Methodology and training material report

E2DRIVER H2020 project

MAIN AUTHOR: CIRCE

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"Training on energy audits as an Energy Efficiency DRIVER for the automotive sector"
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PROJECT PARTNERS

CIRCE: Fundación CIRCE Centro de Investigación de Recursos y Consumos Energéticos

FRAUNHOFER: Fraunhofer Gesellschaft zur Förderung der Angewandten Forschung e.V.

POLITO: Politecnico di Torino

EPROPLAN: EPROPLAN GmbH Beratende Ingenieure

SINERGIE: Sinergie Società Consortile a Responsabilità Limitata

ENGIE: ENGIE Lab CRIGEN

SERNAUTO: Asociación Española de Proveedores de Automoción

AEN: Automotive.Engineering.Network – Das Mobilitätscluser e.V.

MESAP: Centro Servizi Industrie SRL

MOV'EO: Pole Mov'eo – Mobility Competitiveness Cluster

EPC: EPC Project Corporation Climate. Sustainability. Communications. mbH

MERIT: MERIT Consulting House

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PUBLISHABLE SUMMARY

This deliverable is the culmination of one of the key results of the E2DRIVER project: the methodology. The first version of the E2DRIVER Methodology was created in the context of the Task 3.2 – *Development of the overall training methodology*. However, this first version was necessarily uncompleted due to the fact several aspects were not defined in that moment. This fact and the potential improvements identified in the pilot phase made necessary to perform a fine-tuning of this methodology which is materialized in the present document. Therefore, this document constitutes the final version of the E2DRIVER Methodology.

The E2DRIVER Methodology constitutes and explains the pedagogical and logistical approach that is used to successfully implement the E2DRIVER Capacity building programme in a company. Furthermore, it is a guide for trainers that will support them in the development of their activities during the execution of a one specific training.

The E2DRIVER Methodology is composed by a clear explanation of the different pedagogical innovations that are used in the project, as well as the identification of the format that has been implemented and the steps that the teachers must follow.

The ultimate goal of the E2DRIVER Methodology and this document is that the work performed in the E2DRIVER project gets the way to replicate its solution to other spheres, contexts, and sectors. In that sense, the E2DRIVER Methodology in general and the guide included will be the main content addressed in the implementation of the E2DRIVER Training of Trainers.

TABLE OF CONTENTS

1 INTRODUCTION

This deliverable justifies the work performed in the context of the Task 4.4 – *Training methodology fine-tuning*. To do so, the document is divided in three main parts plus the Annex I.

The first section describes the whole development of the task, and which have been the activities performed on it. Thus, it is detailed the requirements which should be achieved if the Grant Agreement is considered, what the consortium has done in this respect and finally the result of the task: the E2DRIVER Methodology.

Next, in section 3 and 4, the document performs an analysis of the performance of the methodology in the pilot phase implementation of the E2DRIVER training and, subsequently, the weaknesses and improvements identified are clearly detailed and explained.

Finally, the most important part of this document is included in the Annex I. In the end, the objective of this Task 4.4 is to fine-tune the methodology that was previously generated in the Task 3.2. Thus, the whole methodology created in this task is adjusted and included in the Annex I of the present document.

2 DESCRIPTION OF THE TASK 4.4 – TRAINING METHODOLOGY FINE-TUNING

2.1 Purpose of the Task 4.4.

The objective of this task is specified in the Grant Agreement as follows:

> *"Using the results and conclusions from the implementation of the capacity building programme at the Pilot Companies and the continuous analysis of the results in WP5, the developed methodology in task 3.2 will be refined and improved. The results of the monitoring and evaluation plan in the pilot companies will be analysed to facilitate the replication in other companies. This will result in a comprehensive method that will enable an easier implementation of these courses and interventions in a wide number of companies. In this task the planning, program, general objectives for training modules (co-creation sessions, introductory sessions, specific training and interactive workshops) will be revised to obtain their definitive design. These training modules will be divided into training units and the final methodology will define the concepts, specific objectives (capabilities and evaluation criteria), duration, topics, methodological strategies, learning activities, equipment, installation and resources for every training unit. Afterwards, the lessons for training the trainers in E2DRIVER final methodology will be developed as required input for Task 4.3."*

From this text it can be deduced that the main objective of Task 4.4 is the development of the final version of the E2DRIVER Methodology generated in Task 3.2 considering all the weaknesses identified during the pilot phase.

The ultimate goal is to create a comprehensible method that facilitates the implementation of courses and interventions in a larger number than in the pilot phase. In logistical terms, the pilot phase is often a period when many eventualities arise, issues that have yet not been taken into account are discovered and aspects designed in a theoretical way do not prove to be very useful in practical terms. Thus, a process of fine-tuning is necessary in order to simplify, systematise and rationalise the overall process of implementing training and interventions in companies.

In line with the methodology, this task involves defining the planning, programme and general objectives of the modules, as well as the objectives, duration, topics, methodological strategies, equipment, facilities and resources. At this point it is important to clarify that, although it was preliminarily defined that the courses would be divided into "co-creation sessions, introductory sessions, specific training and interactive workshops", when the methodology of the project was established, the focus was modified and a division was made between "adjustment session, E2DRIVER training, virtual reality and workshops for change agents". In this way, while maintaining each and every one of the exercises required in the Grant Agreement, an approach was established that was considered more appropriate and simpler for easy implementation. In any case, the justification for this modification can be found at the beginning of the guide for trainers that it is going to present in the Annex I.

2.2 Development of the Task 4.4.

Taking into account the objectives explained above, during the development of Task 4.4. different actions have been defined in order to improve the project approach, not only for the replication phase expected from January 2022 on, but also for the exploitation after the end of the project. The set of activities carried out can be divided into three packages:

- Collection of all inputs on possible improvements to be implemented in the methodology and the platform.
- Adjustment of the new methodology and platform to overcome these weaknesses and constitute a clear, simplified, efficient and effective approach.
- Creation of additional tools and systematization of existing tools to be clearly presented to E2DRIVER trainers and to those who can take advantage of the E2DRIVER methodology in the exploitation after the project.

Regarding the collection of improvements to be implemented, a key point was the information received from deliverable 4.3 where a report on the performance of the pilots was made. Two internal workshops of the E2DRIVER partners were held on the 28th and 29th September 2021 to evaluate the performance of the methodology, the platform and the training materials in the development of the pilot phase. These three tools, the deliverable and the two workshops, made it possible to become aware of the key points that needed to be confronted and improved.

Then, in order to finally decide which aspects needed to be improved and which would not add real value, two exercises were carried out. On the one hand, in terms of the platform, a meeting between CIRCE and EPC to define exactly what could be done to improve the platform's functionalities was held. After this meeting, the conclusions were transferred to the University of Valencia, as developer of the platform, so that it could proceed to implement the improvements in the platform.

Regarding the methodology, CIRCE was in charge of carrying out an improvement and simplification exercise that was subsequently validated by SINERGIE, as the leader of the exploitation of the training part, and by FRAUNHOFER as key partner in the post-training actions leading to the calculation of the project's impact. In terms of methodology, in addition to change the procedure, a considerable effort has been made to systematise all the tools, templates and documents. This allows to carry the implementation in a more effective and efficient way.

2.3 Result of the Task 4.4.

Ultimately, the outcome of Task 4.4 can be summarised as follows:

- A more user-friendly platform.
- A systematised methodology and where the post-training counselling part of the E2DRIVER methodology becomes a fully-fledged phase of the E2DRIVER methodology.
- Minor adaptations of the training materials.

The following sections identify in more detail what was identified in the methodology and the platform as a potential improvement and what improvements have finally been implemented.

3 THE METHODOLOGY AND PLATFORM IN THE PILOT PHASE

3.1 Performance of the E2DRIVER Methodology in the pilot phase.

The methodology proved to be a powerful tool for the training of the companies involved in the project. However, several issues were identified as having potential for improvement in the pilot phase:

1. Given the novelty of the methodology where the Ontological Flip Teaching pedagogical paradigm and different customisation modalities were integrated, the trainers sometimes showed that they were not very aware of the way in which the training activities had to be carried out This can be considered the main challenge that the fine-tuning process faced.
2. In line with the above, several teachers were confused about which tools, templates or documents they had to use for each methodological step.
3. In the first phase it was thought that some of the training materials were not necessary to have them in the national languages. However, the need to complete the translation of all the training materials was identified.
4. Regarding the methodological terms, the link activity proved to be a strange element on many occasions for the trainers. Since they didn't understand the purpose of it, they were not able to correctly approach it. Moreover, even in those cases where the essence of this exercise was understood, it was seen that the "pure" implementation of this approach posed problems due to the sensitive company information that could be dealt with in such academic papers.
5. Some of the meetings and time estimates were not accurately considered when compared to the actual implementation of the meetings.
6. In the area of tutorials, the need to harmonies the number of them in the online part of the training was identified. It was also identified the need for an initial course tutorial in which it was clearly explained how the course would work and how to register on the platform.
7. It was also found that the expected face-to-face hours for the companies often did not match what finally was implemented in the pilots. For example, in many pilots, joint trainings were implemented for all groups except technicians and operators. In others the sessions were divided into two halves to allow for a break, etc.
8. In terms of evaluation, the final mark was calculated as a 70% of the exam and a 30% of the link activity. Given the nature of the training, where the ultimate aim is for the company to be able to implement improvements rather than obtain a diploma, it felt that this might not be the assessment scheme and that aspects such as participation in exercises and practices should be taken into account.
9. As for the diplomas, due to the fact that it has not been possible to agree on a common format, the delivery took a long time. The need to shorten the deadline for delivering the diplomas was highlighted.
10. Finally, and in any case, the methodological scheme needs to be made more flexible in order to fully adapt to the needs of the companies.

3.2 Performance of the E2DRIVER Platform in the pilot phase.

For the E2DRIVER platform, the following improvements were identified:

1. The registration process was long, tedious and resulted in learners not being able to successfully complete registration on the platform.
2. A need for the trainer to be aware of the learners' progress was identified.
3. The calendar, not being linked to any other application, made it difficult for learners and teachers to link course activities with their day-to-day professional schedules.
4. On the other hand, the E2DRIVER Community section proved not to be useful for the intended purpose of the project. It was therefore necessary to rethink this issue.

4 IMPROVEMENTS IMPLEMENTED IN THE METHODOLOGY

4.1 Improvements in the E2DRIVER Methodology.

Considering the weaknesses identified in section 3.1, below a table explaining the improvement implemented for each weakness can be found. In case a more detailed explanation of the weakness is wanted, please refer to section 3.1 using the numerical codes.

	IDENTIFIED WEAKNESS	IMPLEMENTED IMPROVEMENT
1	Lack of knowledge of the procedure on the part of teachers	In addition to the trainer's guide (Annex I), which is the most important result of this task, an excel document has been generated so that trainers can easily use it to identify what actions they need to take to follow the E2DRIVER methodology correctly. In this excel the phases, the time for each to be conducted, as well as the action and the nature of it is identified. Also, an additional part including the tracking of each task and actions to be completed has been designed. This makes it easier for the teacher to know when and how somethings has been uploaded. This also allows the training to be done in a more fluidly and efficiently manner.
2	Confusion as to which documents/templates to use at each methodological step	There has sometimes been confusion about which tool or methodological document should be used to successfully complete each task in the context of a training with a company. This is solved by including a section in the excel mentioned above which states which document should be used depending on the activity. Additionally, trainers will be provided, together with the excel, a package of documents and tools referred to in the excel so that there is no confusion about previous versions used in the pilot phase.
3	Training materials not translated from English to national language	These documents were translated into the national languages.
4	Inadaptation of the link activity to the reality of E2DRIVER	The link activity in the context of the Ontological Flip Teaching methodology is intended as an instrument to increase collective intelligence. In one of the meeting among the E2DRIVER Consortium was proposed that these academic work developed by the students could also be included in the training repository and, thus, be able to progressively increase its content. However, in the context of E2DRIVER, this point of the methodology has proven not to be fully adapted to what is needed in automotive SMEs in the field of energy and the need to identify energy efficiency measures. This academic work was a key tool for the identification of energy efficiency measures that could be implemented

		in the company and so it was used for the students to do this reflection work on measures prior to the face-to-face session. Although extremely useful, it has been difficult to use this academic work as new training materials, as this work often contained information from the company that could not be shared. In addition, some working papers were often written in an informal and sometimes schematic way, which made them not very attractive as training materials. For these, a need to rethink what the link activities in this project without compromising the original intention should be is needed, bemeaning, a tool that can help the continued growth of collective intelligence, but staying within the reasonable framework a project like E2DRIVER reaches. In this sense, the paradigm to implement the final version of the methodology will be one in which the link activity exercise serves to identify best practices and energy efficiency measures. They can easily be extrapolated to empower trainers even more for replication in other companies, allowing them to translate solutions from one company to another one with similar needs.
5	The duration of the meetings was not as planned.	Some meetings, such as the Adjustment session, turned out to be much shorter than expected. Reason being, that just on the first session was often not possible to carry out the awareness-raising action originally planned. In this way, the methodology reconsiders the possibility of reducing these meetings, but does not go as far as implementing a compulsory reduction. It maintains flexibility between the companies and the trainers to adapt as much as possible to each of the companies.
6	Lack of a common approach to tutorial sessions	The tutoring system was not defined in the first version of the methodology. It was simply suggested that tutorials should be held during the online phase to prevent students from feeling lost, to explain the topics and resolve doubts. In the fine-tuning process, there was a need to modify and homogenise the tutoring approach while maintaining a certain degree of flexibility. In this sense, it was agreed to hold a first tutorial at the beginning of the course in which the methodology of the course and how to register on the platform were explained. Subsequently, a weekly tutorial would be held throughout the online training. Ideally, these tutorials would be divided in a rational way, grouping the more technical groups on one side (technical manager, science and engineering professionals) and the management groups on the other (managers and change agent).

7	The duration of face-to-face sessions were not as planned.	The face-to-face sessions were planned in such a way that a 2-hour session was held with managers; a 5-hour session with science and engineering professionals, technical managers and the change agent; and a 2-hour awareness-raising session with operators. However, it was observed that in each country it was implemented with adaptations. For example, in Italy, shorter sessions with breaks were carried out and in Spain, all the face-to-face sessions were merged into one, except for the one with the operators. In view of this situation, and even though the previous paradigm is still considered the most appropriate, the door to make minor adaptation considering the needs of companies is open.
8	Lack of harmony between the assessment criteria and the actual purpose of the training	To adapt to the objective of the project, which is ultimately for companies to learn about energy efficiency measures and energy audits, the evaluation criteria are modified to give weight to the classroom part. Thus, the evaluation criteria would be as follows: 60% the exam grade, 20% the grade in the link activity and 20% the active attendance to the face-to-face sessions.
9	Delay in sending out diplomas	During the pilot phase there was a huge delay in the awarding of diplomas due to a lack of agreement on the format. However, in the replication phase the template is now clearly identified and the deadline of 1 month after the training to send them to the trainees is set.
10	Rigidity in methodology	Ultimately, one point to keep in mind is that the purpose of the project is to enable company employees to acquire the knowledge and eventually implement energy efficiency measures in their companies. Strict compliance with the methodology is secondary if the cost is not to achieve the above objectives. So, as long as the general structure of the methodology is maintained, it is not a problem if some parameters are changed to suit the needs of the company.
11	VR exercise. Some users wrote that explanations of interaction commands / buttons on the hand controllers were not totally intuitive	To add some panels with visual hints in the application and/or highlight the buttons during the explanation.
12	VR exercise. Need to put a carpet/mat to insulate the operator.	Adjust implemented.

4.2 Improvements in the E2DRIVER Platform.

Taking into account the weaknesses identified in section 3.2, below is a table explaining the improvement implemented for each weakness. In case a more detailed explanation of the weakness is needed, please refer to section 3.2 using the numerical codes.

	IDENTIFIED WEAKNESS	IMPLEMENTED IMPROVEMENT
1	Long and tedious registration process.	In the previous format of the platform, the registration process involved several steps where several consecutive steps were expected from the learner and the platform administrator. This resulted in many learners becoming tired and either giving up or simply not succeeding. Thus, the registration process has been modified in such a way that learners only have to register, and they have automatic access to the classifier test and then to the courses.
2	Inability to see trainees' progress.	A part of the platform is identified where it would be possible to see those "Observed material" boxes that students have ticked. However, the platform is technically weak when it comes to solving this problem, so a more traditional monitoring system is proposed in which the tutorials can be used by teachers to find out directly about the progress of each student.
3	Calendar not synchronised	The possibility of downloading a link has been identified thanks to which the events of the E2DRIVER platform could be downloaded to the personal calendar.
4	E2DRIVER Community not useful as planned	As the purpose of the platform is not yet clear to potential users, several solutions should be brought forward and will be addressed in the frame of the exploitation phase: the platform should be presented to the trainees as possibility to exchange and mutual learning; the platform should offer horizontal exchange between students of pilot/replication companies; activities on the platform should be monitored; active involvement should bring benefits for the users.

