# D7.1

Training material – 1<sup>st</sup> version

*31 August 2022*

# OPTIMAI

## DOCUMENT SUMMARY INFORMATION

| | | | |
|---|---|---|---|
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## DISCLAIMER

## DOCUMENT HISTORY

| Version | Date | Changes | Contributor(s) |
|---------|------|---------|----------------|
| V0.1 | 10 May 2022 | Draft Table of Contents shared with consortium | CARR |
| V0.2 | 11 May 2022 | Table of Contents updated following partner input at training material workshop | CARR |
| V0.3 | 13 May 2022 | Contribution to module on virtualization and simulation | VIS |
| V0.4 | 24 May 2022 | Contribution to modules on data protection and employee rights | TRI |
| V0.5 | 16 June 2022 | Contribution to module on AR glasses | YBQ |
| V0.6 | 17 June 2022 | Contribution to module on data acquisition network | EVT |
| V0.7 | 22 June 2022 | Contribution to module on QIF standard | UNIMET |
| V0.8 | 7 July 2022 | Contribution to module on AI ethical principles | UAB |
| V0.9 | 14 July 2022 | Contribution to module on sensors installation | CERTH |
| V0.10 | 3 August 2022 | Addition of modules on AR Interface and Virtualisation modules based on content produced by FORTH and VIS respectively | CARR |
| V0.11 | 6 August 2022 | Contribution to module on DSS | CERTH |
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| V0.14 | 23 August 2022 | Quality check and version ready for submission | ENG |
| V1.0 | 31 August 2022 | Submission | CERTH |

OPTIMAI

## PROJECT PARTNERS

| Logo | Partner | Country | Short name |
|---|---|---|---|
| | ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS ANAPTYXIS | Greece | CERTH |
| | FINT FUTURE INTELLINGENCE LIMITED | Cyprus | FINT |
| | IDRYMA TECHNOLOGIAS KAI EREVNAS | Greece | FORTH |
| | EVT EYE VISION TECHNOLOGY GMBH | Germany | EVT |
| | VISUAL COMPONENTS OY | Finland | VIS |
| | YOUBIQUO SRL | Italy | YBQ |
| | PANEPISTIMIO THESSALIAS | Greece | UTH |
| | ENGINEERING – INGEGNERIA INFORMATICA SPA | Italy | ENG |
| | UNIMETRIK SA | Spain | UNIMET |
| | UNIVERSITAT POLITECNICA DE VALENCIA | Spain | UPV |
| | Carr Communications Limited | Ireland | CARR |
| | UNIVERSIDAD AUTONOMA DE BARCELONA | Spain | UAB |
| | TRILATERAL RESEARCH LIMITED | Ireland | TRI |
| | KLEEMANN HELLAS –INDUSTRIAL COMMERCIAL SOCIETE ANONYME FOR MECHANICAL CONSTRUCTION SA | GREECE | KLEE |
| | TELEVES SA | Spain | TVES |
| | MICROCHIP TECHNOLOGY CALDICOT LIMITED | United Kingdom | MTCL |

# LIST OF ABBREVIATIONS

| Abbreviation | Definition |
|---|---|
| AI | Artificial Intelligence |
| AR | Augmented Reality |
| DMIS | Dimensional Measuring Interface Standard |
| DMSC | Dimensional Metrology Standards Consortium |
| DSS | Decision Support System |
| FOV | Field of View |
| GD&T | Geometric Dimensioning & Tolerancing |
| GPS | Geometrical Product Specifications |
| GUI | Graphical user interface |
| HD | High Definition |
| HMI | Human-Machine Interaction |
| HUD | Heads up display |
| HW | Hardware |
| IoT | Internet of Things |
| LIN | Linear motion |
| MIPI | Mobile Industry Processor Interface |
| MQTT | MQ telemetry transport |
| OMIDES | Operator - Machine Interaction & Decision Support |
| OMIDES-FE | Operator - Machine Interaction & Decision Support Front–End |
| OPC UA | Open Platform Communications Unified Architecture |
| PCB | Printed Circuit Board |
| PMI | Product Manufacturing Information |
| PTP | Point-to-point motion |
| QIF | Quality Information Framework |
| REST API | Representational state transfer application programming interface |
| RS232 | A standard protocol used for serial communication |
| SDK | Software Development Kit |
| SW | Software |
| T | Task |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| UDP | User Datagram Protocol |
| WP | Work Package |
| XML | Extensible Markup Language |

# Executive Summary

End-user training plays a significant role in the successful implementation and deployment of the OPTIMAI solutions. A set of the training material has been produced to ensure that end-users understand how the OPTIMAI system works, how to interact with the technology and how they fit into the broader picture of responsible, technology-driven production optimisation.

