



E2DRIVER training methodology

E2DRIVER H2020 project

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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 Mobilitätscluster 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 report presents the first version of the **E2DRIVER Methodology**. This methodology will be a **guide for trainers** that pretends to explain in deep how trainers should confront the ideation and the execution of a capacity building programmes that follows the E2DRIVER way of work.

To do so, the guide will be divided in **four parts** in order to transfer a clear idea of the E2DRIVER project and its capacity building programmes to the trainers of the project and to those future trainers that will use the **E2DRIVER Methodology** beyond the end of the project:

- Firstly, it is explained the **project** and what E2DRIVER is looking for: their **objectives**, which are the main **tools** used in order to achieve their goals, etc. In this point, the essence of the Methodology, as well as of the platform, will be explained.
- In a second part, the guide explains **the main characteristics of the E2DRIVER Capacity building programmes**. On one hand, the cornerstone will be the **customization** of the trainings, based on the scheme of classification of trainees in four groups, in order to provide a personalized learning. On the other hand, it is necessary to highlight that the E2DRIVER trainings will follow the **Ontological Flip Teaching** as pedagogical approach, with a blended learning and academic works as key points of this approach. Finally, these capacity building programmes will count with a high level of **interactivity**, thanks to the platform and the virtual reality.
- Thirdly, the **format** of the E2DRIVER Capacity building programmes is explained, trying to clarify doubt about how trainings will look like and the main features that they will have.
- Finally, it is included a **practical guide for trainers** where it is explained how to create an E2DRIVER Capacity building programme and how to train by following the suggested methodology.

Unfortunately, due to the fact that this first version of the Methodology has been performed before getting some critical results of the project, this deliverable has been focused on the **theoretical** part of the guide, while the more **practical** issues will be completed once Work Package 3 is ended. Thus, the **complete version of the guide for trainers** will be delivered in the context of the **Task 4.4 – Training methodology fine-tuning**.

Considering this purpose to achieve a final version of the guide for trainers in Task 4.4, this deliverable **identifies** those aspects that must be improved or included.

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1 INTRODUCTION

E2DRIVER project is not only one among the several training projects. It looks for the establishment of a scheme of **continual increase of collective intelligence** inside the Automotive sector. Therefore, the impact of this project is not expected only in the context of the training actions performed during the project lifetime, but beyond.

This will be achieved thanks to an **E2DRIVER Platform** and an **E2DRIVER Methodology** that will enable the possibility to plan and manage, not only the capacity building programmes that E2DRIVER will perform during its project life, but future training actions that could be performed in actions after the end of the project.

In line with this purpose of generating two tools that allow a continual increase of collective intelligence in the Automotive sector, this deliverable constitutes **the first version of the E2DRIVER Methodology**.

2 OBJECTIVE OF THE DELIVERABLE.

The objective of this deliverable is to develop the **E2DRIVER Methodology** that rules the execution of the E2DRIVER Capacity building programmes. In this respect, in the Grant Agreement Annex 1, the purpose of the Task 3.2 – *Development of the overall training methodology*, which is the task that generates this deliverable and, therefore, the E2DRIVER Methodology, is explained as follows:

“Using as baseline the format developed in task 2.4 [...]”

The E2DRIVER Methodology has made its first step with the development of the format in Task 2.4 – *Capacity building programme format*¹. There, the general characteristics of the E2DRIVER Capacity building programmes were defined, such as the expected courses, target groups, duration, general contents, structure, timeline, etc. This work constitutes a “template” that determines the form of the programmes executed in the context of the project. In this Task 3.2 about the Methodology, a new step is performed by defining the way to generate the specific Capacity building programme for each company, as well as providing a complete guide for trainers about how to carry out this type of courses.

“[...] the methodology for effective design of capacity building programmes on energy audits and energy efficiency tailored to particular companies and enterprises in the automotive supply sector will be developed. [...]”

As can be noted in this paragraph, E2DRIVER Methodology is just a way of work, a form of generating and designing of E2DRIVER Capacity building programmes which are trainings:

- (1) that address energy audits and energy efficiency topics,
- (2) that are adapted to the needs and interests of the companies from the Automotive sector and
- (3) that include specific approaches in their execution, such as the Ontological Flip Teaching in pedagogical terms and high interactivity with use of virtual reality.

E2DRIVER Methodology constitutes one of the key results of the project, while the other one is the Platform, the software that enables to bring life the E2DRIVER Methodology.

“[...] This methodology will be developed by using the trainees’ prerequisites identified and determined by exchanging information with the main stakeholders and by analysing the benchmark analysis developed in WP2. [...]”

E2DRIVER Methodology is based on the consideration that a training must suit end-users needs and interests. For that reason, the WP2 – *Benchmarking and analysis of training programmes at the automotive sector* is focused on the study of the characteristics of the automotive sector and the currently on-going training programmes that can be found in this context. This study had enabled E2DRIVER to build the format (Task 2.4) and the specifications of the Platform (Task 2.3), and it will be key to build the Methodology.

¹ For more information, consult the whole Deliverable 2.4 – *Capacity building programme format* in the next link: http://e2driver.eu/wp-content/uploads/2020/06/E2DRIVER_D2.4_Capacity-building-programme-format_29.05.2020_CIRCE.pdf

Due to the importance of these inputs from the end-users, E2DRIVER Methodology is lightly influenced by the Human-Centered Design approach used in its sister project, the INDUCE project².

“[...] Moreover, the training methodology will determine topics addressed, teaching techniques, the duration, chronology and sequence of the selected topics, learning activities and support documents, etc. A close interaction with Task 3.1 will be required in order to adjust the training material and available documentation to the needs of the training methodology.”

As was mentioned before, the format set the general structure of the courses. Now, during the Methodology definition, the training characteristics are explained deeper, while the final and most detailed explanation will be performed in Task 3.3 – *Customized training plan module development*.

To do so, during the whole development of those three tasks (T2.4 about format, T3.2 about methodology and T3.3 about the customization of the trainings) that are the responsible ones for the specific definitions of the characteristics of the trainings, E2DRIVER partners have been aware how much important is to build a solid repository of contents for developing a successful E2DRIVER Capacity building programmes. For that reason, these three tasks have been working in close collaboration with Task 3.1 – *Information gathering and repository development*.

Being aware of the goal of the Methodology and the deliverable, it is important to highlight that the E2DRIVER Methodology defined in this document is the **first version** that will be tested in the pilot companies. Afterwards, once these 12 E2DRIVER Capacity building programmes will have been implemented, E2DRIVER team could extract conclusions and lesson in order to consolidate the final version of the Methodology in **Task 4.4 – Training methodology fine-tuning**.

In this last version when final version of the Methodology is clear, a **guide** for designing Capacity building programmes will be consolidated, explaining all the points about the E2DRIVER that a trainer needs to know in order to implement the E2DRIVER Methodology and to launch an E2DRIVER Capacity building programme: how to analyse the characteristics of each company and the trainees, how to use the E2DRIVER Platform, the resources that E2DRIVER has available and how to design and execute a Capacity building programme with the E2DRIVER requirements, etc.

