methodology of training and consulting has helped many companies in Germany, Italy, France and Spain to meet the challenge of being entities with an increasingly lower consumption and a greater awareness of the weight that energy has in any industrial process. In fact, E2DRIVER has proven to be a useful tool to raise companies' awareness and to make them aware that they have the capacity to take measures that really have at the same time a positive effect reducing their energy bills and a positive fallout on the environment.

Finally, the exploitation potential of the platform has been analysed and different training ways have been identified in which this tool could be used as a support or as a fundamental element. Similarly, a great potential for replication of the E2DRIVER methodology to many other sectors has also been found, highlighting those with high energy consumption, such as the chemical sector.

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Disclaimer

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The logo for eDRIVER, featuring the lowercase letter 'e' in black, followed by a stylized graphic of three overlapping circles in blue, orange, and green, and the word 'DRIVER' in black uppercase letters.

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