The OPTIMAI Training Catalogue is publicly available on the OPTIMAI website at https://optimai.eu/optimai-training-catalogue. It introduces relevant end-users and operators to the OPTIMAI concept and offers training in the use of the OPTIMAI tools. The catalogue contains a broad range of instructional presentations, learning videos and guidelines. The primary purpose of the training material is to provide end-users with a good understanding of the OPTIMAI technologies, associated rights and requirements as well as relevant supporting resources. Step-by-step guides and illustrated walkthroughs help users familiarise themselves with the parts covered in the training.

The process for the development of the training material is divided into five phases: Phase I: Needs assessment; Phase II: Design; Phase III: Development; Phase IV: Delivery and Phase V: Evaluation.

The catalogue is split into eleven concise, standalone modules. Each module is available as a digital open access resource. The material is provided as a combination of PowerPoint presentations, PDFs and YouTube videos. It aims to be user friendly through clear language, visual aids and an aesthetically coherent layout.

The training material will be updated with the completion of D7.2 in M30. Feedback on the first version of modules will be elicited to support the development of the second version.

The final Training Catalogue will stay live on the OPTIMAI website for five years after the end of the funding period, i.e., until December 2028.

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# 1 Introduction

Manufacturing industries are constantly looking for new ways to improve quality control for both manufactured products and manufacturing processes. OPTIMAI is spearheading innovation in this area. Introducing new technologies designed to reduce scrap, eliminate defects, maximise productivity and improve quality of shop floor processes, the project is set to make a tangible impact on European industry and environmental sustainability.

Feeding into the current transformative phase in the Industrial Revolution known as Industry 4.0, OPTIMAI's innovations go beyond the state of the art and pave the way for a smarter, digitalised European manufacturing domain.

Against this backdrop, OPTIMAI is seeking to provide training material and training activities that will familiarise users with these innovations and that will boost human performance in industry across Europe.

A dedicated task, "T7.1 OPTIMAI Training" therefore focuses on the development of training material and training activities aimed to introduce relevant end-users and operators to the OPTIMAI concept and to train them in the use of the OPTIMAI tools. The aim is to ensure that end-users understand how the system works, how to interact with the technology and how they fit into the broader picture of responsible, technology-driven production optimisation.

## 1.1 Purpose and structure of the document

The purpose of this document is to describe the first version of the OPTIMAI training material as well as the process leading to its development. It serves as a report that explains the training catalogue and its components that are available as standalone open-access documents on the project website.

Section 1 of this report introduces the deliverable. Section 2 presents the OPTIMAI approach to end-user training, the background and the methodology. Section 3 describes the training needs, design and development. Section 4 covers the training catalogue and the modules comprised in the catalogue. Section 5 outlines the next steps and concludes the deliverable.

## 1.2 Intended readership

As this deliverable is public, it is openly accessible in the Deliverables section of the project website. The content of this deliverable is disseminated both internally within the project consortium and externally to any interested parties outside the project. The intended readership primarily comprises OPTIMAI end-users including operators, technicians, engineers and

managers who will be using the OPTIMAI tools. Secondary audiences include external stakeholders from the Industry 4.0 sector and beyond with an interest in the OPTIMAI solutions.

## 1.3 Relationship with other OPTIMAI deliverables

This deliverable is closely linked to the deliverables listed in Table *1*.