5 CONCLUSIONS

This deliverable has explained what the purpose of Task 4.4 was and how it was developed. Additionally, the main weaknesses identified during the pilot phase have been presented, as well as the measures undertaken to improve it.

In any case, as explained above, the most important result of this task is not to be found in the body of the deliverable but in the Annex that is below. In the Annex I can be found the final version of the E2DRIVER Methodology, which is a sort of guide for trainers that allows the replication of the designed training programmes to future experiences.

6 ANNEX I: GUIDE FOR TRAINERS

E2DRIVER Methodology: A guide for trainers.

Effective designing of Capacity Building Programmes on energy audit and energy efficiency tailored to particular companies and enterprises in the automotive supply sector.

E2DRIVER H2020 project

MAIN AUTHOR: E2DRIVER CONSORTIUM

DISSEMINATION LEVEL: PUBLIC

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1 INTRODUCTION.

The automotive value chain is composed by a small number of large original equipment manufacturers (OEM) and a tiered structure of suppliers dominated by a large number of SMEs, which **consumes about 88-92% of the total energy required** in the process[1]. Being aware of this reality and the fact that those SME are not forced by law to perform energy audits, it is highly important to ideate a scheme that encourage those companies to implement energy efficiency measures that reduce their consumption of energy and, consequently, their greenhouse gases emissions. Furthermore, it is necessary to show them that these measures will impact clearly in economic terms, since their financial savings could be significant.

The **solution** provided by E2DRIVER consists of the implementation of several E2DRIVER Capacity building programmes in different small and medium enterprises (SME) from the automotive sector. To do so, the project has created an E2DRIVER Platform that will allow to perform a blended learning by following the **Ontological Flip Teaching** approach.

In this context, this document looks for being the **reference document for trainers** in order for them to understand the approach of the E2DRIVER project and how to implement the expected capacity building programmes. This guide is a manual that will be fundamental for the daily work of the trainers of the projects, as well as for the expected experts that will replicate this methodology after the project lifetime. Here, they can find a clear explanation of the E2DRIVER Methodology, how the trainings should look like and how to use the platform. **Ultimately, trainers can learn in this training how to create a customized training about energy efficiency and energy audits and how to implement it.**

[1] Susana G. Azevedo, Kannan Govindan, Helena Carvalho, V. Cruz-Machado, „*Ecosilient Index to assess the greenness and resilience of the upstream automotive supply chain*“, Journal of Cleaner Production, Vol.56, 2013.

1.1 E2DRIVER and project results.

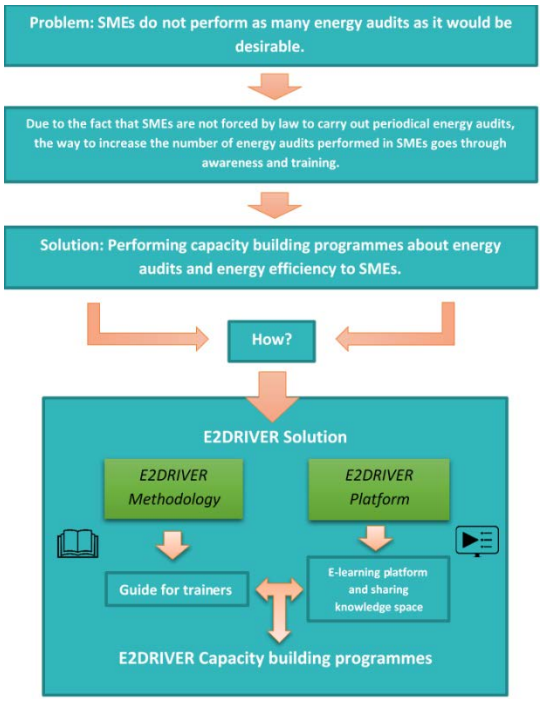

Figure 1. E2DRIVER Solution.

The goal of E2DRIVER project is to generate a training Methodology and an e-learning Platform that enable to make **SMEs** from the Automotive sector **fully aware** of the **benefits** of the **energy audits** and the implementation of their recommendations. In legal terms, SMEs are **not forced** by law to perform an energy audit (in contrast to large companies). Therefore, awareness and training are key to encourage this kind of companies to carry out this analysis.

Considering that, E2DRIVER project seeks to create:

- a **Methodology**, as a guide for trainers, that allows the generation and execution of customized Capacity building programmes about energy efficiency and energy auditing and
- a **collaborative-cooperative Platform** that brings life to the Methodology and that constitutes an e-learning tool and a knowledge sharing-space to execute those trainings.

These two outcomes are the **results of the project**. Therefore, the Platform, as a tool, and the Methodology, as a guide for trainers, constitute the tools which could be replicated in future training actions based on E2DRIVER.

1.2 What is the E2DRIVER Methodology?

E2DRIVER Methodology is a **way of generating and executing Capacity building programmes** about **energy audits** and **energy efficiency adapted** to the **needs** and **interests** of the Automotive sector's companies. This is achieved through the use of **innovative pedagogical approaches**, such as the Ontological Flip Teaching[2] and high interactive exercises and lessons.

E2DRIVER Methodology is an abstract result of the project, an **intangible result**. This may be problematic, due to the fact that is easier to identify a result when it is physical, such as an equipment or a software. Doing an effort to facilitate the identification of it as a result, E2DRIVER wants to present the Methodology as a **guide**, a handbook for those trainers that want to generate a Capacity building programme with the features of the E2DRIVER. This guide will mainly include:

- An explanation of the **characteristics** of the **E2DRIVER Capacity building programmes**.
- How these E2DRIVER Capacity building programmes can be **generated.**
- **Functionalities of the platform**, (how it looks like and how it works).

[2] Fidalgo-Blanco, Á., Sein-Echaluce, M. L., & García-Peñalvo, F. J. (2018). Ontological flip teaching: A flip teaching model based on knowledge management. Universal Access in the Information Society, 17(3), 475–489. doi:10.1007/s10209-017-0556-6

- **How to teach** in a training that follows the E2DRIVER Methodology.

1.3 What is 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/

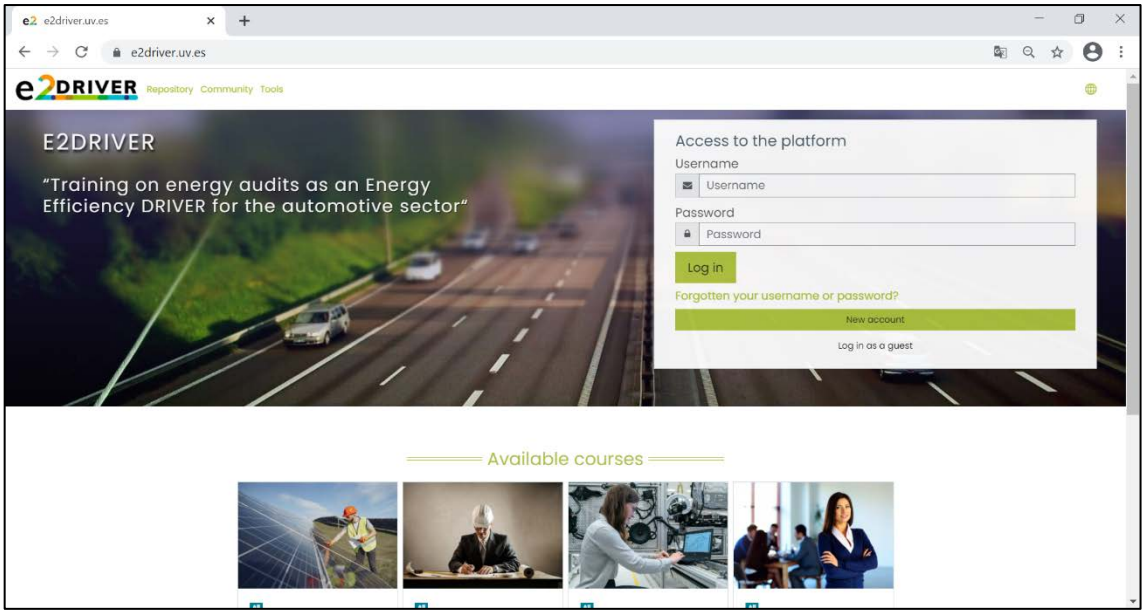

Figure 2. Log in page of the E2DRIVER Platform.

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.

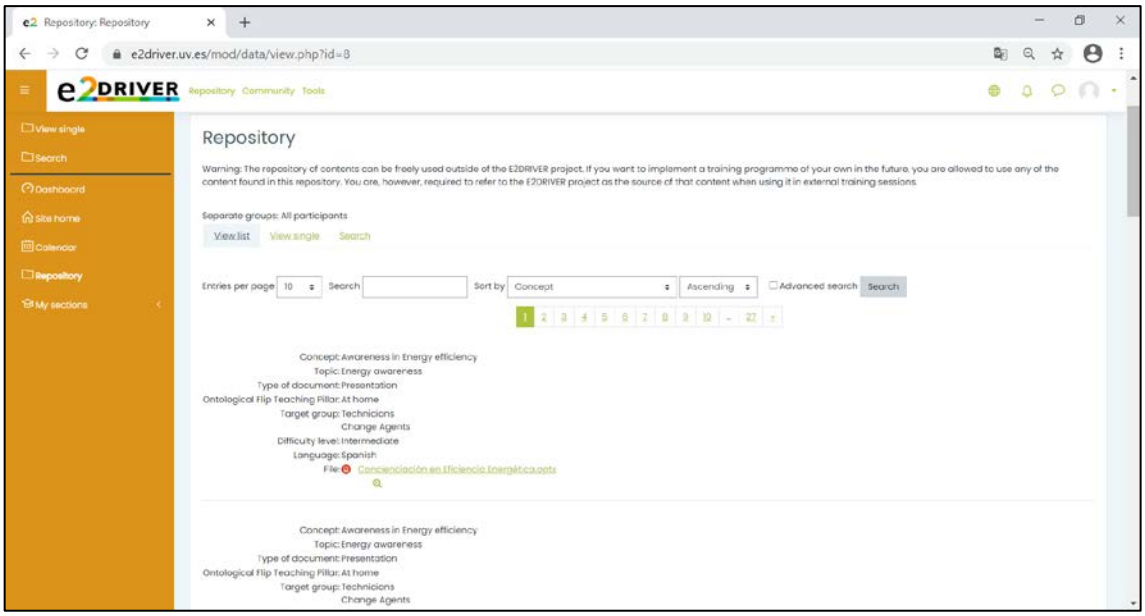

Figure 3. Repository of the E2DRIVER Platform.

(2) **E-learning part,** where trainees can consult the units of their E2DRIVER Training.

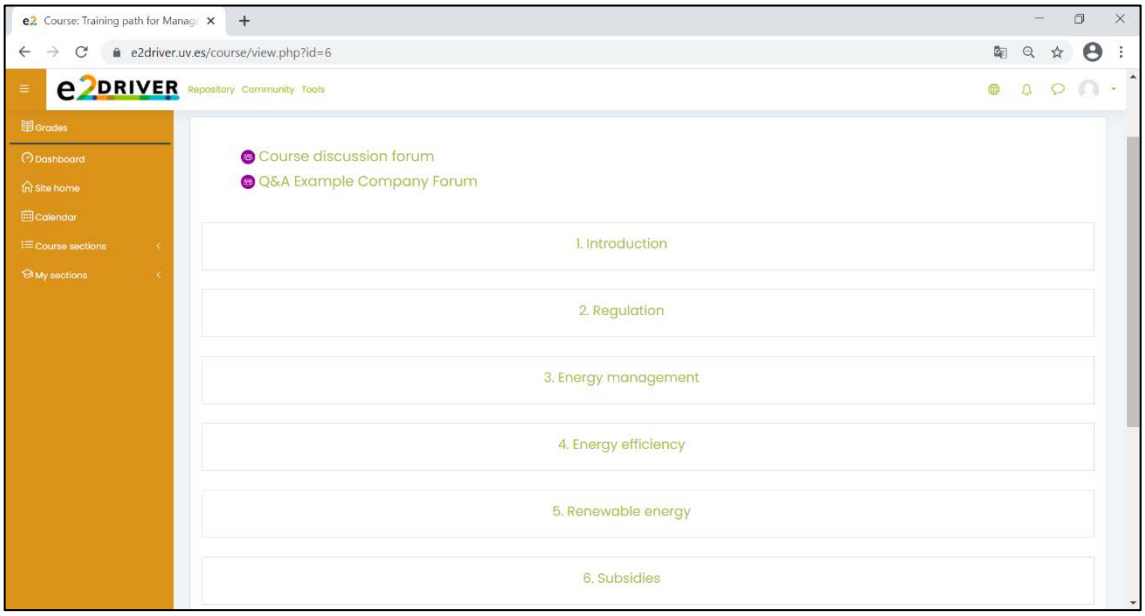

Figure 4. Index of the training path for Managers.

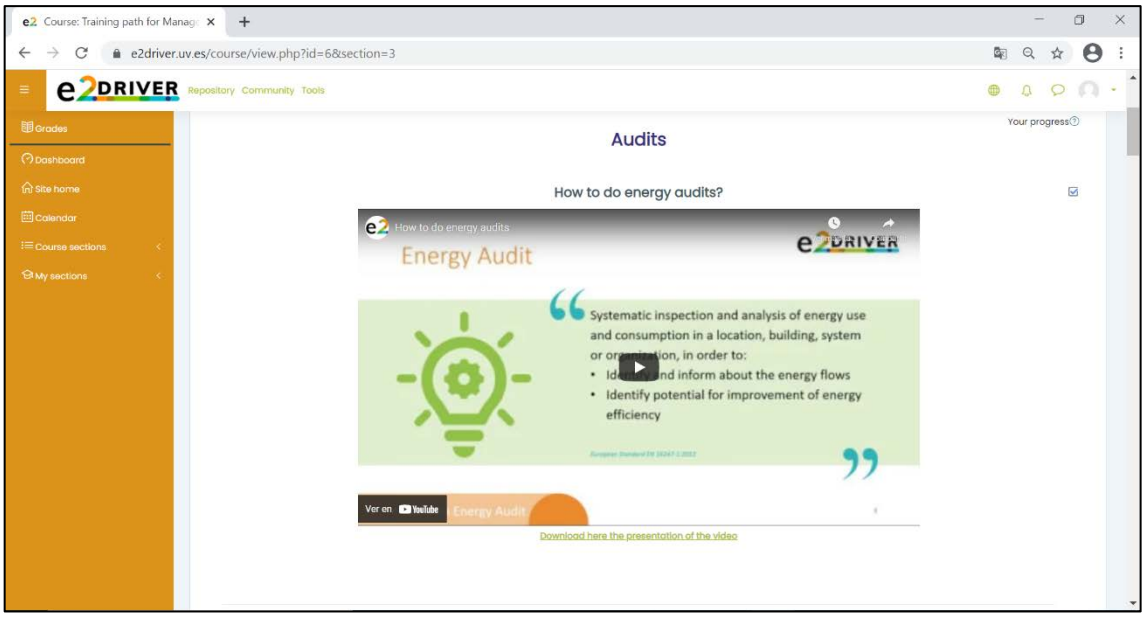

Figure 5. Previsualization of the contents in the training path for Managers.

(3) **E2DRIVER Community**, where trainees, trainers, external experts, financial entities, etc. are able to share ideas, news and create networking.