Taking into account all these points, the **goal of this deliverable** is to create the first version of the E2DRIVER Methodology that will rule the development of the E2DRIVER Capacity building programme in the pilot companies and that will be the starting point for defining the final E2DRIVER Methodology and for preparing the mentioned guide as a result of the project.

In order to prepare as much work as possible in the process of making the mentioned guide in Task 4.4 – *Training methodology fine-tuning*, the present document follows the “**guide format**” in its section 3. Therefore, this section can be used as a baseline for the final version of the guide. This section 3 explains the part of the Methodology that is already defined and, furthermore, it includes some gaps and signs (blue squares) that identify those parts that E2DRIVER consortium is not able to explain by the moment, because they have not been designed so far or they depend on future tasks of the project that have not started yet. By sure, they are expected to be explained in the consolidated version of the guide in Task 4.4.

Among those aspects that cannot be explained yet, it is possible to highlight the next:

² For more information, consult the INDUCE project website: <https://www.induce2020.eu/project-info/>

- First of all, it is expected that the final version of the guide will include instructions about how to use the E2DRIVER Platform. However, the final definition of the **E2DRIVER Platform's functionalities** is still pending because the E2DRIVER Platform has not been developed yet. For that, it is needed to finish the Task 3.5 – *Platform development and modules integration* in order to explain properly this part. The end of this task is expected for next January 2021.
- On the other hand, there are several finishing touches that is necessary to include once the **validation of the Methodology** is performed in the pilot companies. Indeed, this is the most important step that is needed to be performed before E2DRIVER project gets its final E2DRIVER Methodology. E2DRIVER Methodology and E2DRIVER Platform will be tested in the 12 pilot companies during the first part of the next year 2021. Thanks to the training designed for them, E2DRIVER consortium will be able to detect weaknesses and hypothetical improvements in the Methodology and the Platform.

In any case, these and further pending explanations are collected, identified and explained in section 4 of this document.

3 E2DRIVER METHODOLOGY: A GUIDE FOR TRAINERS. EFFECTIVE DESIGNING OF CAPACITY BUILDING PROGRAMMES ON ENERGY AUDIT AND ENERGY EFFICIENCY TOILORED TO PARTICULAR COMPANIES AND ENTERPRISES IN THE AUTOMOTIVE SUPPLY SECTOR.

3.1 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 process³. 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.

³ 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.

3.2 E2DRIVER and project results.

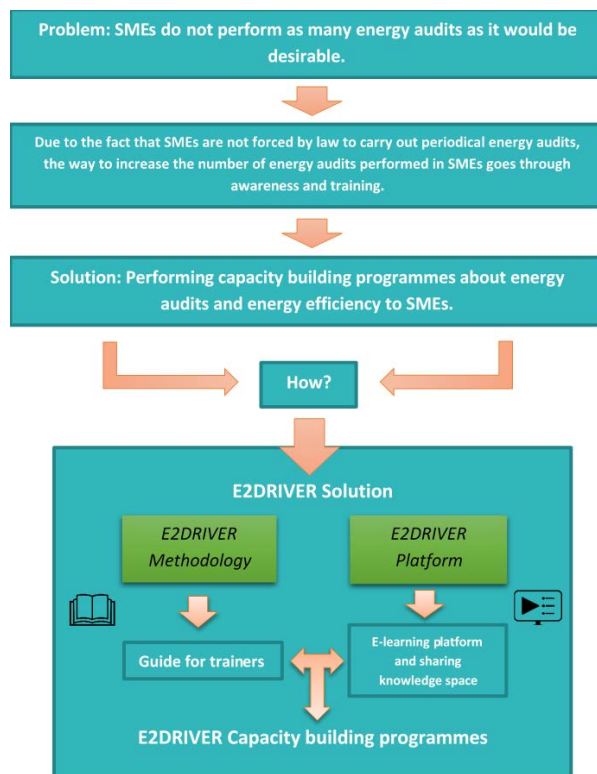


Figure 1. E2DRIVER Solution.

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 is key to encourage this kind of companies to carry out this analysis.

Considering that, E2DRIVER project seeks to create (Figure 1):

- 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 for 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, constitutes the tools which could be replicated in future training actions based on E2DRIVER.

3.2.1 What is the E2DRIVER Methodology?

E2DRIVER Methodology is a way of work, 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 and through the use of **innovative pedagogical approaches**, such as the Ontological Flip Teaching⁴ and high interactive exercises and lessons.

E2DRIVER Methodology is necessarily 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**.
- The guide will include the **functionalities of the platform**, how it looks like and how it works.

⁴ 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.

Further explanation in Task 4.4

This deliverable constitutes the **second step** in the generation of this guide that will be the final version of the E2DRIVER Methodology. The first one was the Deliverable 2.4 – *Capacity building programme format* where the main characteristics of the E2DRIVER training plan was detailed. In the Deliverable 3.2 – *E2DRIVER Training Methodology*, it is defined (1) the general **structure** of this future guide for trainers; (2) the characteristics of the **Ontological Flip Teaching approach** and the general process of the **customization**; and (3) it is starting to explain **how to generate** an E2DRIVER Capacity building programme and **how to teach** in this type of trainings.

After defining these pillars, the core of the Methodology is set and the purpose of the Task 3.2 – *Development of the overall training methodology* could be considered as fulfilled. Afterwards, the final and depth explanation of the Methodology will be performed in Task 4.4 – *Training methodology fine-tuning*, once there will be a clear view of all the aspects.

3.2.2 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 will be adapted to the characteristics of the project and its pedagogical approach.

The E2DRIVER Platform expects four main parts:

- (1) The **repository** of contents where all the training materials will be collected in order to facilitate that internal and external entities of the project could consult them for free.
- (2) The **e-learning part** where trainees will consult the units of their E2DRIVER Training.
- (3) The **E2DRIVER Community**, where trainees, trainers, external experts, financial entities, etc. will be able to keep in contact, share ideas and news and create networking.
- (4) At least three tools for pedagogical and methodological purposes will be defined: The **Energy Audit Self-Assessment Tool**, the **Financial Tool** and the **Benchmarking Tool**.

Furthermore, the Platform is being designed by considering the **Ontological Flip Teaching approach** that needs a part where the trainees get in contact with education material and study the lessons and a site that allows them to upload the materials that they generate in order to be included in the repository of contents.

Finally, E2DRIVER consortium is creating an **algorithm** that will be in the Platform and will work for a customized training. This customization mechanism will consider data from the sector, the company (general information about their consumption and the equipment that there are in their industrial process) and the trainees (academic and professional background, specific fields where there is a lack of knowledge, etc.). However, E2DRIVER project will try to collect as few data as possible, and the data collected will be managed as confidential. Thanks to this data and the algorithm, the E2DRIVER customization tool will be able to plan the most appropriate E2DRIVER Training for this person.

Further explanation in Task 4.4

By now, unfortunately, it is not possible to go deeper in the details about how this algorithm will be embedded in the platform and how it will work. This point is been working thanks to a close cooperation between the partners involved in Task 3.3 – Customized training plan module development and Task 3.5 – Platform development and modules integration.

In task 4.4, this point will be addressed considered the final definition of this point.