Table 1: Relationship with other deliverables

| Deliverable no | Title of deliverable | Link to D7.1 |
|---|---|---|
| D2.1 | User and ethics and legal requirements I | The user requirements guide the development of the training material. |
| D2.2 | User and ethics and legal requirements II | The user requirements guide the development of the training material. |
| D6.1 | Decision support and early notification framework - 1st version | A training module explains the functionalities and use of the DSS |
| D7.2 | Training Material – 2$^{nd}$ version | D7.2 will build on D7.1. |
| D7.3 | Ethics recommendations and regulatory framework | The content of D7.3 feeds into the training modules addressing ethical and legal aspects. |
| D8.1 | Project website and branding | The training catalogue is hosted on the project website. The brand guidelines are applied throughout the training material. |
| D8.2 | Communication and dissemination strategy | The principles of clear communication are applied in the training material. |

This deliverable is also connected to milestone 10 as presented in Table 2.

Table 2: Relevant milestone

| Milestone no | Milestone title | Lead beneficiary | Means of verification |
|---|---|---|---|
| MS10 | Training material for end-users is ready | CARR | This milestone will be accomplished with the availability of D7.1. |

# 2 The OPTIMAI approach to end-user training

## 2.1 Background

End-user training plays a significant role in the successful implementation and deployment of the OPTIMAI solutions. End-user training is all about familiarising the users with the relevant tools and the optimal use of these tools. It is also about empowering users by building their confidence through skills development, by giving them a sense of ownership and responsibility, and explaining their role in the wider scheme of things. Offering appropriate training is essential to ensure that employees know and understand how the system works and how to interact with the technology.

This is why Task 7.1 OPTIMAI Training focuses on producing a comprehensive training catalogue containing guidelines and a set of learning presentations and videos introducing the OPTIMAI tools and procedures and teaching end-users how to use the tools. Users include factory floor operators, technicians, engineers, production managers and production specialists among others.

The training material also serves as a good opportunity for the technical partners to promote their tools. The material presenting the tools will be shared across OPTIMAI channels and can also be showcased at events such as trade fairs and workshops, where they are likely to attract plenty of attention.

OPTIMAI places the end-user at the heart of the training material development. The material is instructional and includes guidelines on how to operate the tools. The aim is to give the user a good understanding of how each tool works. As each tool is different, each training module is consequently different as well. Each module aims to be user-friendly and comprehensible, and aims to contain step-by-step guides, walkthroughs with screen captures/recordings and/or illustrative imagery where relevant.

D7.1 constitutes the first version of the OPTIMAI training material. A second, final version of the material will be available in M30.

## 2.2 Methodology

The process for the development of the training material is divided into five phases:

- Phase I: Needs assessment
- Phase II: Design
- Phase III: Development
- Phase IV: Delivery
- Phase V: Evaluation

It is worth noting that the design and development phases are nonlinear. They are iterative and involve several rounds of modifications as the material is generated and its relevance is evaluated. The following subsections describe the steps involved in each phase.

### 2.2.1 Phase I: Needs assessment

Phase I aims at establishing the training needs and preferences of the end-users. It entails establishing the nature of the end-users' existing training environment to determine how the OPTIMAI training solutions will fit in. Given the novel nature of the solutions, the end-users are not expected to have prior knowledge of them or prior experience of the use of similar tools.

The needs assessment was carried out by combining a review D2.1 User and ethics and legal requirements - 1st version, including the requirements questionnaire appended to D2.1, D2.2 User and ethics and legal requirements - 2nd version and D7.3 Ethics Recommendations and Regulatory Framework. In addition, a questionnaire specifically on end-user training needs was circulated to the end-users in February 2022.

### 2.2.2 Phase II: Design

The training design phase aims to answer the "what, where, who, when and how" details of the training. The results of the previous phase, the needs assessment, answers these questions to a certain degree. A further step in the OPTIMAI training design process was to organise a T7.1 Training material workshop. The purpose of the workshop organized by CARR on 10 May 2022 was to make collective progress on the planning of the training material to be included in D7.1. The main questions discussed during the workshop were:

- Scope: What should be included in the training material?
- Partner input and collaboration: What role does each contributing partner play?
- Layout, structure: What will the end result look like?

The workshop was followed by email exchanges between CARR and contributing partners to agree on details regarding the delivery of the individual training components.
The design phase therefore primarily builds on: 1) the results of the needs assessment, 2) the planning workshop and 3) email correspondence with partners.