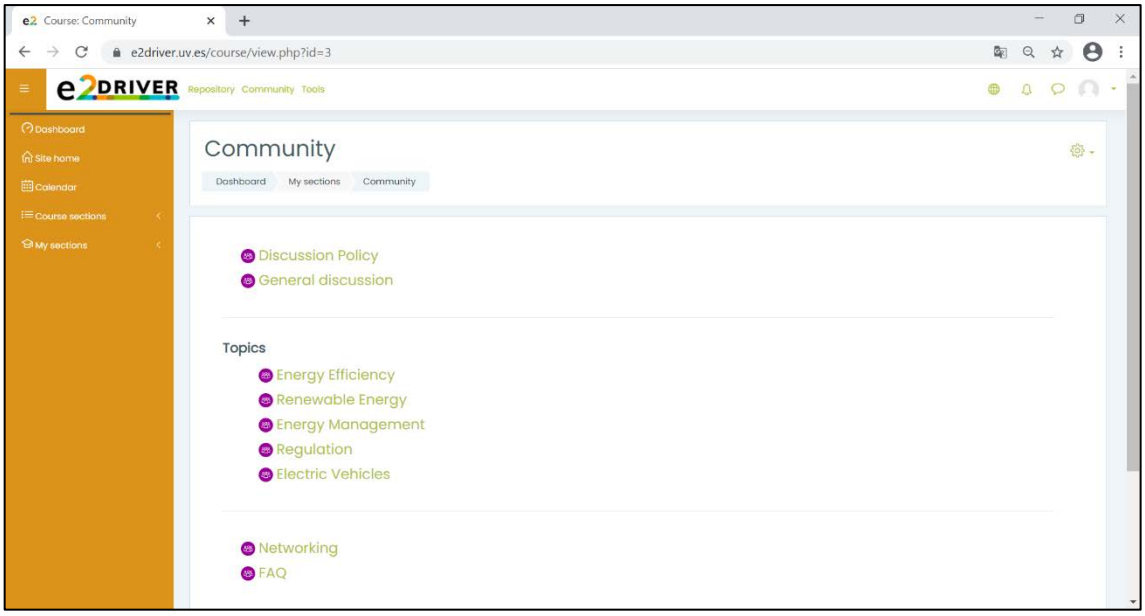

Figure 6. E2DRIVER Community structure.

(4) At least three tools for pedagogical and methodological purposes will be defined: The **Energy Audit Self-Assessment Tool**, the **Financial Tool** and the **Virtual Reality tool.**

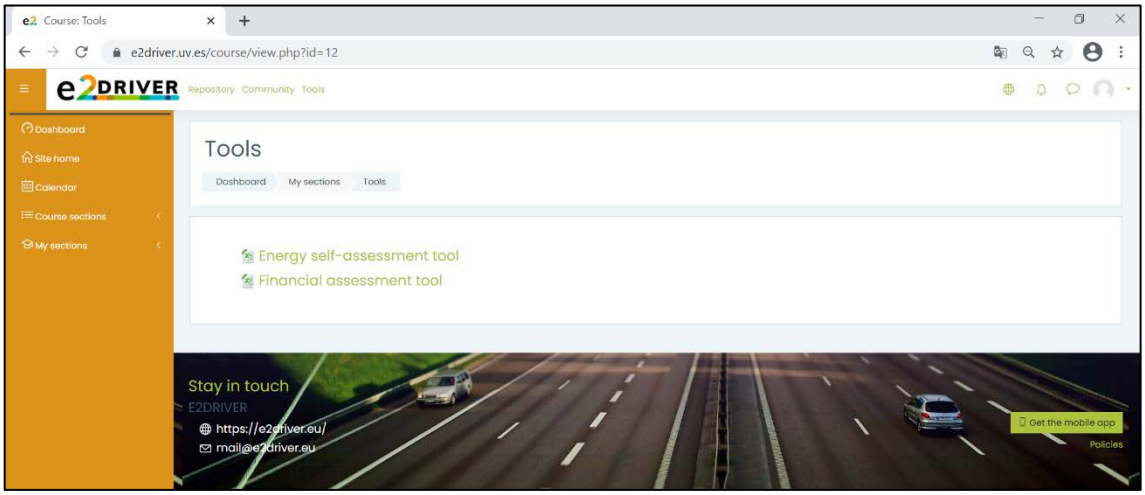

Figure 7. View of the E2DRIVER Tools section in the Platform.

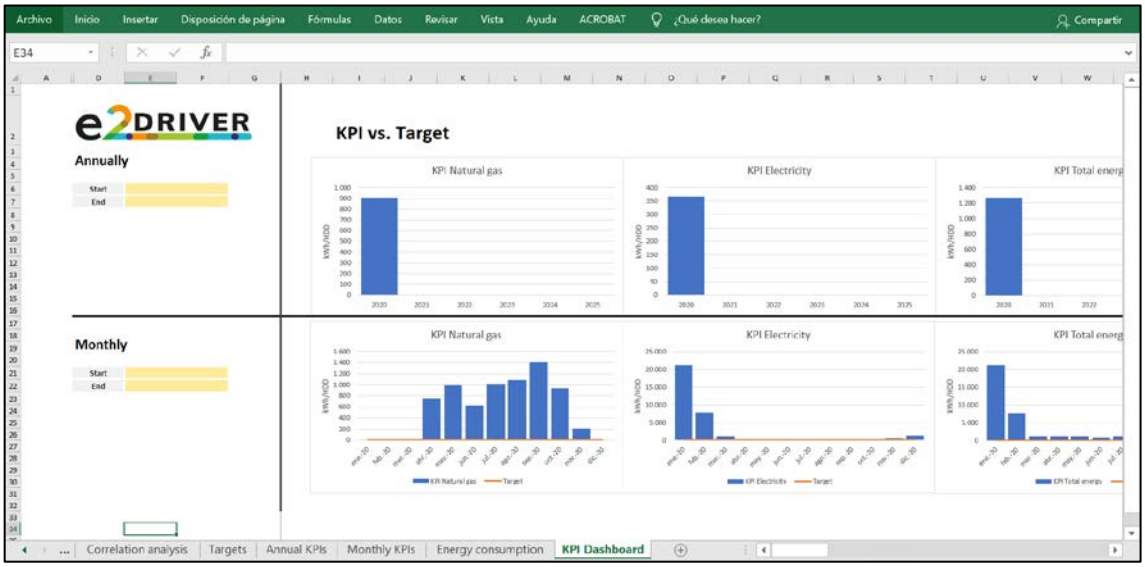

Figure 8. Energy Self-Assessment Tool.

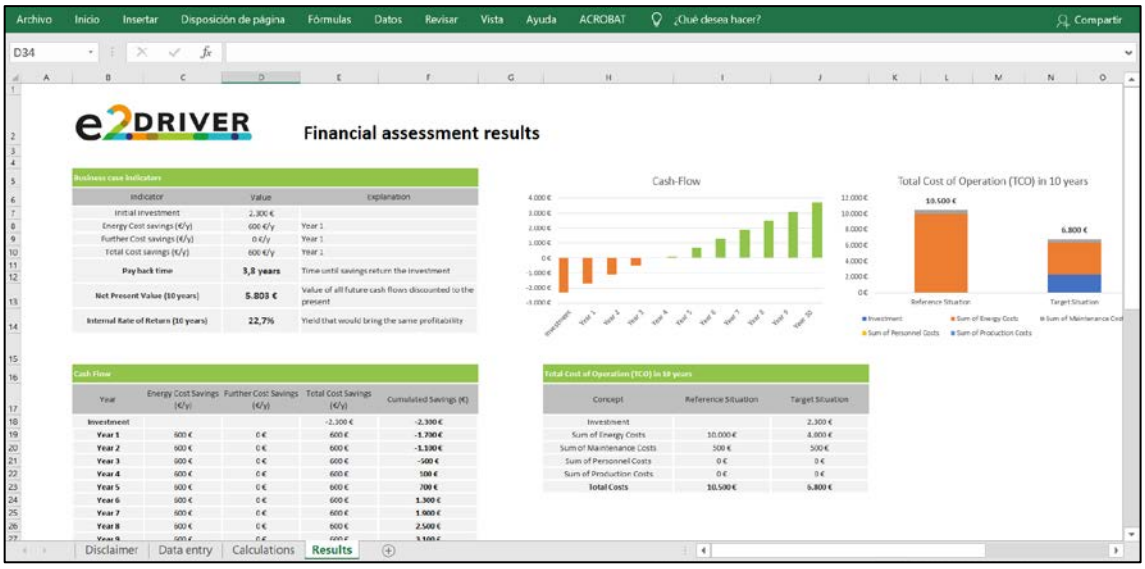

Figure 9. Financial Assessment Tool.

Figure 10. E2DRIVER Virtual reality.

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.

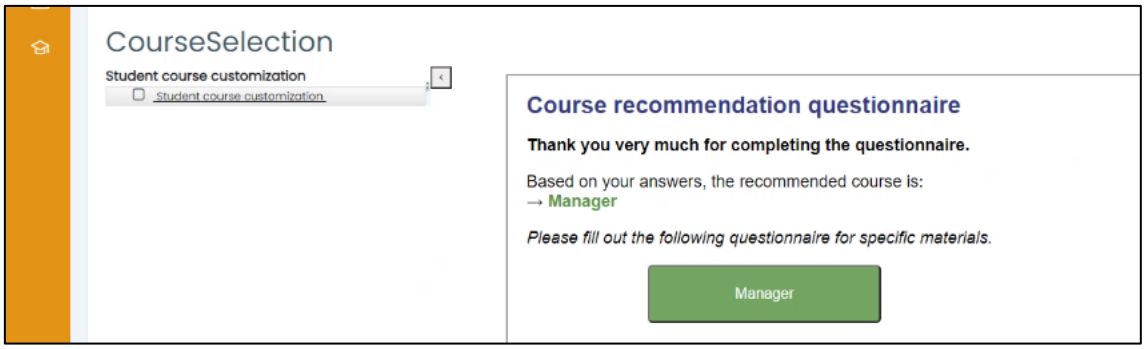

Figure 11. View of a result of the questionnaire. This trainee has been classified as "Manager".

Figure 12. The four training paths available in E2DRIVER Platform.

2 CHARACTERISTICS OF THE E2DRIVER CAPACITY BUILDING PROGRAMMES.

The E2DRIVER Methodology looks for the generation of **non-traditional training** where the **customization** of the training to the needs and interests of the trainees is key. The Methodology uses a pedagogical approach of the **Ontological Flip Teaching** and integrates several **interactive technologies** and tools in order to increase the immersive experience of the trainee (virtual reality).

In this section, all these innovative approaches are explained, showing **the type of training that E2DRIVER project seeks to implement**.

2.1 Customized training.

The Customization is linked with how the E2DRIVER Capacity building programmes are created[3], since the customization step is **a key part of the generation process**. Furthermore, the **customization** can be considered as the cornerstone of the E2DRIVER project. The whole approach is based on the concept that hears **the demands of the trainees** in order to know their needs and interests and, thus, be able to offer capacity building programmes in line with their expectations. In that sense, it is necessary to accept that **trainees are not a passive being** in the learning process anymore and to recognize the potential this new reality has.

The term **customization** is normally linked with other concepts that are used as synonyms, such as adaptive learning, personalized learning, differentiated learning or training ad-hoc. At this point, it is important to clearly define what is expected to be performed in E2DRIVER Project.

There are several pedagogical paradigms that assume the generation of specific training itineraries for different trainees by taking into account different variables. According to the Observatory of Educational Innovation of the *Tecnológico de Monterrey*[4], there are three main types of training that avoid the approach of "one size fits all":

- **Differentiated learning** "is considered a personalization, involving the development of different routes through which students will gain knowledge" (Edu Trends Report (English version), 2014, p. 4).
- **Personalized learning** "includes diagnostics to determine students' needs in order to offer a customized solution" (Edu Trends Report (English version), 2014, p. 4).
- While **Adaptive learning**, according to aulaPlaneta, is an "educational method based on the data analytics that generate the process of learning in the trainees. It allows to modify the educational proposal in real time, personalizing them, and taking into account the performance of each student"[5]. In this approach, new technologies are key, because using computer data systems, the training process is able to adapt the training contents and to identify what

[3] See section 3.5.1.

[4] Edu Trends Report. July 2014. *Adaptive learning and testing.* Observatory of Educational Innovation. Tecnológico de Monterrey. https://observatorio.tec.mx/edutrendsaprendizajeadaptativo

[5] El aprendizaje adaptativo en diez preguntas [Infografía]. (2020). Retrieved 31 August 2020, from https://www.aulaplaneta.com/2017/05/19/recursos-tic/el-aprendizaje-adaptativo-en-diez-preguntas-infografia/

is needed by a trainee in a specific moment in order to continue their academic progress with a successful result[6].

The customization approach followed in E2DRIVER project does not exactly fit within these paradigms. E2DRIVER looks for a **personalized learning** of automotive SME by analysing their needs and interests. However, since the E2DRIVER Platform constitutes a key pillar of the training and the fact that some kind of automatic customization is implemented because of the embedded algorithm in the platform, it can be considered that this project contains some of the **adaptive learning** features .

As it was previously defined in Task 2.4 – *Capacity building programme format*, E2DRIVER will design a Capacity building programme for each company. This E2DRIVER Capacity building programme will be composed by one **E2DRIVER Adjustment session**, several **E2DRIVER trainings** and one **E2DRIVER Virtual reality session**. By default, all E2DRIVER Capacity building programme will count with one E2DRIVER Adjustment session (for methodological reasons) and one non-customizable E2DRIVER Virtual reality session. Therefore, **the customization potential lies in the E2DRIVER trainings**[7].

The **customization** of this E2DRIVER training is possible thanks to two main mechanisms in the project:

- On the one hand, the **E2DRIVER Adjustment session** will enable the experts of the project to obtain information about the preferences of the companies, being possible to perform changes about the duration of the training and the activities of the on-site part of the training.
- On the other hand, the customization of the online part of the training is not possible to be performed manually by the experts after the E2DRIVER Adjustment session. In contrary, E2DRIVER project has designed an **automatic scheme** that, thanks to the algorithm, enables the customization of the online part of the training. Thus, the first time the trainees log in in the platform must complete a **questionnaire** that will classify them in one of the training groups: *Managers, Scientific and Engineering professionals, Technical managers, Technicians and Change agents*.

Because of these two mechanisms, the project can adjust the E2DRIVER Capacity building program to the needs and interests of the companies.

2.2 Ontological Flip Teaching.

The other big pillar of the E2DRIVER training is the **Ontological Flip Teaching**[8] (hereinafter "OFT"). This refers to the pedagogical approach that will be implemented in the courses developed by the project. This approach is based on the concept that individual experiences and knowledge can become **collective** if managed properly. For that reason, this paradigm has ideated a whole process that enables the

[6] Edu Trends Report. July 2014. *Adaptive learning and testing.* Observatory of Educational Innovation. Tecnológico de Monterrey. https://observatorio.tec.mx/edutrendsaprendizajeadaptativo

[7] For further information about E2DRIVER Training, consult Deliverable 2.4 – *Capacity building programme format*. http://e2driver.eu/wp-content/uploads/2020/06/E2DRIVER_D2.4_Capacity-building-programme-format_29.05.2020_CIRCE.pdf

[8] Fidalgo-Blanco, Á., Sein-Echaluce, M. L., & García-Peñalvo, F. J. (2018). Ontological flip teaching: A flip teaching model based on knowledge management. Universal Access in the Information Society, 17(3), 475–489. doi:10.1007/s10209-017-0556-6

socialization of the trainees and, consequently, the generation of "explicit" knowledge that can positively impact in the **collective intelligence** of a group.

2.2.1 What is the Ontological Flip Teaching?

OFT can be considered as a **new flipped teaching approach** that integrates elements from the theory of **organization knowledge creation** of Nonaka and Takeuchi[9] .

Flipped teaching model encourages the benefits that provides "to flip" the model traditionally used in training since the education was institutionalized. Instead of a paradigm where the trainer unidirectionally transfers knowledge to trainees by using a master class, flipped teaching encourages that the internalization of the knowledge is performed *at home*. This means that trainees consult the contents prepared by the trainer, and the dynamic part of the training, the exercises and hands-on, is moved *to class*. In summary, the **Flipped Learning Network** defines this model as:

> *"Flipped Learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter."*[10]

Regarding the approach of Nonaka and Takeuchi (1995), in the **theory of organization knowledge creation** where they address the point of the knowledge generation inside a human organization, they explain that there are four main steps in the production of organizational knowledge where several types of relationship between the knowledge and the individuals or groups are set[11]:

- **Exteriorization**: the knowledge and experience of a specific person could become articles, papers or other explicit expression.
- **Interiorization**: a specific person could acquire knowledge by reading an article, a paper or other explicit content.
- **Socialization**: the knowledge of each person could be shared among a group of people.
- **Combination**: several explicit knowledge contents can be used in order to produce other explicit knowledge.