3.3 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, where it is used the pedagogical approach of the **Ontological Flip Teaching** and where several **interactive technologies** and tools are implemented 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 trainings that E2DRIVER project seeks to implement**.

3.3.1 Customized training.

Customization is linked with how the E2DRIVER Capacity building programmes are created⁵, since the customization step is **a key part of the generation process** of the E2DRIVER Capacity building programme. What is more, the **customization** can be considered as the cornerstone of the E2DRIVER project. The whole approach is based on the concept that it is needed **to hear the demands of the trainees** in order to know their needs and interests and, therefore, to 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.

But, what is that mean? What is the customization? Sometimes, **customization** is linked with other concepts that are used even as synonyms, such as adaptive learning, personalized learning, differentiated learning or training ad-hoc. In 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*⁶, 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”⁷. In this approach, new technologies are key, because using computer data systems, the training process is able to adapt the training contents and to

⁵ See section 3.5.1.

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

⁷ 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/>

identify what is needed by a trainee in a specific moment in order to continue their academic progress with a successful result⁸.

The customization approach followed in E2DRIVER project does not fit exactly with any of these paradigms. E2DRIVER looks for a **personalized learning** of automotive SME by analysing their needs and interests. However, due to the fact that the E2DRIVER Platform constitutes a key pillar of the training and the fact that some kind of automatic customization will be implemented by embedding an algorithm in the platform, it can be considered that this project will have some features of the **adaptive learning**.

Further explanation in Task 4.4

As mentioned before, how the customization process will work (technically speaking) could be explained in depth once the Task 3.3 – Customized training plan module development and Task 3.5 – Platform development and modules integration are finished.

As it was 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**⁹. In session 3.4.2, the **general features of the E2DRIVER Training** for each profile is described.

3.3.2 Ontological Flip Teaching.

The other big pillar of the E2DRIVER training is the **Ontological Flip Teaching**¹⁰ (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 is able to become **collective** if it is managed properly. For that reason, this paradigm has ideated a whole process that enables the **socialization** of the trainees and, consequently, the generation of “explicit” knowledge that could impact positively in the **collective intelligence** of a group.

3.3.2.1 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 Takeuchi¹¹.

⁸ Edu Trends Report. July 2014. *Adaptive learning and testing*. Observatory of Educational Innovation. Tecnológico de Monterrey. <https://observatorio.tec.mx/edutrendsaprendizajeadaptativo>

⁹ 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

¹⁰ 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

¹¹ Nonaka, I., Takeuchi, H.: *The Knowledge Creating Company: How Japanese Companies Create the Dynamics of Innovation*. Oxford University Press, New York, NY (1995)

Flipped teaching model encourages the benefits that provides “to flip” the model traditionally used in training since the education was institutionalized. Thus, instead of a paradigm where a trainer transfers unidirectionally knowledge to trainees by using a master class, flipped teaching encourages that the internalization of the knowledge is performed *at home*, where 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.”¹²

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 set¹³:

- **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 collective one. This can be linked with the **ontological dimension** of this theory¹⁴ 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 becomes collective through four steps: conceptualization, consolidation, distribution and combination¹⁵. 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**.

¹² Definition of Flipped Learning - Flipped Learning Network Hub. (2019). Retrieved September 14, 2020, from <https://flippedlearning.org/definition-of-flipped-learning/>

¹³ 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

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

¹⁵ 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

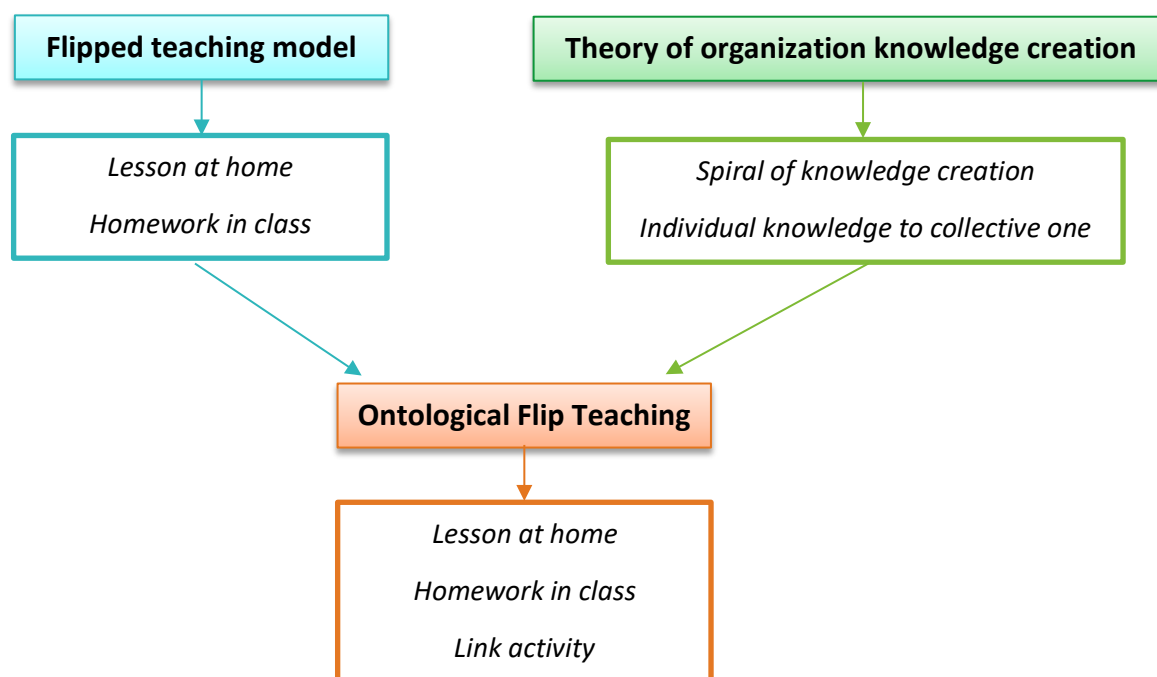


Figure 2. Configuration of the Ontological Flip Teaching.

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** (Figure 2) 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 knowledge¹⁶. Being aware of this limitation, **OFT** goes beyond and includes the rest of processes: **exteriorization** and **combination**. And 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 to achieve the objective of increase the organizational knowledge, the **OFT model** explain the importance of taking advantage of these academic work in **future editions** in order to use them as training materials and, then, to achieve the collective increase of skills.