### 2.2.3 Phase III: Development

The development phase commences once it has been determined what will be included in the training material, by whom and how. The development phase is the most labour-intensive and time-consuming phase of training. It involves building the structure and drafting materials addressing the identified needs and learning objectives. The process is highly iterative as the material may undergo multiple rounds of revisions and involve both content experts (end-users and OPTIMAI partners) and communication and training experts before the modules are

finalised. The drafting process typically includes a planning, a content development, a turning-content-into-presentation, a preliminary review and an editing stage. The development stage also takes aspects such as accessibility issues into account.

### 2.2.4 Phase IV: Delivery

The delivery phase starts once the needs assessment, design and development have been carried out. While the earlier phases focus on the content of the training material, the delivery phase focuses on the process of teaching and methods of learning.

In OPTIMAI, each end-user organisation has a different existing training setup, and the OPTIMAI training will be tailored to each end-user. The delivery phase goes hand in hand with the OPTIMAI pilot activities as the preparation of the respective demos takes place in parallel with the training.

The delivery may take various forms depending on established end-user practices, including lectures / classroom style training, group discussions/tasks, on the job learning on the shop floor and virtual classes.

### 2.2.5 Phase V: Evaluation

Training evaluation will combine structured evaluation (written post-training participant feedback through feedback forms), informal evaluation (verbal "How did it go?" discussions at the end of a training session) and trainer assessment where the trainer assesses the progress of the training. The use of post-training tests, e.g., quizzes, to measure training success, and the issuing of certificates of completion will be explored as well.

The feedback gathered will then guide further development of the training material in the period M21-M30. During the needs assessment, design and development phase of the 2$^{nd}$ version of the training material, process evaluation will be carried out. This means every step will be evaluated along the way and any issues or blockages encountered will be addressed before moving on to the next step.

See Appendix A1: Feedback form for the initial feedback form.

# 3 Training needs, design and development

This section describes the identification of training needs and the design and development of the initial set of training material.

## 3.1 Training needs

In the requirements questionnaire appended to D2.1, end-users and other partners were asked the following question: In addition to technical training regarding the functionalities of OPTIMAI, what other issues should be included in the training sessions designed for the human operators? The training needs identified by a) end-user partners, and b) other OPTIMAI partners are presented in Table 3.

*Table 3: Training needs identified through the D2.1 requirements questionnaire*

| a) | Partner | Identified training needs |
|---|---|---|
| | KLEE | **Health and safety** issues should be included in the training sessions regarding the procedures of the valve block calibration. |
| | | **Product characteristics** issues should also be included. |
| | TVES | No additional ones are foreseen at present. |
| | MTCL | A full disclosure of **how any information gathered will be used**. Full disclosure of the methods being used to **protect anonymity and personal data**. |
| b) | Partner | Identified training needs |
| | CERTH | In the training sessions for the human operators, aspects about their previous **experience/attitude** towards included technologies e.g., AR glasses, gesture-based system etc., and their **perceptions** about being supported by a digital agent while working, should be considered and be an essential part covering horizontally the training process. These aspects should not to be marginalized. |
| | UAB | Human operators must be **aware** of the fact that they are interacting with **AI systems, their purposes, capabilities and limitations** |
| | | Implications to **privacy** and the extent to which they are tracked |
| | | **Health and occupational safety** issues |
| | TRI | **Health & safety** training would be advantageous for wearables. |

A dedicated questionnaire focusing specifically on end-user training needs was circulated to the end-users in February 2022. The full set of questions is presented in Appendix A2: Questions for end-users. Selected key questions and answers are presented in Table 4.