Thus, happening these four phenomena, new knowledge could emerge in an organization. However, they also remark the importance to consider the point about how the individual knowledge becomes a collective one. This can be linked with the **ontological dimension** of this theory[12] where it "raises the idea that the knowledge created by the individuals of the organization must be transformed into a collective or organisational knowledge" (Fidalgo-Blanco, 2018, p. 3). It explains that the knowledge

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[9] Nonaka, I., Takeuchi, H.: The Knowledge Creating Company: How Japanese Companies Create the Dynamics of Innovation. Oxford University Press, New York, NY (1995)

[10] Definition of Flipped Learning - Flipped Learning Network Hub. (2019). Retrieved September 14, 2020, from https://flippedlearning.org/definition-of-flipped-learning/

[11] Fidalgo-Blanco, Á., Sein-Echaluce, M. L., & García-Peñalvo, F. J. (2018). Ontological flip teaching: A flip teaching model based on knowledge management. Universal Access in the Information Society, 17(3), 475–489. doi:10.1007/s10209-017-0556-6

[12] Fidalgo-Blanco, Á., Sein-Echaluce, M. L., & García-Peñalvo, F. J. (2018). Ontological flip teaching: A flip teaching model based on knowledge management. Universal Access in the Information Society, 17(3), 475–489. doi:10.1007/s10209-017-0556-6

becomes collective through four steps: conceptualization, consolidation, distribution and combination[13]. This "ontological" part, together with the four steps for creating new knowledge, could be consider the two key points of the Theory of organization knowledge creation that is instrumentalized in the **OFT.**

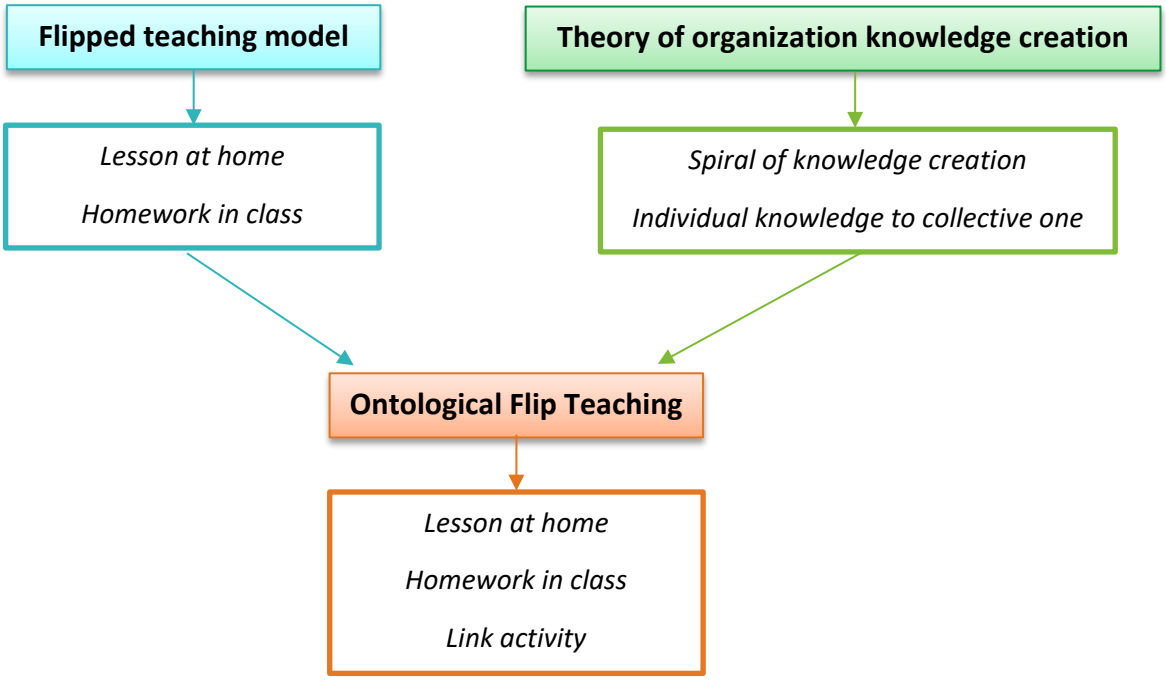

Figure 13. Configuration of the Ontological Flip Teaching.

Considering the origin explained before, the methodological justification and the inputs provided by the Flip Teaching model and the Theory of organization knowledge creation, the features of the **Ontological Flip Teaching** can be summarized as follows.

First of all, it is necessary to remember that this approach is part of the "Flip teaching" family, so, as this paradigm remarks, the **OFT** internalizes the need to maintain the scheme of "**Lesson at home**" and "**Homework in class**". However, considering the theory of Nonaka and Takeuchi, a basic Flip Teaching approach only includes the **interiorization** and **socialization** part of the steps for creating new knowledge[14]. Being aware of this limitation, **OFT** goes beyond and includes the rest of processes: **exteriorization** and **combination**. This is performed by including a ***link activity*** "in which students carry out academic work based on the teacher's video and the complementary material" (Fidalgo-Blanco, 2018, p. 5). Thus, the combination and exteriorization would be included in the scheme, as well as the part that constitutes the ontological dimension of the Theory of Nonaka and Takeuchi. Finally, in order

[13] Fidalgo-Blanco, A., Sein-Echaluce, M.L., García-Peñalvo, F.J.: Epistemological and ontological spirals: from individual experience in educational innovation to the organisational knowledge in the university sector. Program 49(3), 266–288 (2015). doi:10. 1108/PROG-06-2014-0033

[14] Fidalgo-Blanco, Á., Sein-Echaluce, M. L., & García-Peñalvo, F. J. (2018). Ontological flip teaching: A flip teaching model based on knowledge management. Universal Access in the Information Society, 17(3), 475–489. doi:10.1007/s10209-017-0556-6

to achieve the objective of increase the organizational knowledge, the **OFT model** explains the importance of taking advantage of these academic work in **future editions** in order to use them as training materials and, thus, achieving, the collective increase of skills.

Interiorization phase: ***Lesson at home*** *(Online lessons)*	**Combination and exteriorization phase:** ***Link activity*** *(Academic work)*	**Socialization activity:** ***Homework in class*** *(Face-to-face sessions)*
•It constitutes online lessons. •This is the part where trainees consult and learn the theoretical contents of the course. •Use of short videos of about 10 mins. •Complementary resources and web references. •Forum for questions and doubts. •In this phase, the trainers should explain trainees the *Link activity*. •In this part is used the academic works made by former trainees in past editions: it should be presented in a document and a video where all the past results are presented.	• "The main objective is for students (either individually or in groups) to perform a task that, on the one hand, is an application of what has been done in the interiorization phase and, on the other hand, provides results that will be later used as a didactic resouce to promote socialisation in the classroom activity" (Fidalgo-Blanco, 2018, p. 7). •*Link activity* constitutes a self-learning transition from "*Lesson at home*" to "*Homework in class*" where both trainers and trainees have an active role. •Trainer will suggest / stimulate / support trainees in the realization of the academic work. •Trainees may ask for support to trainers and doing extra researchers/trying to apply the learned lessons into the work context.	•This part will contitutes the on-site part of the training. •Solving of doubts. •Collaborative exercises. •Debates. •Discussion about the *Link activity*.

Figure 14. The three steps of the Ontological Flip Teaching. (Source: Proprietary with information from Fidalgo-Blanco, 2018).

In Figure 14, it is possible to appreciate the three main parts of the Ontological Flip Teaching where it is explained in general what should be performed by the trainees at home, the exercises to perform in class, as well as the link activity that could integrate totally the theory of the organizational knowledge creation.

2.2.2 How will the Ontological Flip Teaching be implemented in E2DRIVER project?

E2DRIVER project has created a methodology and a platform that boost the automotive sector **collective intelligence** on energy efficiency. This is the reason why this methodology is chosen. **OFT** mixes the benefits of the last pedagogical approaches with elements that allow to create organizational knowledge. This approach is not only focused on the improvement of the skills of each trainee by considering them as individual and isolated elements. This approach emphasizes the importance of creating a collective knowledge, shared by different individuals. On the same way, this project is not solely focused on the skill's need of a person, as it confronts the issue by being aware that the lack of knowledge about a correct energy management and the social and environmental consequences are a **collective problem.** In this sense, it increases the knowledge of the whole automotive sector about energy efficiency and about the importance to perform energy audits.

The innovative part of this project is that the collective target is a whole sector, the automotive sector. The theory of organizational knowledge creation was designed for companies, while the OFT is focused on a class. E2DRIVER tools maintain the approach of the OFT, but they look for the ambitious goal to perform an impact in the whole sector. This is the reason why E2DRIVER creates a scheme of knowledge-sharing between different companies. Thus, the energy efficiency could be improved in all of them, with their consequences in economic, social and environmental level.

Following the three-pillars scheme of the **OFT** (see Figure 3), the **E2DRIVER Trainings**[15] will have a blended learning format[16] with the following scheme (notice that the names of the pillars have varied in order to be adapted to the E2DRIVER reality):

- **Online lessons**[17]**:** E2DRIVER platform will enable trainees to consult all the training materials that they should internalize in order to increase their knowledge about energy efficiency and energy audit (*Interiorization*). The contents are composed by short videos, documents and exercises. Furthermore, a forum for sharing questions and doubts can be used
- **Link activity**: during the "Online lessons" execution, trainers can suggest activities that each trainee will have to prepare (*Exteriorization*). For making this academic work, they could consult the contents of the course and complementary contents that they could find or that trainer could provide to them (*Combination*). These academic works will be useful for dynamizing the "On-site class", since trainees could discuss about their results and the debate would be possible (*Socialization*).
- **On-site class**[18]: this event is thought to be a face-to-face class (*Socialization*), where trainers could explain the points they would like to remark (coaching, mentoring, behavioral, cultural and organizational aspects); where they could discuss about the topic of the academic work that they should prepare in the context of the link activity; and where they could talk about specific aspects of the company.

With this scheme, the **four steps** of **knowledge creation** are set inside E2DRIVER Trainings. Trainees will be able to ***internalize*** the theoretical contents online; they will be able to ***express*** what they have learnt in an academic work[19] and to ***combinate*** contents from several sources as well; and they will be able to ***socialize*** and, consequently, share the knowledge between them in a face-to-face session.

Finally, in order to ensure that effectively the new knowledge created in this process becomes public, the trainers should check the quality of the academic works of the trainees and keep them in the public

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[15] See section 3.4 and Deliverable 2.4 – *Capacity building programme format.* http://e2driver.eu/wp-content/uploads/2020/06/E2DRIVER_D2.4_Capacity-building-programme-format_29.05.2020_CIRCE.pdf

[16] With the exception of the E2DRIVER Training for Technicians that should be 100% face-to-face if possible (See section 3.4.2.4. and Deliverable 2.4 – *Capacity building programme format.* http://e2driver.eu/wp-content/uploads/2020/06/E2DRIVER_D2.4_Capacity-building-programme-format_29.05.2020_CIRCE.pdf

[17] This refers to the "Lesson at home" pillar of the OFT. However, the name of this pillar is different in E2DRIVER project in order to remark the „online" essence of this part and to highlight that this part should not be performed strictly speaking "at home". Ideally, trainees will count with some hours in the work for consulting the platform and learn the lessons.

[18] This refers to the „Homework in class" pillar of the OFT.

[19] The academic work will be performed individually. However, different groupal approaches could be considered taking into account each case.

repository[20]. Thus, **all this new knowledge can be used in other trainings** and it can be consulted by the rest of the automotive sector's participants. Only then, the scheme of collective intelligence increase can start.

In any case, it should also be borne in mind that a large number of link activities are likely to use sensitive company information, in which case the exercise clearly cannot be made public. However, it should be noted that **this does not limit the potential of these exercises to increase the collective intelligence of the sector**, as these lessons learnt will enable trainers to identify key points for improvement that can be applied in an abstract way to other trainers.

[20] Being aware in all cases the importance that these academic works do not show personal data or sensitive information of the company.

3 E2DRIVER CAPACITY BUILDING FORMAT.

Taking into account all these characteristics explained before, the features of the E2DRIVER Capacity building programme is presented in this section.

An "**E2DRIVER capacity building programme**" is a training plan for a company. As in the next figure (Figure 15) can be seen, it is composed by one "E2DRIVER adjustment sessions", one or more "E2DRIVER trainings" and one closing "E2DRIVER virtual reality session".

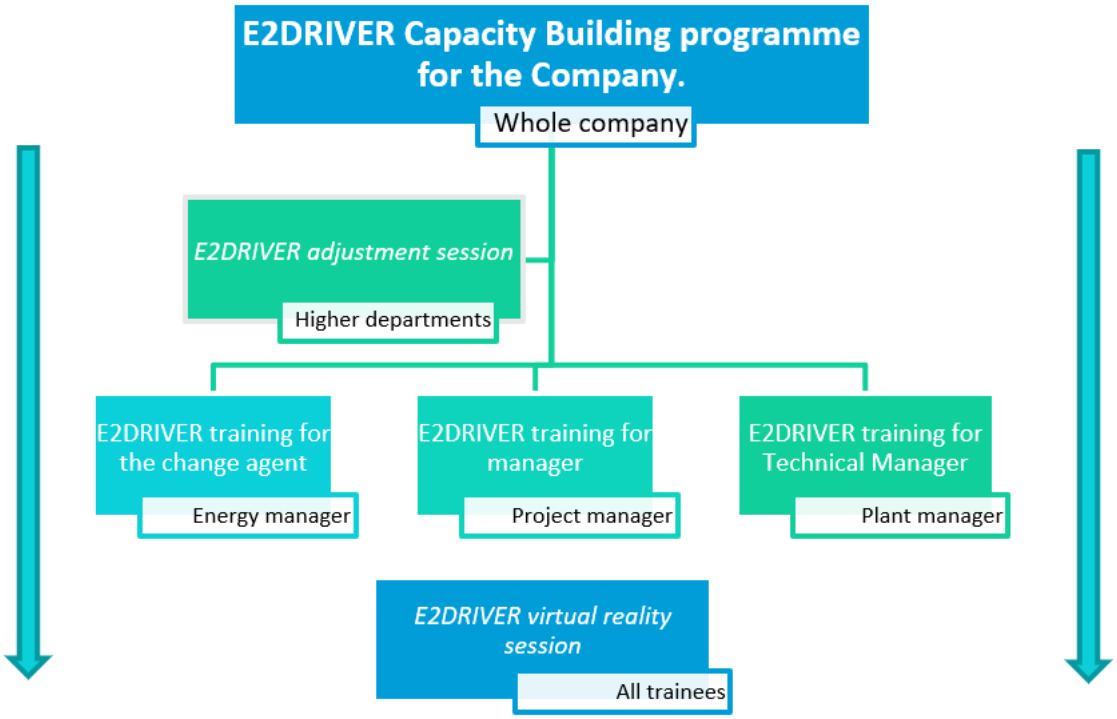

Figure 15. Example of the structure of one E2DRIVER Capacity building programme.

The "E2DRIVER adjustment session" is in charge of ensuring the correct **customization** of the E2DRIVER capacity building programme of the company, looking for the best adaptation of the several "E2DRIVER trainings" to the **needs and interests** of each target group. Once the "E2DRIVER trainings" are perfected, they can be implemented. Finally, the closing session will be focused on the virtual reality.

3.1 E2DRIVER Adjustment session (5 hours)

E2DRIVER Adjustment sessions	
Objective	(1) To show energy audits benefits and (2) to perform the final adjustment.
Duration	5 hours.
Mode	Face-to-face.
Type of training	Meeting.
Topic	(1) Benefits of energy audits and energy management and (2) final adjustment of E2DRIVER Capacity building programme.
Target	Higher department of the company and the energy/maintenance manager.

Table 1. E2DRIVER Adjustment session.

After a preliminary customization of the training, the first contact with the companies will be performed through the **E2DRIVER adjustment session,** in order to verify their training needs and adjust the final version of E2DRIVER Capacity building programme that will be tailor-made for each pilot/replication company. Each company will hold one of those sessions with an expected duration of **5 hours**. They are **not a training strictly speaking**. In spite of the fact that some information about the benefits of the energy audits and energy efficiency will be provided with the purpose to encourage company to implement a correct energy management and to perform an energy audit, the final objective of these sessions is to **put the finishing touches** to the E2DRIVER Capacity building programme designed by the project for the company. Therefore, these sessions constitute the last step of the **customization** process where the project will be able to collect more information regarding the needs, expectations and interest of the company thanks to the inputs from the higher departments.

Regarding the format of those **E2DRIVER adjustment sessions**, considering the limited time available of the expected target groups, it is appropriate that this type of session would be **tight** and enclosed in **only one day**. During their execution, trainers should be **patient** and **flexible**, since continual interruptions are likely to happen due to the nature of the work of the expected attenders: managers and direction. Sometimes, they may be forced to absent for a while in order to attend another meeting or to answer a call or another possible event.

On the other hand, it is advisable that this session is divided into **four main parts**:

(1) Firstly, the trainer(s) or E2DRIVER expert(s) will explain some key points about the **assessment** performed in the specific company, sharing with the attenders the results of the analysis performed during the characterization of the enterprise. The E2DRIVER experts will show the results of the energy assessment, the data obtained in the technical and non-technical measuring, as well as the data obtained in the surveys, interviews and meetings performed during customization phase. Thanks to this explanation of the main results obtained, the company's higher departments could express their opinion and considerations, being possible to know if the company's view that E2DRIVER project has, is **complete** and **correct**.