¹⁶ 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

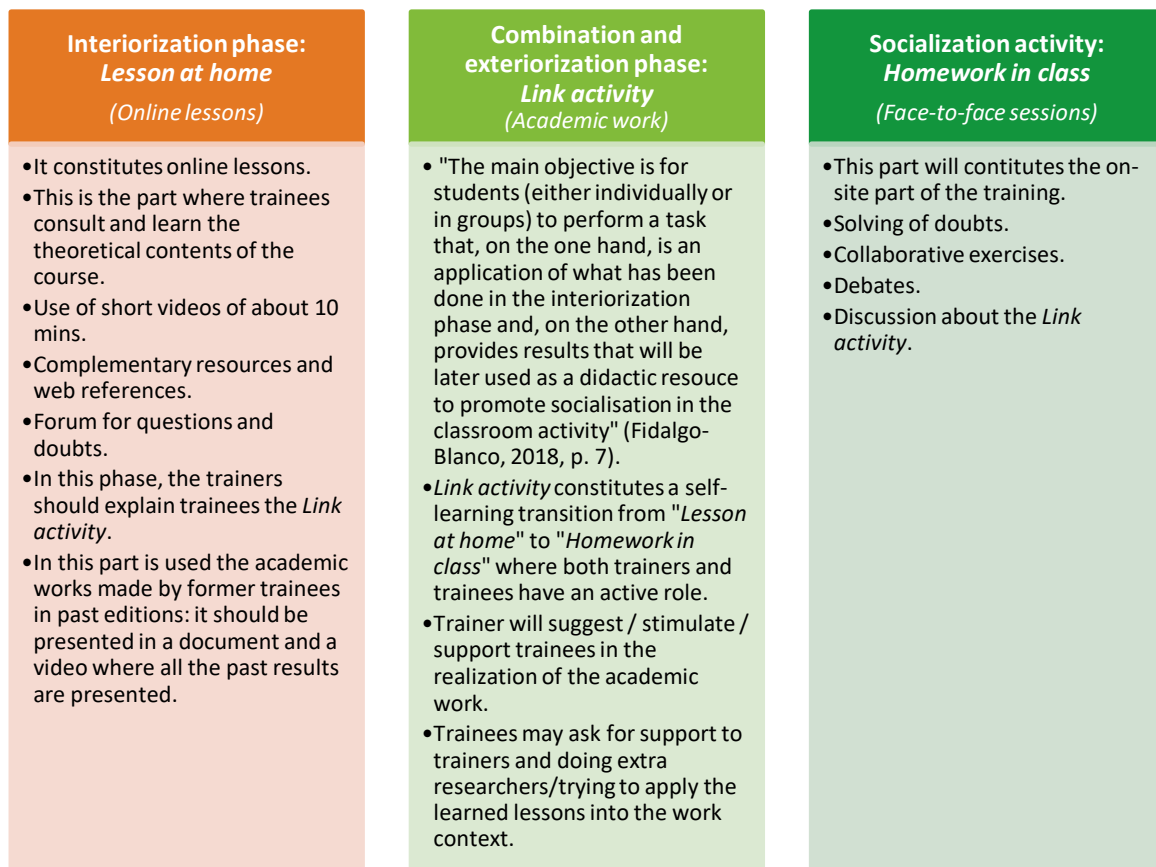


Figure 3. The three steps of the Ontological Flip Teaching. (Source: Proprietary with information from Fidalgo-Blanco, 2018).

In Figure 3, 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.

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

E2DRIVER project has as objective to create a methodology and a platform that boost the automotive sector **collective intelligence** on energy efficiency. This is the reason why it is chosen this methodology. **OFT** mixes the benefits of the last pedagogical approaches with elements that allow to create organizational knowledge. It means that this approach is not only focused on the improvement of the skills of each trainee, considering them as individual and isolated elements. This approach emphasizes the importance to create a collective knowledge shared by different individuals. This is exactly what it is trying to perform in this project. This project is not only focused on the skill's need of a person; it confronts the issue being aware that the lack of knowledge about a correct energy management and the social and environmental consequences are a **collective problem** and that is important to increase 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 our collective target is a whole sector, the automotive sector. This is important to comprehend in order to really understand what E2DRIVER project is trying to perform. The theory of organizational knowledge creation was designed for companies, while the OFT is focused on a class. By sure, E2DRIVER tools maintain the approach of the OFT, but they are

looking for the ambitious goal to perform an impact in the whole sector. This is the reason why the platform is thought as an open e-learning platform and the reason why E2DRIVER is trying to create 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. This is the reason that justify this scheme of knowledge-sharing between companies about these topics, since it is necessary an **aggregated effort** in order to ensure a green, sustainable and healthy future.

Following the three-pillars scheme of the **OFT** (see Figure 3), the **E2DRIVER Trainings**¹⁷ will have a blended learning format¹⁸ with the following scheme (notice that the names of the pillars have varied in order to be adapted to the E2DRIVER reality):

- **Online lessons**¹⁹: 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 could be used for questions and doubts where all trainees and trainers could send messages.
- **Link activity**: during the “Online lessons” execution, trainers will 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**²⁰: this event will be a face-to-face class (*Socialization*) where trainers could explain the points that 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 appropriate 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 work²¹ and to **combine** 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

¹⁷ 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

¹⁸ 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

¹⁹ 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.

²⁰ This refers to the „Homework in class“ pillar of the OFT.

²¹ The academic work will be performed individually. However, different groupal approaches could be considered taking into account each case.

repository²². Thus, **all this new knowledge could be used in other trainings** and it could be consulted by the rest of the automotive sector. Then, the scheme of collective intelligence increase could start.

3.3.3 Interactive learning.

E2DRIVER project has as objective to provide a training that is as much interactive as possible. To do so, the platform will count with an attractive interface and interactive exercises. And, furthermore, each E2DRIVER capacity building programme will be finished with an **E2DRIVER Virtual reality session**.

Further explanation in Task 4.4

For now, it is not possible to specify in more details about the interactivity of the E2DRIVER Capacity building programme. In task 4.4, considering the platform and the final version of the virtual reality, it will be possible to go deeper in this point.

²² Being aware in all cases the importance that these academic works do not show personal data or sensitive information of the company.

3.4 E2DRIVER Capacity building format.

The majority part of this section is taken directly from the Deliverable 2.4 – Capacity building programme. However, minor changes have been performed.

Furthermore, the sections of the specific E2DRIVER Training for the different trainees' groups have been increased with further explanations.

Taking into account all these characteristics explained in section 3.3, 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 can be seen in next Figure 4, it is composed by one “E2DRIVER adjustment sessions”, one or more “E2DRIVER trainings” and one closing “E2DRIVER virtual reality session”.