*Table 4: End-user training needs identified through questionnaire Feb 2022*

| End-user training needs – questionnaire Feb 2022 | |
|---|---|
| Please describe the current in-house training setup in the pilot site. | |
| How are existing training resources presented to employees? | |
| KLEE | Seminars, KLEEMANN academy, external training, workshops |
| TVES | Training room with computers and projectors if needed |
| MTCL | Training resources are mostly pdf documents accessed by tablet at the work station, videos of some activities are also starting to be used. |
| Do you have a shared workspace/intranet or similar? If so, will it be possible/desirable to provide access to the OPTIMAI training material through the same platform? | |
| KLEE | KLEEMANN academy and the company's shared folders in our in-house servers. Unfortunately, it is not possible to provide access to the OPTIMAI training material. |
| TVES | In our intranet we will open an internal folder to include all the information. |
| MTCL | Yes, it is possible – necessity would be driven by the number of expected users of the system. |
| Is training in your organisation generally organised through guided sessions (classroom style), self-study, a combination or some other way? | |
| KLEE | Classroom style, self-study and on the shopfloor training |
| TVES | Guided sessions |
| MTCL | Training is normally provided by a machine or system manufacturer to engineers and technicians who then take the relevant training material and understanding to provide an internal document bespoke to the MTCL use for the equipment. This training takes place with the equipment and training material and takes the form of a shown, imitate and repeat activity after which sign off for the operator is given. This includes any Health & Safety requirement. |
| Language: Please indicate what language(s) the training material will be required in. | |
| KLEE | Greek and English |
| TVES | Spanish |
| MTCL | English |
| Will you be able to translate training material from English as required? | |
| KLEE | Since we'll have to outsource the translation, it depends on the budget |
| TVES | Yes |
| MTCL | N/A |
| Accessibility: Will there be need for sign language (any deaf or hard of hearing employees)? | |
| KLEE | No |
| TVES | No |
| MTCL | No |
| Accessibility: Will there be need for Braille or audio only resources (any blind employees)? | |
| KLEE | No |
| TVES | No |
| MTCL | No |
| Accessibility: Will there be need for simplified language (any employees needing plain language)? | |

| | |
|---|---|
| KLEE | No |
| TVES | No |
| MTCL | No |
| Digital vs. printed training material: will there be a need for printed material, or can the training resources be exclusively digital to minimise the environmental footprint? | |
| KLEE | Only digital training material. It is the company's strategic goal to reduce printed material in general. |
| TVES | Digital, please |
| MTCL | Digital versions are fine. |

The training needs assessment was further complemented through a review of D2.1 User and ethics and legal requirements – 1st version and D2.2 User and ethics and legal requirements - 2nd version and D7.3 Ethics Recommendations and Regulatory Framework.

As stated in D7.3, ethical principles governing Responsible Research Innovation in Industry cover training in the workplace. The forthcoming training activities using the training material included in this deliverable will thus be conducted operationalising such ethical principles.

D7.3 also discusses training requirements arising from Data Protection Law, Employment Law, Equality Law and Health and Safety Law in the pilot countries. Such regulations enshrine the duty to provide adequate training pertaining to data protection, employment, equality and health and safety at work. This is reflected in a number of end-user requirements on Employees' Rights, General Duties of Employers, and Employee Duties, Capabilities, and Training for the UK, Spain and Greece. Essentially, training must be delivered if there are changes in the working activities or when new technologies or changes in work equipment are introduced. The OPTIMAI piloting activities do introduce such changes, and the training material responds to the need to provide training to the end-users affected by such changes.

## 3.2  Design of training material

The design phase answered the questions around <u>what</u> will be included (scope), <u>where</u> the material will be made available and <u>where</u> it will be used, <u>who</u> will contribute (partner roles), <u>when</u> the work is due (timeline) and <u>how</u> the work will be organised. These aspects are elaborated below.

Before "Training Catalogue" was selected as the title for the entity of training material, alternative names were discussed during the design phase. Options such as Training Handbook, Training Toolkit and Training Guide were considered. Training Catalogue was selected as it appropriately describes the list of all the training modules offered as part of the training solution. The modules are presented systematically in alphabetical order under the heading Training Catalogue on the project website.

### 3.2.1  Training material workshop

A training material workshop was organised by CARR on 10 May 2022. The purpose of the workshop was to make collective progress on the planning of the training material to be included in D7.1. The main questions discussed during the workshop were:

-        Scope: What should be included in the training material?

-        Partner input and collaboration: What role does each contributing partner play?

-        Layout, structure: What will the end result look like?

The decisions made during the workshop determined the scope, roles and layout of this deliverable. The workshop was attended by 24 partners from 12 organisations as shown in Figure 1.



*Figure 1: T7.1 workshop attendees 10 May 2022*

### 3.2.2  Partner roles and modules

Most OPTIMAI partners are involved in T7.1, and each contributing partner plays an important role in the production of the training material.