(2) Secondly, taking advantage of the first part where the company assessment is explained, the E2DRIVER expert(s) could present the **benefits of the energy audits**. Hence, the company's higher departments are able to see the benefits of having **energy audits** regularly and of implementing a correct energy management system.

(3) The third part of the session is expected to be the most **dynamic** one. The purpose is to encourage attenders to share with the group their opinion regarding the expected training planned. For getting that, first, the E2DRIVER expert(s) will present the E2DRIVER Capacity building programme designed. Afterwards, the attenders will express their opinions about it, providing **feedback** about the most appropriate format, changes in the topics addressed or whatever other considerations could be improved.

(4) Finally, once the whole session has been completed, the E2DRIVER expert(s) will explain the conclusions and the general ideal of the expected **E2DRIVER Capacity building programme**. As far as it is possible, the experts would include in the conclusions the points and feedback collected during this session.

Once the **E2DRIVER adjustment session** is over it is expected for the attenders to be more **aware** of the benefits that energy audit and energy management provide to an industry Regarding the E2DRIVER expert(s), they should have gathered the very last **inputs** from the company to put the finishing touches to the capacity building programme. If both points are achieved, the E2DRIVER adjustment session will be successfully developed.

As last step, it is important to send the **final version of the E2DRIVER Capacity building programme** to the company in order to get the **final validation**.

3.2 E2DRIVER Training (2-20 hours).

E2DRIVER Trainings	
Objective	(1) To train companies' staff and (2) to improve the collective intelligence of the sector.
Duration	Among 3-25 hours. Depending on the target group.
Mode	Face-to-face and online.
Type of training	Online and face-to-face or only on-site. Depending on the target group.
Topic	Not fixed. It depends on the target group.
Target	Companies' employees.

Table 2. E2DRIVER Trainings.

In general, the E2DRIVER training (Table 2) will have a maximum duration of 20 hours with 10 hours of online training, a face-to-face practical class of 5 hours, 4 hours of autonomous work and 1 hour of virtual reality. However, this will vary depending on the target group.

The objectives of these **E2DRIVER training** plans for the companies is two-fold: (1) to **train** employees in energy efficiency and energy audit topics and (2) to improve the **collective intelligence** of the automotive sector. The first one can be achieved thanks to the organization and implementation of the training actions. As for the second one, the use of the Ontological Flip Teaching[21] as a main methodology of the project is critically important in order to catalyse the beginning of the collective intelligence continual progress up.

Regarding the topics addressed during these sessions, the trainee will receive knowledge about **technical** and **non-technical** issues, highlighting the specific state of their company and doing an effort to **contextualize** the acquired knowledge in order to make it applicable to their workplace. In line with that, employees will be trained on **energy efficiency** issues with insights from **behavioural**, **cultural** and **organizational** perspective[22]. In addition, the trainers will address motivating contents as well, trying to transfer employees the need to have a responsible behaviour during their work in the field of energy and environmental. They should be fully aware their actions have economic effects on their company, social consequences and environmental impacts.

[21] See section 3.3.2. – Ontological Flip Teaching.

[22] E2DRIVER Grant Agreement. Part B. Page 17

In general, the format of the E2DRIVER Training consists of three parts: **online** lessons, one **face-to-face** session and **the link activity** that has previously been defined in the Ontological Flip Teaching section.

Regarding the contents that are addressed in each part, these have an important methodological stamp. The **Ontological Flip Teaching** remarks that all the **theoretical** contents and all the activities that each individual can perform by their own should be place out of face-to-face classes using **online** tools or other types of training tools. Meanwhile, the **practical exercises** and dynamics which have a collective essence should be place **in class**, fostering the collaborative way of work.

For that reason, all the **theoretical** aspects about the **energy efficiency** (energy audits, energy management, energy efficiency in thermal and electrical processes and energy monitoring systems) and about **organization** will be addressed during the E2DRIVER training in **online** format by using the **E2DRIVER platform**. Meanwhile, in **class**, the trainers will be focused, on one hand, on **motivating**, **behavioural** aspects and **communication** skills[23] and, on the other hand, on the **specific state** of the company, trying to make employees aware about which is the situation in their case, which are the most appropriate changes and **energy measures** that should be implemented and which is the **role** that each one must play in order to achieve a successful change in the company. This last face-to-face lesson must be **practical** and **interactive**[24]. Furthermore, it is expected that trainees discuss about the **link activity** that was suggested by the trainer.

Finally, as mentioned, it is important to highlight that the Ontological Flip Teaching has this third pillar of **Link activity** that aims to increase the **collective intelligence** of the automotive sector by suggesting trainees to make academic work susceptible to be used in future training editions. The purpose of this part is that trainees collaborate with the Project by generating new materials which feed the E2DRIVER repository. This will cause an increase of its resources (new knowledge) available for future trainings and, consequently, an increase of the collective intelligence of the sector and their workers one. These new contents can be shared with other trainees in case the materials have an appropriate quality. E2DRIVER platform will enable to **spread** these new contents in two levels: within the company to influence other staff of relevance for energy use and consumption, and outside the company to increase the collective intelligence on energy related issues of the automotive sector[25]. In any case, it is also important to consider the fact that the link activity is likely to be used in order to identify potential energy efficiency measures, so this could affect to the point of spreading potential. However, this doesn't change the capacity of this link activities to increase the collective intelligence of the sector as said before.

The evaluation of the trainee's performance will be assessed by a **theoretical exam** that will be hosted in the E2DRIVER platform. In addition, the trainer can consider **extra practical exercises** to be performed during face-to-face sessions.

To conclude, it must be noted that this is just a **general scheme** of an E2DRIVER training. Training's characteristics will necessarily vary depending on the company and its needs and interests. In line with

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[23] „how to communicate energy efficiency issues within the company" (E2DRIVER Grant Agreement. Part B. Page 17).

[24] E2DRIVER Grant Agreement. Part B. Page 17.

[25] E2DRIVER Grant Agreement. Part B. Page 17

that, in following subsections, the guide goes deeper. It will explain the general expected E2DRIVER training for the five main trainee's groups defined in E2DRIVER: **Managers, Science and Engineering Professionals, Technical Managers, Technician and Change agents**.

3.2.1 E2DRIVER Training for Managers.

E2DRIVER Training for Managers	
Objective	(1) To train companies' managers and (2) to improve the collective intelligence of the sector.
Duration	17 hours.
Mode	Face-to-face and online.
Type of training	10 hours using a learning platform + 2 hours of on-site session + 4 hours of autonomous work + 1 hour of Virtual reality session.
Topic	Non-technical aspects and technical aspects with high-level perspectives.
Target	Companies' managers.

Table 3. E2DRIVER Training for Managers.

This E2DRIVER training for Managers (Table 3) is expected to have a duration of **17 hours** with 10 online hours, a final face-to-face practical class of 2 hours, 4 hours of autonomous work (link activity) and 1 hour in the Virtual Reality session.

The **target group** are the **Managers** (medium or high-level managers), senior officers, managing directors in traditional management areas, such as general management, sales, marketing etc. They usually hold a graduate or post-graduate degree in management, business administration, finance, accounting etc. Generally, their background is business oriented or theoretical, while having little technical knowledge. They also participate quite often in self-educational programs in order to improve their skills, while utilizing new technologies. Their role is a priority in order to be able to carry out any energy efficiency action in the company, as their position requires them to have a global vision of the company, not only at a technical level, but also at a business level, which implies having knowledge of the potential that carrying out certain energy efficiency actions can have.

Methodologically, this type of E2DRIVER training will maintain the general structure of the **Ontological Flip Teaching model:**

- **Online lessons** (10 hours).
- **Link activity** (4 hours).
- **On-site class** (2 hours).

Regarding the distribution of the estimated times in this training path for Managers, in table 4 can be seen the time that is expected each student spends per part of the training.

TRAINING PLAN FOR MANAGERS				
Online course (10 hours)		**Link Activity**	**On-site class**	**Virtual reality session**
Slides	3,4 hours	4 hours	2 hours	1 hour
Video	0,9 hours		No work to be done in advance	No work to be done in advance
Text	2,2 hours			

TOTAL	6,5 hours
Tutorials + assimilation of concepts	3,5 hours

Table 4. Timing of the E2DRIVER Training for Managers.

In table 5, it is presented an ideal planning of 6 weeks for the E2DRIVER Training for Managers. However, it is possible (and even expected) that this planning suffers variations depending on the availability and preferences of the company (see section 3.1).

	ESTIMATED TRAINING PLANNING FOR MANAGERS				
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Week 1	1.1.1 2.1.1	3.1.1	3.1.3	3.1.4	3.1.5
Week 2	Tutorial	3.1.6	3.2.1	3.2.2	3.2.3
Week 3	3.3.1	Review	Tutorial	3.4.1	4.1.1
Week 4	6.1.1	Review of bibliography	Review of bibliography	Final Review	Tutorial
Week 5	*Link Activity*				
Week 6	*On-site session*				

Table 5. Suggestion of planning for E2DRIVER Training for Managers. *The codes refer to the resources (Table 6) that must be learnt in that day.*

3.2.1.1 Online lessons (10 hours).

The online part is performed thanks to the E2DRIVER Platform where the content is organized as a digital book. There, the student has access to the whole training materials that (s)he should learn. Below (Table 6) are the specific resources for the Managers that is hosted in that digital book.

The main goal of the training for managers is focused on **management aspects**, and the **benefits** that their company can acquire by adopting certain actions that reduce its energy consumption or that help to manage and control it. The **general energy aspects** are also included, depending on the area or department they manage, as well as general regulatory aspects.

TRAINING PATH FOR MANAGERS (online part)					
Area	**Subarea**	**Resource**	**Format**	**Duration**	**Managers**
1. Introduction	1.1 Kick-off	1.1.1. Concepts about energy	P	17 slides	X
		1.1.2. Conversion of units	T	19 pages	B
2. Regulation	2.1 Legislation	2.1.1. Country X	T	25-14 pages	X
3. Energy Management	3.1 Audits	3.1.1. How to do energy audits?	P + V	24 slides 8:05 min	X
		3.1.2. Checklist Relevant Information	T	3 pages	B
		3.1.3. Main Energy Audit steps	P	50 slides	X

		3.1.4. Development of an action plan	P	10 slides	X
		3.1.5. Measurement and Verification	P + V	31 slides 8:19 min	X
		3.1.6. EN16247:2015	P	24 slides	X
	3.2 Energy Culture	3.2.1. Targets and Goals	P + V	24 slides 7 min	X
		3.2.2. High-level positions	P + V	20 slides 7 min	X
		3.2.3. ISO 50001:2018	P + V	32 slides 14 min	X
	3.3 Monitoring	3.3.1. Best Practice on Monitoring and Benchmarking	P + V	21 slides 7:03 min	X
	3.4 Energy Contracting	3.4.1. Country X	T	44-19 pages	X
4. Energy efficiency	4.1 Energy Efficiency	4.1.1. Energy efficiency in industries and examples	P + V	21 slides. 5:24 min	X
	4.2 Electrical devices	4.2.1 Concepts about electricity	P	13 slides	B
		4.2.2. Efficiency in Engines	P	21 slides	B
		4.2.3. Efficiency in Cooling processes	P	16 slides	B
		4.2.4. Efficiency in Transformers	P	6 slides	B
	4.3 Thermal devices	4.3.1. Boilers	P	41 slides	B
		4.3.2. Furnaces	P	32 slides	B
	4.4 Horizontal utilities	4.4.1. Efficiency in Lighting	P	18 slides	B
		4.4.2. Efficiency in Compressed air	P	16 slides	B
		4.4.3. Efficiency in HVAC	P	44 slides	B
	4.5 Buildings	4.5.1. Efficiency in building envelope	P	23 slides	B
5. Renewable energy	5.1 Renewable energy	5.1.1. Renewable energy integration	P	9 slides	B
		5.1.2. Photovoltaic energy	P	24 slides	B
		5.1.3. Mini-Wind energy	P	21 slides	B
		5.1.4. Solar thermal energy	P	17 slides	B
		5.1.5. Geothermal energy	P	15 slides	B
6. Regulation	6.1 Subsidies	6.1.1 Country X	T	54-7 pages	X
7. Electric vehicle	7.1 Future of the sector	7.1.1. Sustainable mobility and future of the automotive sector	V + T	20 pages	B
	7.2 Electric vehicle	7.1.2. General approach: electric vehicles	V + T	20 pages	B
		7.1.3. Operation and parts of the electric vehicles	V + T	26 pages	B

Table 6. Online part of the training path for Managers. *X = Resource included in the training path; B = Bibliography or material for consultation; CA = Exclusively for Change Agents Workshop; IH = Material to be used for the link activity of in on-site class; IF = Material conditioned to the answers of the questionnaire and the processes and uses present in the company according to the adjustment session; V = Video; P = Presentation; T = Text, word document.*

3.2.1.2 Link activity (4 hours).

The main objective of this activity is to generate new content to increase and improve the current training material. The experience of those trainees will usually be used to increase case studies, examples of best practices in the sector, or to improve the content of resources related to the more technical part on energy efficiency in processes. Therefore, there is here a list of possible link activities:

a. The activity proposed within the resource "*Main energy audits steps*", in which, they can explain the way they are currently acting in the company with respect to energy, and after the training received, how it could be improved or acted upon in another way. A writing exercise of no more than 2 pages. An idea of possible wording is included:

> *Considering the concepts seen in the Area of Energy Management, within the sub-area of Audits, the resource "Main steps of energy audits" explains the phases that comprise an energy audit. In this sense, and considering other information addressed in the same sub-area, you are asked to briefly explain what actions you carry out in your company to manage your energy consumption, what information you consider could be useful in the future, and ideas that could be routinely applied in your company to address energy issues.*
>
> *Consider, that it is possible to use your development as a new resource, improving the content of the course and sharing it with other trained people. Therefore, do not mention people who can identify the company or persons.*

b. The activity proposed within the resource "*ISO 50001*" in relation to the previous analysis to see the potential that an energy management system can have. Different activities can be included here:
   - SWOT analysis about the influence that energy has on the company. List at least 4 ideas in each of the quadrants
   - Analysis of stakeholders who can influence both positive and negative energy aspects in the company. List 5-6 different stakeholders and explain how they intervene.

   An idea of possible wording is included:

> *Considering the concepts seen in the Area of Energy Management, within the sub-area of Energy Culture, the resource "ISO 50001" explains the management's involvement in the energy management system and their role in it.*
>
> *Please, consider these concepts to analyse the energy potential of your company. Through a SWOT analysis, list 4 Strengths, 4 internal Weaknesses of your company, 4 external Opportunities and 4 external Threats that can influence to carry out actions or measures of energy efficiency in your company that allow to reduce your consumptions and your costs. In the same way, try to identify the relevant stakeholders (5-6) that influence their energy consumption either positively or negatively, and explain why and how.*
>
> *Consider, that it is possible to use your development as a new resource, improving the content of the course and sharing it with other trained people. Therefore, do not mention people who can identify the company or persons.*

3.2.1.3 On site class (2 hours).

The main idea of this session is to comment on the activities included in the Link Activity, so that a debate can be generated. Managers can be supported to find a way to focus energy efficiency actions on their company, strengthening the importance of energy audits and energy management. This session is short in comparison with other roles of the company.

The face-to-face session begin with a brief review, of no more than 30 minutes, where the main concepts seen in online training are summarised.

Considering the high occupations of the Managers, it is necessary to transmit the need to avoid distractions and to be able to carry out the session in a continuous way.

3.2.2 E2DRIVER Training for Science and Engineering Professionals.

E2DRIVER Training for Science and Engineering Professionals	
Objective	(1) To train companies' science and engineering professionals and (2) to improve the collective intelligence of the sector.
Duration	20 hours.
Mode	Face-to-face and online.
Type of training	10 hours using a learning platform + 5 hours of on-site session + 4 hours of autonomous work + 1 hour of Virtual reality.
Topic	Wide knowledge in technical issues
Target	Companies' science and engineering professionals.

Table 7. E2DRIVER Training for Science and Engineering Professionals.

This E2DRIVER training for Science and Engineering Professionals (Table 6) is expected to have a duration of **20 hours** with 10 online hours, a face-to-face practical class of 5 hours, 4 hours of autonomous work and 1 hour for the Virtual reality session.

The **target group** are the **Science and Engineering Professionals** (technology experts, researchers, engineers either leading the R&D department and/or supervising the whole production line, or implementing new designs, processes and equipment). They work in highly technical and technological positions such as process design, management, ICT, system design, holding a graduate, postgraduate educational or even a PhD degree usually in engineering, but also in physics, mathematic, etc. As technology experts they master the learning process and use different sources to develop their skills, including the internet or other novel methods. In this sense, this group has extensive knowledge of the processes or specific areas of work in which they are involved. Therefore, it is expected that they are already optimised, even though they do not have the general vision of the whole company.