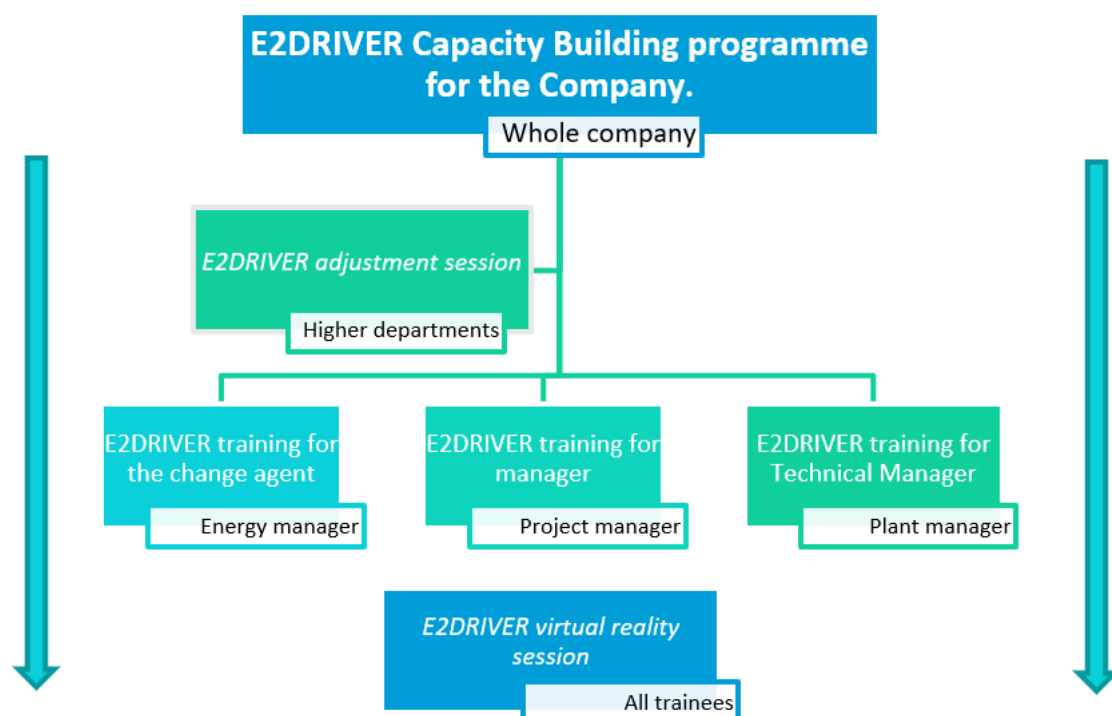


Figure 4. Example of the structure of one E2DRIVER Capacity building programme.

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.

3.4.1 E2DRIVER Adjustment session (5 hours)

<i>E2DRIVER Adjustment sessions</i>	
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 3. E2DRIVER Adjustment sessions.

After a preliminary customization of the training, the first contact with the companies will be performed through the **E2DRIVER adjustment session** (Table 3) in order to verify 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 that will have a 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**. Besides, 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 or E2DRIVER expert 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 experts could present the **benefits of the energy audits**. The analysis performed in the company during characterisation²³ is similar than an energy audit, so it is possible to extract conclusions and to assess possible energy measures from it. Hence, thanks to the example of

²³ Task 4.1 – Detail characterisation of the pilot industries and staff.

this performed analysis, 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 experts 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, on one hand, the attenders should be more **aware** of the benefits that energy audit and energy management provide to an industry and, on the other hand, the E2DRIVER experts would 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 has been developed successfully.

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**.

3.4.2 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 2-20 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 4. E2DRIVER Trainings.

In general, the E2DRIVER training (Table 4) will have a duration of 15 hours with 10 hours of online training and a final face-to-face practical class of 5 hours²⁴.

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. On the other hand, regarding the second one, the use of the Ontological Flip Teaching²⁵ as a main methodology of the project is critically important in order to catalyse the beginning of the collective intelligence continual progress up.

²⁴ E2DRIVER Grant Agreement. Part B. Page 17.

²⁵ See section 3.3.2. – Ontological Flip Teaching.

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 work place. In line with that, employees will be trained on **energy efficiency** issues with insights from **behavioural**, **cultural** and **organizational** perspective²⁶. 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 that their actions have economic effects on their company, social consequences and environmental impacts.

In general, the format of the E2DRIVER Training will consist of three parts: **online** lessons, one **face-to-face** session and **the link activity** that was 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** skills²⁷ 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**²⁸. 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 works susceptible to be used in future training editions. The purpose of this part is that trainees collaborate with E2DRIVER by generating new materials which feed the E2DRIVER repository. This will cause an increase of E2DRIVER 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 sector²⁹.

²⁶ E2DRIVER Grant Agreement. Part B. Page 17

²⁷ „how to communicate energy efficiency issues within the company“ (E2DRIVER Grant Agreement. Part B. Page 17).

²⁸ E2DRIVER Grant Agreement. Part B. Page 17.

²⁹ E2DRIVER Grant Agreement. Part B. Page 17

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, the trainee's group and the personal background. In line with 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**.

Therefore, next, it is possible to consult the general E2DRIVER training expected for each trainee's group. Additionally, the special E2DRIVER training that is focused on **change agents** has been included.

3.4.2.1 E2DRIVER Training for Managers.

<i>E2DRIVER Training for Managers</i>	
Objective	(1) To train companies' managers and (2) to improve the collective intelligence of the sector.
Duration	12 hours.
Mode	Face-to-face and online.
Type of training	10 hours using a learning platform + 2 hours of on-site session.
Topic	Technical and non-technical aspects with high-level perspectives.
Target	Companies' managers.

Table 5. E2DRIVER Training for Managers.

This E2DRIVER training for Managers (Table 5) is expected to have a duration of **12 hours** with 10 online hours and a final face-to-face practical class of 2 hours.

The **target group** are the **Managers** who are those employees working as 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.

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. On the other hand, **general energy aspects** are also included, depending on the area or department they manage, and general regulatory aspects.

The training provided to them is **agile**, but **precise** in terms of what an energy audit or management system entails for the company, and above all, knowing what type of actions are carried out, what investment has to be made and how long it takes, as well as who has to be involved from their team for each of the phases or steps that have to be taken. In this sense, most of the training is online, mainly

due to the high theoretical content, and to facilitate the simultaneity of the training with the work. Only the motivational part is organized by a face-to-face session.

Another of the needs identified in this group, and reflected in the training material, is the need for **conviction** and **awareness** to perceive the energy aspects as a need in their company. In this way, if the managers are involved and convinced, the process is facilitated, and it is easier to motivate the rest of the actors involved. This can be considered as a key goal of this training.

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

- **Online lessons** (10 hours): thanks to the theoretical contents that they could find in the platform, they will be aware of practices and process related to energy management, as well as with more technical aspects, from a high-level perspective, like energy flows and conversions. Additionally, they will receive training about best practices, renewable energies and integration of energy management in existing management systems.
- **Link activity**: it can be considered as a transition phase and its implementation can be quite open. Trainees will suggest to trainers an option of coursework that could increase the collective intelligence of the sector and/or could improve the energy performance of their company.
- **On-site class** (2 hours): this session will be two-fold: (1) it will have a part where coaching, mentoring, behavioural, cultural and organizational aspects will be addressed, and (2) a second part where a discussion will be addressed about the current state of the company and its potential to improve energy performance.

Further explanation in Task 4.4

The whole itinerary will be designed in the context of the Task 3.3 – Customized training plan module development. Therefore, once this task is finished, further information could be included.

3.4.2.2 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	15 hours.
Mode	Face-to-face and online.
Type of training	10 hours using a learning platform + 5 hours of on-site session.
Topic	Wide knowledge in technical issues and economic, social and environmental impacts.
Target	Companies' science and engineering professionals.

Table 6. E2DRIVER Training for Science and Engineering Professionals.

This E2DRIVER training for Science and Engineering Professionals (Table 6) is expected to have a duration of **15 hours** with 10 online hours and a final face-to-face practical class of 5 hours.

The **target group** are the **Science and Engineering Professionals** who are those employees working as technology experts, researchers, engineers leading the R&D department, 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. They are technology experts, and they master the learning process using 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, and therefore, they know how they work, and it is expected that they are already optimised, but, they do not have the general vision of the whole company.