The pilot partners MTCL, KLEE and TVES contribute with end-user requirements, preferences and feedback. They translate the training material where relevant. They implement the training activities.

CERTH contributes with content for the module on the installation of the sensors and the module on the Decision Support System.

VIS contributes with content for the module on virtualization and simulation.

YBQ contributes with content for the module on the Augmented Reality (AR) glasses.

UNIMET contributes with content for the module on the Quality Information Framework (QIF).

TRI contributes with content for the module on Data Protection and the module on Employee & Equality Rights and Health & Safety (worker-focused legal aspects).

UAB contributes with content for the module on Raising Awareness of Ethical Principles.

CARR creates the Training Catalogue and its modules. CARR also produces a Train-the-Trainer module.

FORTH and EVT are not formally involved in T7.1, but they nevertheless make significant contributions to the AR Interface and EyeVision modules respectively.

ENG and UTH play a key role in the reviewing, quality assurance and integration efforts.

### 3.2.3   Scope of material

The OPTIMAI training does not by any means intend to replace any existing end-user training. On the contrary, it will complement existing training efforts in the pilot organisations to equip end-users with the necessary skills and knowledge to participate in the OPTIMAI pilot activities.

The scope of the first version of the training material was determined by the state of maturity of the different technologies and processes. Certain solutions are important to include among the training material, but will be included in the second version, i.e., D7.2 at M30 rather than in the present first version, as they are not quite mature enough in terms of user interface or functionalities at M20. Such solutions include the Intelligent Marketplace.

Eleven modules were selected to be included in D7.1. The modules are presented in alphabetical order in Section 4 Training catalogue – 1st version.

### 3.2.4   Format and accessibility

The training material is offered exclusively as a digital resource. OPTIMAI aims to limit the provision of printed material to reduce the environmental footprint. The end-users are unanimous about the use of digital material being preferred over print.

The material is provided as a combination of PowerPoint presentations, PDFs and YouTube videos. The material aims to be concise and user friendly through clear language, visual aids and an aesthetically coherent layout.

The material is openly accessible on the project website, and partners can access the modules in the Nextcloud repository as well. TVES and MTCL have the possibility of making the material available through their intranets, whereas KLEE's in-house servers currently don't allow for hosting the OPTIMAI material. The optimal way of making the material available to all relevant parties and integrated into existing end-user training processes will be discussed with the end-users.

KLEE indicated that they will need the training material to be available in Greek and English. TVES indicated that they will need the training material to be available in Spanish. A number of the end-user requirements related to the pilot activities listed in D2.2 also state that training to operators should be delivered in appropriately accessible and multilingual formats (see 130 PAi-AI-R16, 138 PAi-DT-R5, 169 PAi-AR-R9, 177 PAi-B-R4). The arrangements around translating

relevant parts of the training material from English into Greek and Spanish will be agreed after M20. The capacity for in-house and outsourced translation work and the option of combining translation software with human editing will be discussed.

None of the end-users currently need any particular accessibility aspects to be taken into account in the development of the training material. There is no need for material in Braille or an audio only format, in sign language or simplified language. End-users will be consulted on accessibility aspects again ahead of the development of the second version of the training material.

## 3.3 Development of training material

The development involved building the structure and the web platform for the content and drafting appropriate materials addressing the identified needs and learning objectives.

CARR who hosts, designs, maintains and updates the project website built a dedicated webpage for the training material. The training catalogue is therefore fully integrated into the project website. The training modules page includes links to the Project Partners section where Points of Contact are listed for the modules.

The drafting process was divided into a number of stages including a planning, a content development, a turning-content-into-presentation, a preliminary review and an editing stage.

The partners involved in the creation of modules drafted content within their internal teams. They then sent the content to CARR for editing. CARR made any necessary modifications to the content and/or design; turned textual contributions into illustrated presentations and videos. For the videos, a voiceover and the OPTIMAI start and end card were added, presenting the material as narrated explanatory slideshow videos. CARR also gave the modules a unified structure and look.

# 4  Training catalogue – 1ˢᵗ version

The training catalogue is publicly available on the OPTIMAI website at https://optimai.eu/optimai-training-catalogue.