Methodologically, this type of E2DRIVER training will maintain the general structure of the **Ontological Flip Teaching** model with few changes respecting the training for Managers:

- **Online lessons** (10 hours).
- **Link activity** (4 hours).

- **On-site class** (5 hours)[26].

Regarding the distribution of the estimated times in this training path for Science and Engineering professionals, in table 8 can be seen the time that is expected each student spends per part of the training.

TRAINING PLAN FOR SCIENCE AND ENGINEERING PROFESSIONALS				
Online course (10 hours)		**Link Activity**	**On-site class**	**Virtual reality session**
Slides	5,9 hours	4 hours	5 hours	1 hour
Video	0,4 hours		No work to be done in advance	No work to be done in advance
Text	0,5 hours			
TOTAL	6,7 hours			
Exercises + Tutorials + assimilation of concepts	3,3 hours			

Table 8. Timing of the E2DRIVER Training for Science and Engineering professionals.

In table 9, it is presented an ideal planning of 6 weeks for the E2DRIVER Training for Science and Engineering professionals. However, it is possible (and even expected) that this planning suffers variations depending on the availability and preferences of the company (see section 3.1).

	ESTIMATED TRAINING PLANNING FOR SCIENCE AND ENGINEERING PROFESSIONALS				
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Week 1	1.1.1 2.1.1	3.1.1	3.1.1	3.1.3	3.1.3
Week 2	Tutorial	3.1.4	3.1.4	3.2.1	Review
Week 3	Tutorial	4.2	4.2	4.3	4.3
Week 4	4.4 4.5	Review of bibliography	Review of bibliography	Final Review	Tutorial
Week 5	*Link Activity*				
Week 6	*On-site session*				

Table 9. Suggestion of planning for E2DRIVER Training for Managers. *The codes refer to the resources (Table 10) that must be learnt in that day.*

3.2.2.1 Online lessons (10 hours).

The online part is performed thanks to the E2DRIVER Platform, where the content is organized as a digital book. There, the student can access the whole training materials that they should learn. Below

[26] This session can be held together with the face-to-face session of the Technical Managers and Change Agents, due to the contents will be the same.

(Table 10) are the specific resources for the Scientific and Engineering professionals that is hosted in that digital book.

The theoretical content includes information about the monitoring systems, tools, performance indicators, data analysis, energy management and energy efficiency.

TRAINING PATH FOR SCIENCE AND ENGINEERING PROFESSIONALS					
Area	**Subarea**	**Resource**	**Format**	**Duration**	**S & Eg professio**
1. Introduction	1.1 Kick-off	1.1.1. Concepts about energy	P	17 slides	X
		1.1.2. Conversion of units	T	19 pages	B
2. Regulation	2.1 Legislation	2.1.1. Country X	T	25-14 pages	X
3. Energy Management	3.1 Audits	3.1.1. How to do energy audits?	P + V	24 slides 8:05 min	X
		3.1.2. Checklist Relevant Information	T	3 pages	B
		3.1.3. Main Energy Audit steps	P	50 slides	X
		3.1.4. Measurement and Verification	P + V	31 slides 8:19 min	X
	3.2 Monitoring	3.2.1. Best Practice on Monitoring and Benchmarking	P + V	21 slides 7:03 min	X
4. Energy efficiency	4.1 Energy Efficiency	4.1.1. Energy efficiency in industries and examples	P + V	21 slides. 5:24 min	B
	4.2 Electrical devices	4.2.1 Concepts about electricity	P	13 slides	B
		4.2.2. Efficiency in Engines	P	21 slides	IF
		4.2.3. Efficiency in Cooling processes	P	16 slides	IF
		4.2.4. Efficiency in Transformers	P	6 slides	IF
	4.3 Thermal devices	4.3.1. Boilers	P	41 slides	IF
		4.3.2. Furnaces	P	32 slides	IF
	4.4 Horizontal utilities	4.4.1. Efficiency in Lighting	P	18 slides	IF
		4.4.2. Efficiency in Compressed air	P	16 slides	IF
		4.4.3. Efficiency in HVAC	P	44 slides	IF
	4.5 Buildings	4.5.1. Efficiency in building envelope	P	23 slides	IF
5. Renewable energy	5.1 Renewable energy	5.1.1. Renewable energy integration	P	9 slides	B
		5.1.2. Photovoltaic energy	P	24 slides	B
		5.1.3. Mini-Wind energy	P	21 slides	B
		5.1.4. Solar thermal energy	P	17 slides	B
		5.1.5. Geothermal energy	P	15 slides	B
7. Electric vehicle	7.1 Future of the sector	7.1.1. Sustainable mobility and future of the automotive sector	V + T	20 pages	B
	7.2 Electric vehicle	7.1.2. General approach: electric vehicles	V + T	20 pages	B
		7.1.3. Operation and parts of the electric vehicles	V + T	26 pages	B

Table 10. Online part of the training path for Science and Engineering professionals. *X = Resource included in the training path; B = Bibliography or material for consultation; CA = Exclusively for Change Agents Workshop; IH = Material to be used for the link activity of in on-site class; IF = Material conditioned to the answers of the questionnaire and the processes and uses present in the company according to the adjustment session; V = Video; P = Presentation; T = Text, word document.*

3.2.2.2 Link activity (4 hours).

The main objective of this activity is to generate new contents to increase and improve the current training material. The experience of those trainee will usually be used to increase case studies, examples of best practices in the sector, or to improve the content of resources related to the more technical part on energy efficiency in processes. Therefore, there is here a possible link activity:

The activity proposed within the resources "*How to do energy audits?*" and "*Main energy audits steps*", in which they explain the way they are currently acting in the company within respect to energy, and after the training received, how it could be improved or acted upon in another way. A writing exercise of no more than 2 pages. An idea of a possible wording is included:

> *Considering the concepts seen in the Area of Energy Management, within the sub-area of Audits, the resources "How to do energy audits?" and "Main steps of energy audits" explains the main information is required to conduct an energy audit and the phases that comprise an energy audit. In this sense, and considering other information addressed in the same sub-area, and the technical information seen in Energy Efficiency Area, please, briefly explain:*
>
> *a) what actions you carry out in your company to manage your energy consumption, b) what information you consider could be useful in the future, c) ideas that could be routinely applied in your company to address energy issues. Furthermore, d) try to identify the main energy consumers in your company, and e) point out where you would measure in order to obtain more information about their consumption.*
>
> *Consider, that it is possible to use your development as a new resource, improving the content of the course and sharing it with other trained people. Therefore, do not mention people who can identify the company or persons.*

3.2.2.3 On site class (5 hours).

The main idea of this session is to comment on the activities included in the Link Activity, so that a debate can be generated. The aim, both with the link activity and in the face-to-face session, is to put into practice the concepts seen, using their own company as an example, in order for the trainees to already generate an action plan or a list of possible activities to carry out.

The face-to-face session will begin with a brief review, of no more than 30 minutes, where the main concepts seen in online training are summarised.

For the development of these sessions and considering a duration is 5 hours, and the participation of other roles such as Technical Managers and Change Agents, it is necessary to transmit the need to avoid distractions and to be able to carry out the session in a continuous way.

3.2.3 E2DRIVER Training for Technical Managers.

E2DRIVER Training for Technical Managers

Objective	(1) To train companies' technical managers and (2) to improve the collective intelligence of the sector.
Duration	20 hours.
Mode	Face-to-face and online.
Type of training	10 hours using a learning platform + 5 hours of on-site session + 4 hours of autonomous work + 1 hour of virtual reality.
Topic	Wide knowledge in technical aspects.
Target	Companies' technical managers.

Table 11. E2DRIVER Training for Technical Managers.

This E2DRIVER training for Technical Managers (Table 7) is expected to have a duration of **20 hours** with 10 online hours, a face-to-face practical class of 5 hours, 4 hours of autonomous work and 1 hour of virtual reality.

The **target group** are the **Technical Managers**. This is the most versatile and mixed group of trainees. It includes workers that could also belong to another group under certain conditions, working in middle and lower management level positions with a technical orientation. In that term it consists of engineers with managerial skills that become technical managers, manufacturing managers, line managers etc. It can also include managers with some technical skills who have a better understanding of technology and can be production managers, operations managers etc. Finally, it can include some former technicians who do not have some kind of academic degree but hold substantial experience. They may have managed to acquire some kind of typical educational certificate and have proven themselves over the years for their effectiveness, expertise and intelligence. They can also work in one of the above positions, mostly in lower management though. This position is key in a smooth development of energy audits and energy management systems, since they are the link between high management's intentions and the actual operation of the plant.

Methodologically, this type of E2DRIVER training will maintain the general structure of the **Ontological Flip Teaching** model with few changes respecting the training of the rest profiles:

- **Online lessons** (10 hours).
- **Link activity** (4 hours).
- **On-site class** (5 hours)[27].

Regarding the distribution of the estimated times in this training path for Technical Managers, in table 12 the time that is expected each student spends per part of the training can be seen.

TRAINING PLAN FOR TECHNICAL MANAGERS				
Online course (10 hours)		**Link Activity**	**On-site class**	**Virtual reality session**
Slides	5,9 hours	4 hours	5 hours	1 hour
Video	0,3 hours		No work to be done in advance	No work to be done in advance
Text	0,5 hours			

[27] This session can be held together with the face-to-face session of the Science and Engineering Professionals and Change Agents, due to the contents will be the same

TOTAL	6,6 hours
Exercises + Tutorials + assimilation of concepts	3,4 hours

Table 12. Timing for the training of Technical managers.

In table 13 an ideal planning of 6 weeks for the E2DRIVER Training for Science and Engineering professionals is presented. However, it is possible (and even expected) that this planning suffers variations depending on the availability and preferences of the company (see section 3.1).

	ESTIMATED TRAINING PLANNING FOR TECHNICAL MANAGERS				
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Week 1	1.1.1 2.1.1	2.1.1	3.1.1	3.1.1	3.1.3
Week 2	Tutorial	3.1.3	3.1.3	3.2.1	Review
Week 3	Tutorial	4.2	4.2	4.3	4.3
Week 4	4.4 4.5	Review of bibliography	Review of bibliography	Final Review	Tutorial
Week 5	*Link Activity*				
Week 6	*On-site session*				

Table 13. Suggestion of distribution of the E2DRIVER Training for Technical Managers.

3.2.3.1 Online class (10 hours).

The online part is performed thanks to the E2DRIVER Platform where the content is organized as a digital book. There, the students have access to the whole training materials that they should learn. Below (Table 14) are the specific resources for the Scientific and Engineering professionals that is hosted in that digital book.

Technical managers will be heavily involved in the **energy efficiency** section of the training, in order to understand the potential improvements that can be applied in the processes. Also, it is important that they acquire knowledge in **energy auditing**, its goals, and steps, since they will most certainly be involved in their implementation. Lastly, they should be familiarized with **energy management systems** and the role they will play in them.

TRAINING PATH FOR TECHNICAL MANAGERS					
Area	**Subarea**	**Resource**	**Format**	**Duration**	**Technical Managers**
1. Introduction	1.1 Kick-off	1.1.1. Concepts about energy	P	17 slides	X
		1.1.2. Conversion of units	T	19 pages	B
2. Regulation	2.1 Legislation	2.1.1. Country X	T	25-14 pages	X
	3.1 Audits	3.1.1. How to do energy audits?	P + V	24 slides 8:05 min	X

3. Energy Management		3.1.2. Checklist Relevant Information	T	3 pages	B
		3.1.3. Main Energy Audit steps	P	50 slides	X
	3.2 Monitoring	3.2.1. Best Practice on Monitoring and Benchmarking	P + V	21 slides 7:03 min	X
4. Energy efficiency	4.1 Energy Efficiency	4.1.1. Energy efficiency in industries and examples	P + V	21 slides. 5:24 min	B
	4.2 Electrical devices	4.2.1 Concepts about electricity	P	13 slides	B
		4.2.2. Efficiency in Engines	P	21 slides	IF
		4.2.3. Efficiency in Cooling processes	P	16 slides	IF
		4.2.4. Efficiency in Transformers	P	6 slides	IF
	4.3 Thermal devices	4.3.1. Boilers	P	41 slides	IF
		4.3.2. Furnaces	P	32 slides	IF
	4.4 Horizontal utilities	4.4.1. Efficiency in Lighting	P	18 slides	IF
		4.4.2. Efficiency in Compressed air	P	16 slides	IF
		4.4.3. Efficiency in HVAC	P	44 slides	IF
	4.5 Buildings	4.5.1. Efficiency in building envelope	P	23 slides	IF
5. Renewable energy	5.1 Renewable energy	5.1.1. Renewable energy integration	P	9 slides	B
		5.1.2. Photovoltaic energy	P	24 slides	B
		5.1.3. Mini-Wind energy	P	21 slides	B
		5.1.4. Solar thermal energy	P	17 slides	B
		5.1.5. Geothermal energy	P	15 slides	B
7. Electric vehicle	7.1 Future of the sector	7.1.1. Sustainable mobility and future of the automotive sector	V + T	20 pages	B
	7.2 Electric vehicle	7.1.2. General approach: electric vehicles	V + T	20 pages	B
		7.1.3. Operation and parts of the electric vehicles	V + T	26 pages	B

Table 14. Online part of the training path for Technical Managers. *X = Resource included in the training path; B = Bibliography or material for consultation; CA = Exclusively for Change Agents Workshop; IH = Material to be used for the link activity of in on-site class; IF = Material conditioned to the answers of the questionnaire and the processes and uses present in the company according to the adjustment session; V = Video; P = Presentation; T = Text, word document.*

3.2.3.2 Link activity (4 hours).

The main objective of this activity is to generate new contents to increase and improve the current training material. The experience of those trainee will usually be used to increase case studies, examples of best practices in the sector, or to improve the content of resources related to the more technical part on energy efficiency in processes. Furthermore, it must be considered that this activity will be used in the on-site training, and therefore, the activity must be the same or very similar for the three profiles that share the session (Science and Engineering professionals, Technical Managers and Change Agents). Therefore, there is here a possible link activity:

> The activity proposed within the resources "*How to do energy audits?*" and "*Main energy audits steps*", in which, they can explain the way they are currently acting in the company with respect

to energy, and after the training received, how it could be improved or acted upon in another way. A writing exercise of no more than 2 pages. An idea of possible wording is included:

> *Considering the concepts seen in the Area of Energy Management, within the sub-area of Audits, the resources "How to do energy audits?" and "Main steps of energy audits" explains the main information is required to conduct an energy audit and the phases that comprise an energy audit. In this sense, and considering other information addressed in the same sub-area, and the technical information seen in Energy Efficiency Area, please, briefly explain:*
>
> *a) what actions you carry out in your company to manage your energy consumption, b) what information you consider could be useful in the future, c) ideas that could be routinely applied in your company to address energy issues. Furthermore, d) try to identify the main energy consumers in your company, and e) point out where you would measure in order to obtain more information about their consumption.*
>
> *Consider, that it is possible to use your development as a new resource, improving the content of the course and sharing it with other trained people. Therefore, do not mention people who can identify the company or persons.*

3.2.3.3 On site class (5 hours)

The main idea of this session is to comment on the activities included in the Link Activity, so that a debate can be generated. The aim, both with the link activity and in the face-to-face session, is to put into practice the concepts seen, using their own company as an example in order for them to generate an action plan or a list of possible activities to carry out.

The face-to-face session will begin with a brief review, of no more than 30 minutes, where the main concepts seen in online training are summarised.

For the development of these sessions and considering a duration is 5 hours, and the participation of other roles such as Technical Managers and Change Agents, it is necessary to transmit the need to avoid distractions and to be able to carry out the session in a continuous way.

3.2.4 E2DRIVER Training for Technicians.

E2DRIVER Training for Technicians	
Objective	To train companies' technicians
Duration	3 hours.
Mode	Face-to-face.
Type of training	2 hours of on-site session + 1 hour of virtual reality.
Topic	Energy aspects applied to their daily work.
Target	Companies' technicians.

Table 15. E2DRIVER Training for Technicians.

Technicians are employees with no academic degree. They usually work in production, maintenance or other technical positions, following procedures and well-established processes based on their technical skills. Ultimately, they are the ones using the equipment and installations in the plant.

The format of this E2DRIVER training for Technicians changes a lot if we compare it with the rest trainings (Table 15). **These sessions will consist of 1 face-to-face session of 2 hours.** This format has been

selected because it is considered to be the most appropriate format for them, due to their academic and professional background. Also, because the technicians' sample that answered the survey of the Task 2.2 – *Profile design and characterisation of different roles within industries*[28] expressed their preference of on-site training. These sessions will be totally focused on their daily work, looking for a very practical class.