The training will therefore focus on how these professionals can **translate** their **technical knowledge** into energy, and provide the information in the necessary format, to carry out energy efficiency actions, such as indicators, economic aspects, data management and analysis, etc.

Most of the training material is **online** but it is complemented with **practical exercises** that help them to know how to apply different tools in the processes and activities they do.

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): their activities will be composed by training on monitoring systems, tools, performance indicators, data analysis and energy management. Moreover, they should get a broader knowledge on the topic, including economic impacts for the company and environmental impact.
- **Link activity**: they will be encouraged to suggest possible energy measures in order to create an E2DRIVER repository of energy measures. The applicable energy measures could be used during the face-to-face session.
- **On-site class** (5 hours)³⁰: this session will be a practical exercise where the main topic addressed will be the current state of the company and the possible energy measures that are necessary to be implemented. Connected with this, the internal and external economic, social and environmental impacts derived from the activity of the company will be addressed, trying to understand how energy management is relevant and why energy audits should be performed regularly.

Further explanation in Task 4.4

The whole itinerary will be designed in the context of the Task 3.3 – Customized training plan module development. Therefore, once this task is finished, further information could be included.

³⁰ 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.

3.4.2.3 E2DRIVER Training for Technical Managers.

<i>E2DRIVER Training for Technical Managers</i>	
Objective	(1) To train companies' technical managers and (2) to improve the collective intelligence of the sector.
Duration	15 hours.
Mode	Face-to-face and online.
Type of training	10 hours using a learning platform + 5 hours of on-site session.
Topic	Wide knowledge in technical aspects.
Target	Companies' technical managers.

Table 7. E2DRIVER Training for Technical Managers.

This E2DRIVER training for Technical Managers (Table 7) is expected to have a duration of **15 hours** with 10 online hours and a final face-to-face practical class of 5 hours.

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 terms 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.

They 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.

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): their activities will be composed by training on energy saving practices and tips, on monitoring systems, tools, performance indicators, data analysis and energy management, economic impacts for the company and environmental impact. Moreover, training on technical aspects included in the ISO 50001 and the staff involvement.
- **Link activity:** Technical Managers will be encouraged to suggest possible energy measures in order to create an E2DRIVER repository of energy measures. The applicable energy measures could be used during the face-to-face session.

- **On-site class** (5 hours)³¹: this session will be a practical exercise where the main topic addressed will be the current state of the company and the possible energy measures that are necessary to be implemented. Connected with this, the internal and external economic, social and environmental impacts derived from the activity of the company will be addressed, trying to understand how energy management is relevant and why energy audits should be performed regularly. Their face-to-face session exercises will be shared with science and engineering professionals and change agents and their role in the exercises will focus on the planning of an energy audit and the detection on energy efficiency measures.

Further explanation in Task 4.4

The whole itinerary will be designed in the context of the Task 3.3 – Customized training plan module development. Therefore, once this task is finished, further information could be included.

3.4.2.4 E2DRIVER Training for Technicians.

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

Table 8. E2DRIVER Training for Technicians.

Technicians are those employees who do not have some kind of academic degree. The 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 main goal of their training is to introduce them to **energy efficiency** concepts and increase their **awareness** on the effects that the use of the installations has in **energy consumption** and **environmental** impact.

The format of this E2DRIVER training for Technicians changes a lot if we compare it with the rest trainings (Table 8). **These sessions will consist on 1 face-to-face session of 2 hours.** This format has been selected because it is considered the most appropriate format for them due to their academic and professional background, and because the technicians' sample that answered the survey of the Task 2.2 – *Profile design and characterisation of different roles within industries*³² expressed their preference of on-site training.

³¹ 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

³² 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

These sessions will be totally focused on their daily work, looking for a very practical class.

Further explanation in Task 4.4

The whole itinerary will be designed in the context of the Task 3.3 – Customized training plan module development. Therefore, once this task is finished, further information could be included.

3.4.2.5 E2DRIVER Training for Change agents.

E2DRIVER Training for Change agents	
Objective	To provide a specific training for the future change agents.
Duration	20 hours.
Mode	Face-to-face and online.
Type of training	10 hours using a learning platform + 5 hours of on-site session + 5 hours of interactive workshop.
Topic	High technical knowledge, communication, leadership and other soft skills.
Target	Future “change agents” from each company.

Table 9. 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 efficiency³³ 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 **20 hours**.

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

Regarding the contents of the training, the additional capacity programme provided to these agents will contain both main parts. On one hand, a **high technical knowledge** is expected from them, so a deeper theoretical content will be provided to them, while, 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.

³³ E2DRIVER Grant Agreement. Part B. Page 17.

Regarding their training itinerary, first, they will need to be introduced to process energy efficiency to work with technical managers in the detecting of energy efficiency opportunities. Then, they will be trained in energy auditing processes to properly gather and analyze energy data.

Their role will require deep knowledge in energy culture and energy management systems. It will be crucial that they understand the proper way to address this issue in the organization and how to set the procedures and systems that allow for continuous improvement. Furthermore, employee awareness and motivation will be an important stepping stone in their training.

In the face-to-face session exercises they will learn about energy auditing and the day-to-day operation of an energy management systems according to ISO 50001.

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

- **Online lessons** (10 hours): as mentioned, the technical contents that they will receive in their online session will be more advanced. It is expected that they have a high level of energy knowledge: ISO 50001, energy management, industrial processes, energy audits, etc.
- **Link activity**: they will be encouraged to suggest possible energy measures in order to create an E2DRIVER repository of energy measures. The applicable energy measures could be used during the face-to-face session.
- **On-site class** (5 hours)³⁴: this session will be a practical exercise where the main topic addressed will be the current state of the company and the possible energy measures that are necessary to be implemented. Connected with this, the internal and external economic, social and environmental impacts derived from the activity of the company will be addressed, trying to understand how energy management is relevant and why energy audits should be performed regularly.
- **Interactive workshop** (5 hours): the aim of these workshops will be to engage the majority of the actors in changing towards an improved energy culture. For this reason, instead of just giving a speech on the importance of energy efficiency, these workshops will also include interactive storytelling, brainstorming sessions, discussions addressing emotional insight and value redefinition, etc. Here is the most appropriate place where the soft skills can be improved.

As mentioned, the **interactive workshops** will be 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 country³⁵.

Thus, 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 define where it is the **most appropriate place** to hold the event,

³⁴ 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

³⁵ 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.

considering the workplace of each attendee 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 could provide the possibility to see in real-life energy measures implemented and learnt lessons. However, other place could be defined considering the specific circumstances of each country.

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

- First, a brief explanation of the project will be performed, trying to collect **impressions** from the change agents about the experience of their companies during the training execution.
- Secondly, 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**”.

Further explanation in Task 4.4

The whole itinerary will be designed in the context of the Task 3.3 – Customized training plan module development. Therefore, once this task is finished, further information could be included.