The OPTIMAI training catalogue introduces relevant end-users and operators to the OPTIMAI concept and offers training in the use of the OPTIMAI tools. The catalogue contains a broad range of instructional presentations, learning videos and guidelines. The primary purpose of the training material is to provide end-users with a good understanding of the OPTIMAI technologies, associated rights and requirements as well as relevant supporting resources. Step-by-step guides and illustrated walkthroughs help users familiarise themselves with the parts covered in the training.

The catalogue is divided into concise, user-friendly standalone modules. Each module is available in open access mode, free of charge. The individual training modules are also available to the project team in the internal document repository Nextcloud.

The training catalogue is presented as an accordion menu, a vertically stacked list where a total of eleven (11) training modules are displayed in alphabetical order. The modules focus both on relevant OPTIMAI technologies and on horizontal aspects such as ethical, legal and training facilitation aspects.

Each module comes with a brief description on the webpage. The format of the training, the target groups and the language of the module in question is presented as well, and the partner organisation acting as a point of contact is stated. Each module on the website has a "Start training" button that opens the training resource.

The training material will be updated with the completion of D7.2 in M30, and it will stay live on the OPTIMAI website for five years after the end of the funding period, i.e., until December 2028.

Figure 2 shows a mock-up of the placement of the training catalogue on the OPTIMAI website.
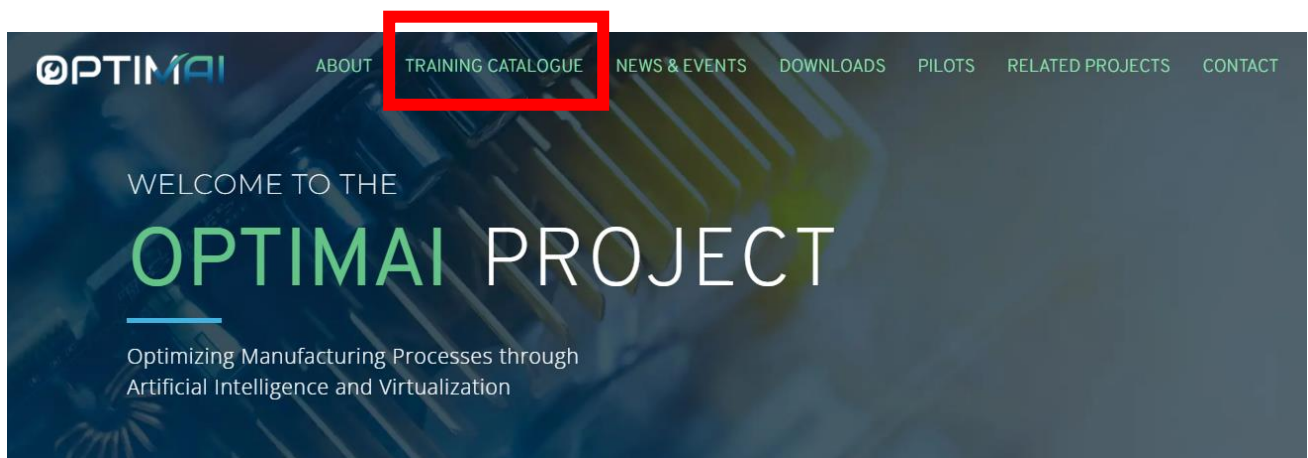