3.2.4.1 On site class (2 hours).

The main objective of this session is to be able to generate a certain amount of concern in energy aspects, so that a certain amount of awareness and improvement of energy behaviour can be achieved. In this sense, very general aspects about energy and motivations will be addressed.

Due to the type of audience, these are not expected to be theoretical sessions, although a brief introduction on energy efficiency and the objective of the session should be made. The resources listed below can be used by the trainer to support the session. In particular, the resources 3.2.1 and 3.3.1 include examples and activities to do with them.

The trainer must try to make this session as dynamic as possible, and Technicians should actively participate, giving their opinion or showing ideas that can be applied to their daily work to improve energy performance. In the same way, it is necessary to introduce them to what an energy audit consists of, so that at the time of carrying it out, they are as receptive and participative as possible Table 16.

TRAINING PATH FOR TECHNICIANS					
Area	**Subarea**	**Resource**	**Format**	**Duration**	**Technicians**
1. Introduction	1.1 Kick-off	1.1.1. Concepts about energy	P	17 slides	X
2. Energy efficiency	2.1 Energy Efficiency	2.1.1. Energy efficiency in industries and examples	P + V	21 slides 5:24 min	X
3. Energy Management	3.1 Audits	3.1.1. How to do energy audits?	P + V	24 slides 8:05 min	X
	3.2. Energy Culture	3.2.1. General employees - Motivation	P	10 slides	X
	3.3. Energy Awareness	3.3.1. Awareness in Energy Efficiency – Employees motivation for energy	P	22 slides	X

Table 16. Training materials that can be used in the E2DRIVER Training for Technicians.

3.2.5 E2DRIVER Training for Change agents.

E2DRIVER Training for Change agents	
Objective	To provide a specific training for the future change agents.
Duration	25 hours.
Mode	Face-to-face and online.
Type of training	10 hours using a learning platform + 4 hours of autonomous work + 5 hours of on-site session + 1 hour of Virtual reality + 5 hours of interactive workshop.

[28] See Deliverable 2.2 – E2DRIVER trainees' target groups definition. http://e2driver.eu/wp-content/uploads/2020/04/E2DRIVER_D2.2_E2DRIVER-Trainees-Target-Groups-Definition.pdf

Topic	High technical knowledge, communication, leadership and other soft skills.
Target	Future "change agents" from each company.

Table 17. E2DRIVER Training for Change agents.

E2DRIVER project foresees to select one "**change agent**" or "energy expert" in each company in order to be the **responsible** person for **improving energy efficiency** and therefore will be trained also on implementing the **right interventions** to ensure a change in the organization towards energy efficiency[29] and raising awareness between employees and stakeholders. This specific training action (Table 9) is foreseen to have both **face-to-face and online** mode and the duration would be around **25 hours**.

The **purpose** of this training is to make the chosen person the **leader** in the change process where the company will adapt to the energy management best practices and will implement as much energy measures as possible. Because of this, the most appropriate character to be the change agent would be the one in charge of energy management, or who controls energy consumptions, if any. On the other hand, the person responsible for maintenance could also be considered. In spite of that, depending on the specific company, another person could be selected to perform this role according to their responsibilities.

Methodologically, this type of E2DRIVER training will also maintain the general structure of the **Ontological Flip Teaching**:

- **Online lessons** (10 hours).
- **Link activity** (4 hours).
- **On-site class** (5 hours)[30].
- **Interactive workshop** (5 hours).

Regarding the distribution of the estimated times in this training path for Change agents, in table 18 can be seen the time that is expected each student spends per part of the training.

TRAINING PLAN FOR CHANGE AGENTS					
Online course (10 hours)		**Link Activity**	**On-site class**	**Workshop**	**Virtual reality session**
Slides	3,8 hours	4 hours	5 hours	5 hours	1 hour
Video	0,9 hours		No work to be done in advance		No work to de done in advance
Text	2,2 hours				
TOTAL	6,9 hours				
Exercises + Tutorials + assimilation of concepts	3,1 hours				

[29] E2DRIVER Grant Agreement. Part B. Page 17.

[30] This session can be held together with the face-to-face session of the Science and Engineering Professionals and Technical Managers, due to the contents will be the same

Table 18. Timing for the E2DRIVER Training for Change agents.

In table 19 an ideal planning of 6 weeks for the E2DRIVER Training for Science and Engineering professionals is presented. However, it is possible (and even expected) that this planning suffers variations depending on the availability and preferences of the company (see Adjustment session).

	ESTIMATED TRAINING PLANNING FOR CHANGE AGENTS				
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Week 1	1.1.1 2.1.1	3.1.1	3.1.3	3.1.4	3.1.5
Week 2	Tutorial	3.2.1	3.2.2	3.2.3	3.3.1
Week 3	3.4.1	Review	Tutorial	3.5.1	4.1.1
Week 4	6.1.1	Review of bibliography	Review of bibliography	Final Review	Tutorial
Week 5	*Link Activity*				
Week 6	*On-site session*				

Table 19. Suggestion for the distribution of the E2DRIVER Training for Change agents.

3.2.5.1 Online lessons (10 hours).

The online part is performed thanks to the E2DRIVER Platform, where the content is organized as a digital book. There, the students have access to the whole training materials that they should learn. Below (Table 20) are the specific resources for the Change agents that is hosted in that digital book.

Regarding the contents of the training, the additional capacity programme provided to these agents will contain both main parts. On the one hand, a **high technical knowledge** is expected from them, so a deeper theoretical content will be provided. On the other hand, **communication** and **leadership** skills will be consider as one of the main tools in order to achieve the objective of changing the company's way of work. In line with that, a package of **soft skills** contents will try to improve the non-technical abilities of the future change agents. This pack will contain issues connected with energy consumption control, motivation, how to communicate, people management, cultural management, and so on.

TRAINING PATH FOR CHANGE AGENTS					
Area	**Subarea**	**Resource**	**Format**	**Duration**	**Change Agents**
1. Introduction	1.1 Kick-off	1.1.1. Concepts about energy	P	17 slides	X
		1.1.2. Conversion of units	T	19 pages	B
2. Regulation	2.1 Legislation	2.1.1. Country X	T	25-14 pages	X
3. Energy Management	3.1 Audits	3.1.1. How to do energy audits?	P + V	24 slides 8:05 min	X
		3.1.2. Checklist Relevant Information	T	3 pages	B
		3.1.3. Main Energy Audit steps	P	50 slides	X
			E+		IH
		3.1.4. Measurement and Verification	P + V	31 slides 8:19 min	X
		3.1.5. EN16247:2015	P	24 slides	X

	3.2 Energy Culture	3.2.1. Targets and Goals	P + V	24 slides 7 min	X
		3.2.2. Communication & Cooperation in EnMS	P + V	20 slides 7 min	X
		3.2.3. ISO 50001:2018	P + V	32 slides 14 min	X
			E+		IH
	3.3 Energy Awareness	3.3.1. Awareness in Energy Efficiency; Employee motivation for energy	P	22 slides	X
	3.4 Monitoring	3.4.1. Best Practice on Monitoring and Benchmarking	P + V	21 slides 7:03 min	X
	3.5 Energy Contracting	3.5.1. Country X	T	44-19 pages	X
4. Energy efficiency	4.1 Energy Efficiency	4.1.1. Energy efficiency in industries and examples	P + V	21 slides. 5:24 min	X
	4.2 Electrical devices	4.2.1 Concepts about electricity	P	13 slides	B
		4.2.2. Efficiency in Engines	P	21 slides	B
		4.2.3. Efficiency in Cooling processes	P	16 slides	B
		4.2.4. Efficiency in Transformers	P	6 slides	B
	4.3 Thermal devices	4.3.1. Boilers	P	41 slides	B
		4.3.2. Furnaces	P	32 slides	B
	4.4 Horizontal utilities	4.4.1. Efficiency in Lighting	P	18 slides	B
		4.4.2. Efficiency in Compressed air	P	16 slides	B
		4.4.3. Efficiency in HVAC	P	44 slides	B
	4.5 Buildings	4.5.1. Efficiency in building envelope	P	23 slides	B
5. Renewable energy	5.1 Renewable energy	5.1.1. Renewable energy integration	P	9 slides	B
		5.1.2. Photovoltaic energy	P	24 slides	B
		5.1.3. Mini-Wind energy	P	21 slides	B
		5.1.4. Solar thermal energy	P	17 slides	B
		5.1.5. Geothermal energy	P	15 slides	B
6. Regulation	6.1 Subsidies	6.1.1 Country X	T	54-7 pages	X
7. Electric vehicle	7.1 Future of the sector	7.1.1. Sustainable mobility and future of the automotive sector	V + T		B
	7.2 Electric vehicle	7.1.2. General approach: electric vehicles	V + T		B
		7.1.3. Operation and parts of the electric vehicles	V + T		B

Table 20. Online part of the training path for Change agents. *X = Resource included in the training path; B = Bibliography or material for consultation; CA = Exclusively for Change Agents Workshop; IH = Material to be used for the link activity of in on-site class; IF = Material conditioned to the answers of the questionnaire and the processes and uses present in the company according to the adjustment session; V = Video; P = Presentation; T = Text, word document.*

3.2.5.2 Link activity (4 hours).

The main objective of this activity is to generate new contents to increase and improve the current training material. The experience of those trainees will usually be used to increase case studies,

examples of best practices in the sector, or to improve the content of resources related to the more technical part on energy efficiency in processes. Therefore, there is here a possible link activity:

The activity proposed within the resources "*How to do energy audits?*" and "*Main energy audits steps*", in which, they can explain the way they are currently acting in the company with respect to energy, and after the training received, how it could be improved or acted upon in another way. A writing exercise of no more than 2 pages. An idea of possible wording is included:

> *Considering the concepts seen in the Area of Energy Management, within the sub-area of Audits, the resources "How to do energy audits?" and "Main steps of energy audits" explains the main information is required to conduct an energy audit and the phases that comprise an energy audit. In this sense, and considering other information addressed in the same sub-area, and the technical information seen in Energy Efficiency Area, please, briefly explain:*
>
> *a) what actions you carry out in your company to manage your energy consumption, b) what information you consider could be useful in the future, c) ideas that could be routinely applied in your company to address energy issues. Furthermore, d) try to identify the main energy consumers in your company, and e) point out where you would measure in order to obtain more information about their consumption.*
>
> *Consider, that it is possible to use your development as a new resource, improving the content of the course and sharing it with other trained people. Therefore, do not mention people who can identify the company or persons.*

3.2.5.3 On site classes (5 hours).

The main idea of this session is to comment on the activities included in the Link Activity, so that a debate can be generated. The trainer has to make the activity very similar for the three profiles that share this session. The aim, both with the link activity and in the face-to-face session, is to put into practice the concepts seen, using their own company as an example, and that they can already generate an action plan or a list of possible activities to carry out.

The face-to-face session will begin with a brief review, of no more than 30 minutes, where the main concepts seen in online training are summarised.

For the development of these sessions, and considering that their duration is 5 hours, and that other roles such as Science and Engineering and Technical Managers also participate, it is necessary to transmit the need to avoid distractions and to be able to carry out the session in a continuous way.

3.2.5.4 Interactive workshop (5 hours).

As mentioned above, the **interactive workshops** will used as an additional tool in order to retain knowledge and skills provided during the training actions for change agents. Furthermore, it will constitute a great **networking** opportunity, since only one interactive workshop per country will be held with all the change agents from this country[31].

[31] So, one interactive workshop in Germany with the 10 changes agents of the 10 companies from this country, one interactive workshop in Spain with the 10 changes agents of the 10 companies from this country and so on.

Thus, these interactive workshops will consist on **an event per country** where companies' change agents will perform different activities such as interactive storytelling, brainstorming sessions, discussions addressing emotional insight and value redefinition, etc. To develop this workshop, the training entities of each country should first define the **most appropriate place** to hold the event, considering the workplace of each attender and the need to concentrate all of them in one point. Ideally, the event will be held in the **facilities** of the **E2DRIVER training entities** (EPROPLAN, CIRCE, ENGIE and SINERGIE) or in a participant company (if it agrees). This last option provides the possibility to see an in real-life energy measures implementation and learnt lessons. However, other place could be defined considering the specific circumstances of each country, as well as it is possible to be performed online if the circumstances force to do it.

The session of 5 hours could be divided like it is explained next:

- First, a brief explanation of the project. The objective of this is to collect **impressions** from the change agents about the experience of their companies during the training execution.
- Second, a part composed by different group dynamics, where the trainees could improve their knowledge in collaboration with their colleagues from Automotive sector companies: discussions, practical exercises, etc. Taking into account that the "hard skills" have been studied during online and face-to-face session in their respective companies, the workshop is expected to be more focused on "**soft skills**".

At the same time, different resources have been indicated to carry out this activity and may be useful for the trainer (Table 21).

CHANGE AGENTS WORKSHOP					
Area	**Subarea**	**Resource**	**Format**	**Duration**	**Technicians**
3. Energy Management	3.1 Audits	3.1.1. How to present measures?	P	15 slides	CA
			E		CA
	3.2 Energy Awareness	3.2.1. Role play rewarding suggestions	E		CA

Table 21. Workshop for change agents.

3.3 E2DRIVER Virtual reality session (1 hour).

Once all E2DRIVER training has been completed, a closing session where the Virtual Reality is the main character will be held. It will be 1-hour length and the attenders will be all the E2DRIVER trainees that have participated in the project in this company. However, due to the limited time available[32], in case it is not possible that all attenders perform the VR exercise, only those who are or will be in charge of energy measurements will perform these exercises. In spite of that, the E2DRIVER trainers will try for all trainees to interact with the Virtual Reality exercise. Furthermore, a screen will enable them to see how others perform the exercise.

[32] One-person virtual reality experience is expected to have a duration of 15 minutes. So, only 4 people could perform the whole exercise in the planned 1-hour session.

This exercise will be focused on **energy consumption measuring** in the companies' facilities. For instance, how to place and connect a measurement equipment in an electric switchboard. This kind of knowledge is highly interesting in order to know how to quantify energy consumptions in industrial processes as a critical point before the procedure of defining energy efficiency measures of improvement and their implementation in the industry. Due to complex technical situations and to safety reasons, the use of Virtual Reality facilitates the teaching and understanding of this example of measurement that is usually carried out in energy audits and for energy consumption control.

4 PRACTICAL GUIDE FOR TRAINERS: STEP BY STEP.

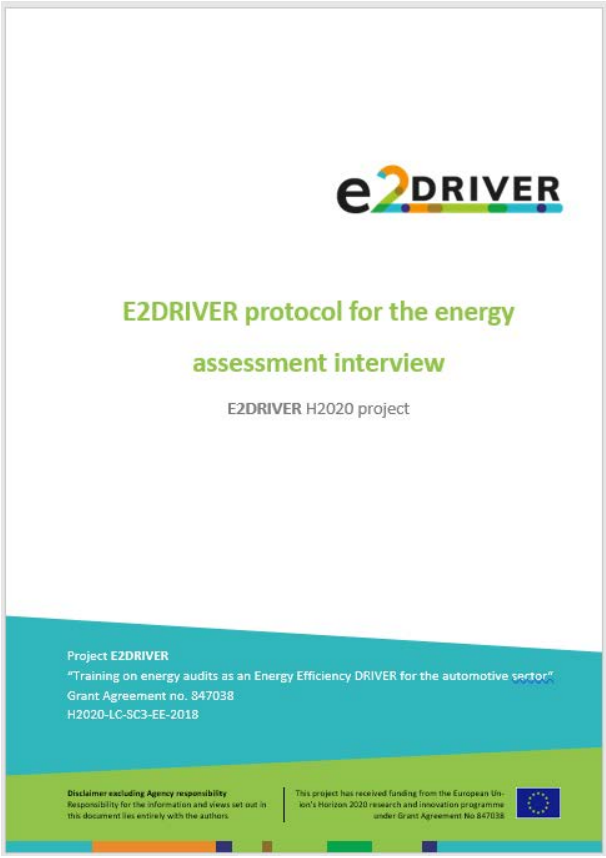
This section seeks to show trainers **how to manage a capacity building programme by following the methodology of E2DRIVER project**. E2DRIVER Capacity building programme is performed by following a four-steps process: **characterisation**, **customization**, **implementation**, **evaluation**[33] and **post-training support**.

4.1 Phase I – Characterisation.

E2DRIVER looks for a **personalized learning** adapted to the needs and interests of each company. Necessarily, the first step in order to achieve this customized learning is **to know and understand the end user** of this training. This is the characterisation.

What E2DRIVER recommends is to perform an **energy assessment** of the companies on the first place. Thus, the trainer will be aware of the general characteristics of the company in energetic or productive terms and, furthermore, this energy assessment will provide the opportunity to have the first contact with the company.

To do so, E2DRIVER project has designed a **template** in five languages (English, German, Spanish, French and Italian) that serves as a guide for performing this energy assessment.