3.4.3 E2DRIVER Virtual reality session (1 hour).

Once all E2DRIVER training are has been completed, a closing session will be held. In this one, the Virtual Reality will be the main character. It will be 1-hour length and the attendees will be all the E2DRIVER trainees that have participated in the project in this company. However, due to the limited time available³⁶, in case it is not possible that all attendees perform the VR exercise, only those who are or will be in charge of energy measuring will perform the exercises. In spite of that, the E2DRIVER trainers will try that all trainees have the opportunity to interact with the Virtual Reality exercise and, furthermore, a screen will enable them to see how others perform the exercise.

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 related to electricity 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.

³⁶ 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.

3.5 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**. Thus, first of all, in next subsection it is explained which are the steps they must follow in order to create a whole E2DRIVER Capacity building programme and, afterwards, the guide continues presenting how trainers should teach in a training with these characteristics.

3.5.1 How to create an E2DRIVER Capacity building programme?

The generation of these trainings is performed by following a four-steps process: **characterization, customization, implementation and evaluation**³⁷. This four-steps generation shares features with the Human-Centered Design approach used in the INDUCE project³⁸ (Figure 5).

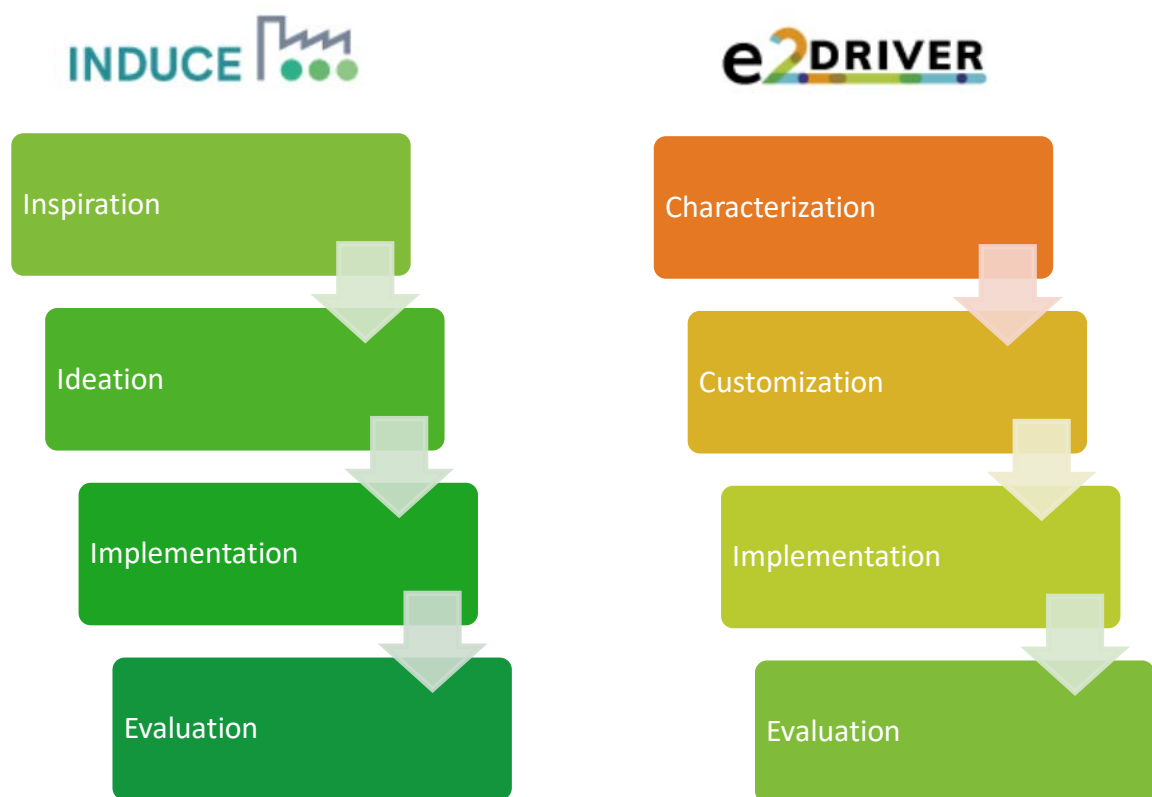


Figure 5. Structure of the INDUCE Methodology and E2DRIVER Methodology

The **Human-Centered Design** approach used in INDUCE is based on the principle that it is necessary to understand the trainees of the training in order to generate an appropriate capacity building programme. Thus, the **inspiration** is a phase intends to deeply understand the reality of these future trainees, their needs, expectations and interests. Afterwards, in **ideation** phase, a prototype of capacity building programme can be gotten thanks to the inputs obtained, being possible to **implement** it in order to satisfy the training needs of the companies.

³⁷ E2DRIVER Grant Agreement. Part B. Page 15-17.

³⁸ INDUCE project website: <https://www.induce2020.eu/project-info/>

Regarding the specific case of the E2DRIVER project, in spite of the fact it does not follow the same scheme, it has been **inspired by this approach**.

3.5.1.1 Phase I – Characterisation.

- *Alignment with the companies needs and expectations.*
- *Measurement and analysis of the current situation of trained companies.*
- *Identification of profiles within the company.*

E2DRIVER looks for a **personalized learning** 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, and it is totally linked with the inspiration phase of the Human-Centered Design approach.

What E2DRIVER recommends is to perform an **energy assessment** of the companies in 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 could be used as a guide for performing this energy assessment (Figure 6). This template will be available in the repository of contents of the E2DRIVER Platform.

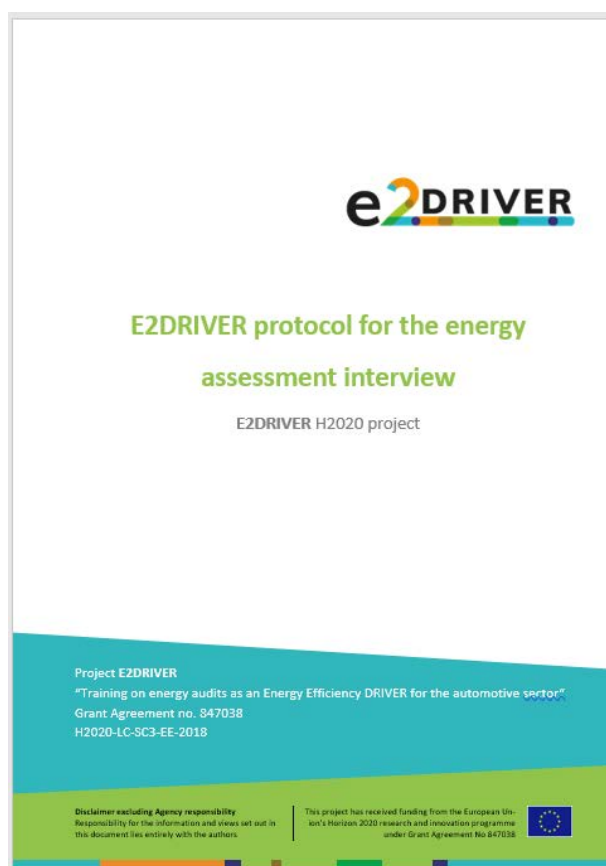


Figure 6. E2DRIVER protocol for the energy assessment interview.

In general, thanks to this energy assessment, the trainer will be able to know:

- 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:** trainer 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 **final version** of the capacity building programme designed for each company.

Once the company finally decided to proceed with the training, they will select the employees that should perform the capacity building programme and they will be encouraged to log in the E2DRIVER platform.

Further explanation in Task 4.4

In the final version of the guide, it is expected to include in this moment a depth explanation about how to log in the platform in the first time, how to include the data needed for making possible that the customization tool works and, furthermore, the guide will explain how the classification of trainees works and the consequences in regard the final training trainees will received.

3.5.1.2 Phase II – Customization.

Further explanation in Task 4.4

The customization mechanism is being designed in the Task 3.3. Indeed, the result of this task will be the customization tool that constitutes the whole E2DRIVER scheme that is used for a final personalized training.

The customization process will finish with an **E2DRIVER Adjustment session**³⁹ where all the results obtained in the customization process is presented to the company. There, the higher management departments will be able to understand the essence of the E2DRIVER training that has been designed for them. E2DRIVER responsible will present the characteristics of the several **E2DRIVER Trainings** that will be included in the whole Capacity building programme and which contents is expected to be present in each one. This session gives the opportunities to the company to provide feedback and inputs in order to perform the **finishing touches** of the E2DRIVER capacity building programme.

3.5.1.3 Phase III – Implementation.

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

³⁹ See 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

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**⁴⁰.

Regarding the **E2DRIVER Trainings**, as can be consulted in the Deliverable 2.4 – *Capacity building programme format* and the section 3.4.2., E2DRIVER has defined **four main trainees' groups** (plus change agents): Managers, Scientifics and Engineering professionals, Technical Managers and Technicians. 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.

For more information about how E2DRIVER Capacity building programme should be implemented, consult the section 3.4 about the format and the section 3.5.2. about how to teach in an E2DRIVER Capacity building programme.

3.5.1.4 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**.

Further explanation in Task 4.4

The evaluation and monitoring are a key part of the E2DRIVER Capacity building programme. In this moment, in the context of the Task 3.6 – Monitoring and evaluation plan definition is being designed the approach followed in order to assess the impact and the acceptance of the training. Therefore, by now, it is not possible to explain the characteristics of this scheme.

3.5.2 How to teach in an E2DRIVER Capacity building programme?

Once the whole **E2DRIVER Capacity building programme** is finally determined, its execution can proceed. E2DRIVER project pretends to provide a high degree of **automatization** to the E2DRIVER Platform. However, the role of the trainers remains fundamental for the execution of the training plan.

This is why this section exists. Here, trainers can find all the needed information in order to perform the tasks that is expected from them in the trainings.

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.

3.5.2.1 Online lessons.

As explained in section 3.3.2., *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, they will find videos,

⁴⁰ See section 3.4.

documents, presentations, exercises and complementary materials that will contain information about energy efficiency and energy auditing in an industrial context.

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

- **Checking** if the **customized** training is effectively the most **appropriate** one for each trainee and to **perform changes** in the itineraries (if needed).
- **Mentoring** for trainees. They will be in charge of clarifying doubts and questions, guiding trainees and solving all the problems that 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.

Further explanation in Task 4.4

Once the E2DRIVER Platform is finished, the idea is to include several screenshots of the platform in this section of the trainers' guide in order to explain trainers clearly how to perform these points in the online platform. To do so, it is necessary to wait until the platform is finished in February 2021.

3.5.2.2 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 could find. Thus, they could generate an original academic work that will be useful for (1) discussing in on-site session and (2) increase the repository of contents (in case the academic work fulfils some specific requirements).

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 their doubts and questions.
- **To correct** 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.

Further explanation in Task 4.4

As in previous section about the Online lessons, it is suitable to include in this part an explanation about how trainers could submit new training materials to the repository. To do so, it is needed to wait until the platform is ready in February 2021.

3.5.2.3 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.

Considering the Deliverable 2.4 – *Capacity building programme format*⁴¹, the expected on-site sessions are the next:

- **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 deeply 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 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.

⁴¹ 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

- To **organize** the exercises.

Further explanation in Task 4.4

Considering the lessons learnt during the execution of the pilot experience, the guide could include a more detailed and realistic view about how to perform these on-site sessions.

4 KEY POINTS TO BE IMPROVED IN THE METHODOLOGY FINE-TUNING.

Through the whole section 3, that is a first version of the future E2DRIVER trainers' guide, several **blue squares** have remarked that there are some aspects of the methodology that cannot be described by the moment. This is due to the fact that lots of points of the expected training depend on other tasks that have not been developed yet or have not even started.

This section pretends to summarize all these points that remains to be defined in order to have a clear list to confront in Task 4.4 – *Training methodology fine-tuning*.

The remaining points are the next:

- Explanation of the **E2DRIVER Platform functioning**. This is the most critical point due to fact that the objective is to create a guide where trainers easily understand how to use the platform and implement an E2DRIVER Capacity building programme. This information could be extracted from the platform once the Task 3.5 – *Platform development and modules integration* is finished and the e-learning site fully operated. Thanks to that, it will be possible to include in the guide:
 - **A general user guide** for trainees and trainers (daily use).
 - How the trainees and the trainers should **log in** by the first time.
 - How trainees should **include information** about their academic and professional background.
 - How the general **customization process** works.
 - How trainees will be **classified** in one of the four expected trainees' groups.
 - How the **algorithm** of customization works.
 - **Review** of link activities and **submission** of new materials to the repository.
- Explanation of the **interactive activities** that will be included in the E2DRIVER Capacity building programmes. For explaining this point, it is needed that the Platform is finished, since then it will be possible to check the interactive possibilities that enable the e-learning space, and that the Task 3.4 about virtual reality is completed as well.
- Explanation of the whole **training itinerary** in the different trainees' group. These training plannings will be finished in the Task 3.3 – *Customized training plan module development*.
- Explanation of the **final version** of the **on-site sessions**. The final version of these sessions will be known once the pilot experience has checked the weaknesses of the planning expected until now and, consequently, the E2DRIVER experts will have had the opportunity to fine-tuning the features of these sessions. This can be also extrapolated to the rest of the training planning, since changes around the whole training may happen.
- Explanation of how the **evaluation** of the Capacity building programme will be. This is something that is being defining in Task 3.6 – *Monitoring and evaluation plan definition*.

5 CONCLUSIONS

Taking into account the lack of information that some companies have, E2DRIVER project seeks to generate a solution for increase the **collective intelligence** of the automotive sector in energy efficiency and energy auditing. To do so, E2DRIVER is designed a 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 is ideating two main 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 that sense, the first step of the definition of this approach was performed in Task 2.4 – *Capacity building format*, where the general characteristics of the training solutions was defined. Now, this Deliverable 3.2 – *Development of the overall training methodology* presents the **scheme of the guide for trainers**, clarifying aspects about the pedagogical approach, the mechanism of training generation and the points that must be considered for teaching in these courses.

The ideal scene would be to define in this deliverable all the aspects that must be included in the E2DRIVER guide for trainers. However, due to the fact that there are a lot of things that remains to be defined, the final version of the guide will be presented in the end of the **Task 4.4 – Training methodology fine-tuning**.

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