E2DRIVER protocol for the energy assessment interview

E2DRIVER H2020 project

Project E2DRIVER
"Training on energy audits as an Energy Efficiency DRIVER for the automotive sector"
Grant Agreement no. 847038
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In general, thanks to this energy assessment, the trainer is able to know:

[33] E2DRIVER Grant Agreement. Part B. Page 15-17.

- The **general information** about the company: roles, structure of the company, etc.
- **Energy management and KPIs**: how the company manages its energy consumption, and the amount of energy and kind of energy sources the company consumes.
- **Energy efficiency measures**: trainers could gather information on the measures that have probably been implemented or are under consideration for implementation. Open questions are listed at the end of the table to make sure no energy efficiency measures have been missed.

All this information will be really useful in the moment of the **definition** of the **first version** of the capacity building programme designed for each company, in which the characteristics of the companies will be considered in order for them to adapt the best practices and exercises of each training programme.

Next, a detailed list of the expected actions of this phase is included:

CODE	Expected actions	Description
1	First meeting	The training entity and the company meet to get to know each other and to find out the general characteristics of the company, its ambitions and interests. This meeting can be online.
2	Schedule of the meeting	A clear date for a visit must be defined.
3	Visit to the company's facilities	In this visit, the training entity must get the characteristics of the company. A good result of this meeting is to get completed the information required in the energy assessment protocol designed by E2DRIVER. This visit should be presential, however the energy assessment document can also be completed in the Adjustment session.

Table 22. Steps of Phase I - Characterization.

4.2 Phase II – Customization.

Once the company has been studied, the process of customization starts. The customisation in the E2DRIVER project consists mainly of two main actions:

- The **E2DRIVER Adjustment session.**
- The **customization questionnaire** in the E2DRIVER Platform.

Regarding the **E2DRIVER Adjustment session**, this is the session where the first version of the E2DRIVER Capacity building programme is presented to the company and where the company is shown the benefits of the energy audits and the benefits of considering the energy variables of the production. The goal of this session is to get feedback from the company and try to adjust aspects such as the duration of the training, how to perform the on-site part and/or which link activities are the most appropriate for this specific company. For more information about how to implement this E2DRIVER Adjustment session, please consult section 3.1 of this guide.

Regarding the online part of the training, the customization is performed thanks to the **customization questionnaire** that all the trainees must complete the first time they log in the E2DRIVER Platform. The

two objectives of this questionnaire are (1) to allocate the trainee in one of the five groups (Managers, Science and Engineering professionals, Technical Managers, Technicians and Change agents) and (2) to perform a further customization of the training materials offered by considering the needs and interests of the trainees. To do so, the questionnaire is composed by questions about the characteristics of the company and the role that they play on it. The result of that is an online part totally customized to the trainee.

Thanks to the Adjustment session and the customisation questionnaire, both the online and on-site parts, as well as the link activities, are customized to the trainee and the company and the E2DRIVER-Capacity building programme can start.

Next, a detailed list of the expected actions of this phase is included:

CODE	Expected actions	Description
5	E2DRIVER Adjustment session.	The Adjustment session consists on a meeting between the company and the training entity or teacher to finalise the characteristics of the training: start date (if not already fixed), adjustments to be made to the training, obtaining the final list of trainees to be trained, etc. In this moment, the change agent should be also identified within the company. An awareness-raising session can also be held at this adjustment session for the company managers who attend. If this has not been done before, the first energy assessment excel can also be completed. This task will be considered completed when the energy assessment sheet is filled in, the start date and the characteristics of the training have been defined and the final list of trainees to be trained has been obtained.
6	Trainer informs platform administrator	As soon as the start of the training is known, the platform administrator will be notified to confirm that the training will take place and that there is no eventuality with the platform. It is also important to send the list of trainees in order to check it in the platform.
7	E2DRIVER Trainer define the features of the link activity and the on-site sessions	With all the information obtained from the company beforehand, the trainer will be able to carry out an adaptation of the link activity and the face-to-face sessions (the online part is automatically customised thanks to the platform's integrated test, as it is possible to see below). This task will be considered completed when the necessary adjustments have been made at this point and the training can start.
8	Contact to trainees welcoming course &	The trainer is in charge of welcoming the trainees by email using the contact details provided by the company. This first

	providing 1. date of beginning and 2. the link 1st tutorial	communication will have to highlight the start date of the training and the date, videoconference link and purpose of the first tutorial. Also, the link to the registration part of the platform should be included.
9	**START OF THE COURSE**	
10	First tutorial session where the methodology of the course is explained	In this first tutorial, the methodology of the course will be explained (the study through the platform, the practical exercise and the face-to-face part with virtual reality), as well as how to register on the platform.
11	Trainees register themselves in the platform and complete the classifier test	This task will be considered completed when all trainees have registered on the platform and have completed the classifier test. The platform will automatically classify the trainee in the appropriate path.

Table 23. Steps of Phase II - Customization.

4.3 Phase III – Implementation.

Once the customization process is finished, the final version of the E2DRIVER Capacity building programme is ready for implementation.

In general, this Capacity building programme will be composed by the several **E2DRIVER Trainings** that have been defined for this specific company and a final **E2DRIVER Virtual reality session**[34]**.**

Regarding the **E2DRIVER Trainings** (see section 3.2), E2DRIVER has defined **five main trainees' groups**: Managers, Scientifics and Engineering professionals, Technical Managers, Technicians and Change agents. All of them (excepting Technicians) will count with the **three steps of the Ontological Flip Teaching**, having an important part in online format. Technicians will count with a 100% on-site session of 2 hours, where trainers will be focused on the daily workday of the trainees.

The E2DRIVER Capacity building programme of the company will have a closing session with an **E2DRIVER Virtual reality session** where an exercise about energy auditing will be performed.

In case more information about the format is required, please refer to the section 3.4. Now, the next subsections will explain how E2DRIVER Capacity building programme have to be implemented. The explanation is divided by following the **three steps of the Ontological Flip Teaching**. Thus, trainers will be able to really understand what is expected from them in each phase.

4.3.1 Online lessons.

Online lessons step is the part of the training where trainees will be able to **absorb the theoretical knowledge** by consulting the E2DRIVER Platform. There, videos, documents, presentations, exercises and complementary materials that content information about energy efficiency and energy auditing in an industrial context cab be found-

[34] See section 3.4.

In this phase, the trainer will be in charge of:

- **Mentoring** for trainees. They will be in charge of clarifying doubts and questions, guiding trainees and solving all the problems could emerge.
- **Monitoring the performance of each trainee**, trying to identify additional needs and, consequently, they would provide complementary materials.
- **Managing the forum and the rest of communication tools, such as the E2DRIVER Community**. They will be in charge of moderating the debates, answering questions and suggest topics of discussion. Ultimately, they are the main responsible of dynamize the course and the activities of the trainees.
- **Correction** of exercises and **evaluation** of trainees.

Next, it is summarized the key actions of the trainer in the online part with the expected **timeline steps**:

CODE	Expected actions	Description
12	Platform administrator checks if all the trainees have registered themselves	On the second day of the training, the platform administrator will check that all expected trainees are registered and will enable those trainees to view the shared forums of the company. In the event that a student has not registered, the platform administrator will notify the teacher so that he/she can notify the student and, if necessary, the company's change agent.
13	E2DRIVER Trainees complete the online part and attend to the tutorial sessions.	During the first four weeks of the training, the trainees will consult the theoretical materials on the platform and will have regular tutorials with the teachers via videoconference. Ideally, 1 tutorial per week should be performed.
14	E2DRIVER Trainers solves all the doubts of the trainees.	During this time and throughout the training, the trainers will be responsible for resolving any doubts that the students may have within a reasonable period of time (maximum 24 hours). Those doubts will be solved both during the tutorial sessions and via forum in the platform.

Table 24. Steps Phase III - Implementation online.

4.3.2 Link activity.

The *Link activity* is an **academic work** made by trainees in the context of the training programme. To do so, trainers will suggest trainees to make an exercise by considering the training contents of the course and additional resources they can find. Thus, they could generate an original academic work that will be useful for (1) on-site session discussing and (2) increase the repository of contents (in case the academic work fulfils some specific requirements). There are suggestions in section 3.2, but trainers must address the option during the Adjustment session. Thus, the trainer is able to define the specific exercise per student.

The responsibilities of the trainers in this phase are:

- **To suggest topics** for performing the academic work.
- **To support them** in the realization of the academic work, solving them doubts and questions.

- **To grade** the academic work.
- **To generate a document** where all those interesting aspects that trainees have found in their academic work could be included. Afterwards, trainers will submit the document into the platform's repository.
- In case there is an academic work with a great quality, trainers will **submit it directly** to the repository (after being proofread by the trainee).

**Except if the link activity includes sensitive data.*

Considering the training calendar of the company, there will exist one week where students will be totally focused on the link activity. Before this week, the trainer must send via email or via forum the link activity that each group of the company must perform.

Next, it is included detailly steps to be performed during this linked activity:

CODE	Expected actions	Description
15	E2DRIVER Trainers suggest the link activity to be performed.	Once the theoretical part of the first four weeks has been completed, the trainers will send the trainees their link activity. Remember that this link activity was defined on the basis of the characteristics of the company. A different link activity is assumed for each training profile. It can be sent directly by email or using the platform's forum.
16	E2DRIVER Trainees complete the link activity	During week 5, trainees will complete the link activity.
17	If this link activity fulfils the quality criteria, Trainers upload the link activity as new material.	In order to properly implement the Ontological Flip Teaching pedagogical methodology, in case the teacher identifies quality material that can be shared in the E2DRIVER community, he/she will consult the author and proceed to include this work in the repository. In case no work of sufficient quality is found, the teacher will try to extract useful inputs for the implementation of future trainings (commonly applied energy efficiency measures, problems common to all companies, etc.). Sensitive company information and personal data will always be protected.

Table 25. Steps Phase III - Implementation link activity.

4.3.3 On-site class.

On-site class refers to the **on-site part** of the training. Taking into account the four groups of trainees (plus the change agent), the organization of the on-sites sessions could vary depending on the company and how many trainees this company has per group.

A standard proposal is suggested next (it can be adapted accordingly):

- **E2DRIVER Training for Manager**: it will have one on-site session of 2 hours where they could address (1) coaching, mentoring, behavioral, cultural and organizational aspects; (2) the current state of the company and (3) their results in the academic work suggested by the trainer.
- **E2DRIVER Training for Scientific and Engineering Professionals; E2DRIVER Training for Technical Managers; and E2DRIVER Training for Change agents**: all the trainees of these three groups will have an on-site session of 5 hours and, taking into account that they also will address similar topics, the on-site session of all of them could be held together. The most important topics to be addressed in this on-site session are (1) the state of the company in energy terms and which are the energy measures could be implemented in order to improve its performance and (2) a discussion about their results in the academic work. Furthermore, it is suitable to go deep in critical points about energy efficiency, energy audits and energy management in order to achieve a better understanding for workers' side.
- **E2DRIVER Training for Technicians**: it is expected that the whole E2DRIVER Training for Technicians will have an on-site format. It will be 2 hours long. It is expected that this session is a very practical session where the daily work of the employees is addressed.

The classroom part will end with a **virtual reality** exercise in which students will learn how to make measurements in an electrical cabinet in a safe context.

The role of the trainers in these sessions will be:

- **To present and explain** aspects about energy efficiency and energy auditing.
- **To dynamize** the sessions and **to moderate** the discussions.
- **To organize** the exercises.
- **To support** in all the points connected with the virtual reality.

Next, the different key actions in this on-site part of the training are explained:

CODE	Expected actions	Description
18	E2DRIVER Trainers dynamize the on-site sessions and the VR.	In week 6 of the training, the face-to-face sessions of the course will be organised to finalise the course. Ideally, three face-to-face training sessions are planned: -A face-to-face session for Managers lasting 2 hours. -A 5-hour face-to-face session for science and engineering professionals, Technical Managers and Change agents. -A 2-hour face-to-face session for technicians. It is possible (and perhaps desirable, depending on the case) to merge the face-to-face sessions for managers with those for science and engineering professionals, technical managers and change agents. The purpose of these sessions is to address the work done in the link activity and try to extract energy efficiency measures that can benefit the company.

		The face-to-face part will be completed with a virtual reality session.
19	E2DRIVER Trainees participate in the on-site sessions and the VR.	Trainee participation will be considered an evaluable criterion and attendance sheets must be collected in order to check attendance.

Table 26. Steps Phase III - Implementation on-site session.

4.3.4 National workshop for change agents.

All change agents were expected to participate in a national workshop to address issues of energy efficiency and energy audits in automotive SMEs, as well as the problems of the sector at this time of crisis due to the pandemic and the lack of components.

Ideally, it would be a national workshop where every change agent from every company would meet and network. Ideally, it should be an in-site session. However, the possibility of an online format is reserved if necessary due to lack of time or the impossibility of bringing together all the change agents.

The actions expected from the trainer are the next:

CODE	Expected actions	Description
21	E2DRIVER change agents participate in the national workshop.	Trainers or training entities should organize a national event with all the changes agents of the different trained companies.

Table 27. Steps Phase III - Implementation national workshop.

4.4 Phase IV – Evaluation.

Evaluation phase will be composed by all the tools used by E2DRIVER experts in order to be aware the **acceptance** of the training by the trainees, as well as to know if the Capacity building programme had had the expected **impact**.

In this sense, the **two tools** used by the E2DRIVER project to assess training were the following:

- The **acceptance survey**: it verifies that the training has met the expectations of the trainees.
- **Trainee evaluation**: an essential tool to check that a training course has achieved its objectives is to set up a learner evaluation scheme to check that the training objectives have indeed been met. In this sense, the students will have 1. a final exam of the theoretical part; 2. the practical exercise of the link activity; and 3. attendance at the face-to-face sessions.

In line with that, next the actions to be performed are explained:

CODE	Expected actions	Description
20	E2DRIVER Trainees complete the surveys about the quality of the training.	All trainees should use the QR at the end of the class to complete the training evaluation questionnaire in which they can appropriately express their impressions of the sessions.

22	**END OF THE COURSE**	
23	Trainer extracts the final marks of the trainees.	The trainers will extract trainees' marks on the platform, on the link activity and whether or not they have attended the face-to-face session to determine whether or not a trainee has successfully passed the training and is entitled to obtain the diploma. The evaluation criteria to obtain the final mark for the course will be 60% of the exam mark, 20% of the attendance to the face-to-face session and 20% of the link activity mark.

Table 28. Steps of the Phase IV - Evaluation.

4.5 Phase V – Consultancy.

Once the training has been completed, the part of advising companies on the implementation of energy efficiency measures can begin.

In this fifth phase, the trainers start intensive work with the change agents in order to spot the **energy efficiency measures** to be identified, as well as their estimation.

This is based on the energy efficiency measures identified in the link activity and addressed in the face-to-face session. From there, a process of suggesting measures and estimating their impact begins, which follows the following itinerary of actions.

CODE	Expected actions	Description
24	Meeting in order to talk about the potential EEMs addressed in the course.	After the training, the trainers, as experts in energy efficiency and energy audits, will meet with the change agent to assess which energy efficiency measures could be of interest for implementation in the company. The energy efficiency measures extracted in the on-site session will be taken into account here.
25	Assessment of the EEMs that can be implemented and the required information for the estimation.	Having addressed this point, the identified measures will be assessed, and an analysis will be made of what information is required to make an appropriate estimation of the measure.
26	Estimation of the impact.	The company, with the support of the trainer, will be responsible for estimating the impact of these measures. The support will be absolute in everything the company needs in order to be able to make a proper impact assessment.
27	Second energy assessment.	The second energy assessment will be carried out to define the impact of the training and consultancy.

28	Send the diploma to the trainees.	Within a maximum period of one month, the diploma will be sent to those students who have fulfilled the criteria for obtaining it.

Table 29. Steps of the Phase V - Consultancy.

5 CONCLUSION

Considering the lack of information some companies have, E2DRIVER project seeks to generate a solution for increasing the **collective intelligence** of the automotive sector in energy efficiency and energy auditing. To do so, E2DRIVER is a designed solution based on personalized capacity building programmes to the needs and interests of the companies and their workers.

In order to implement these capacity building programmes, E2DRIVER Project relies on two main developed pillars: the **E2DRIVER Methodology** and the **E2DRIVER Platform**.

This deliverable defines the characteristics of the **E2DRIVER Methodology**. E2DRIVER Methodology is a way of work, or a guide for trainers, about how to create/design an E2DRIVER capacity building programme and how to teach in an E2DRIVER Training. In line with this, this document explains in as much detail as possible how a course is to be created, managed and completed from start to finish under the E2DRIVER methodology.

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