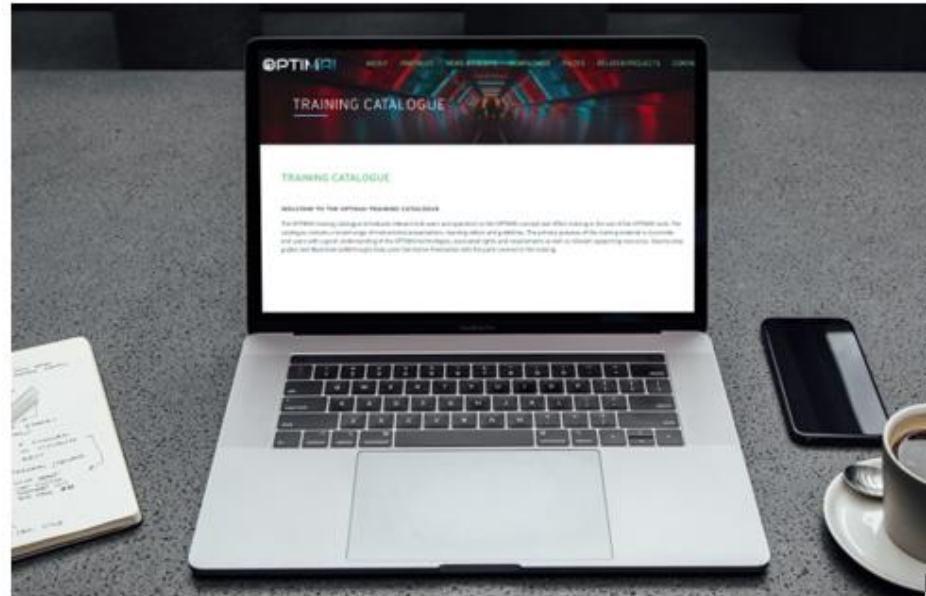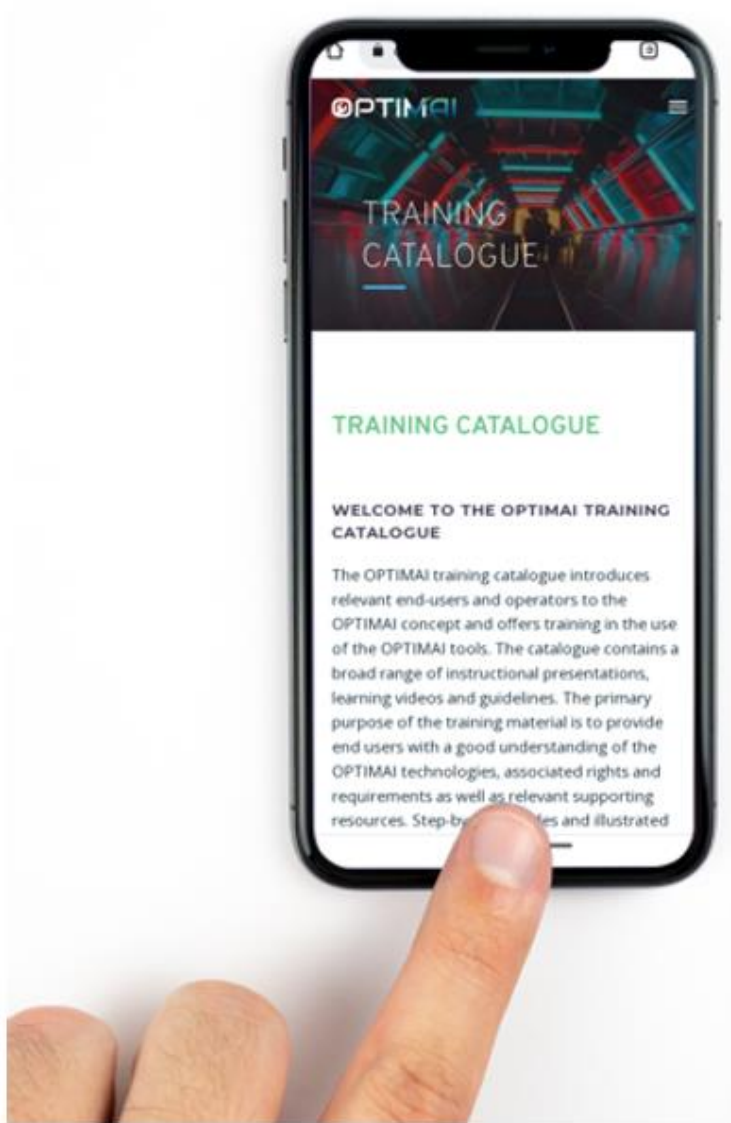*Figure 2: Training catalogue tab displayed on landing page – mock-up*

*Figure 3: Mobile phone, tablet and laptop mock-up*

The catalogue is built in a way that works well across multiple devices. The page therefore allows users to smoothly access all training material regardless of whether they are using a laptop, mobile phone or tablet. A mock-up off the look of the page is presented in Figure 3.

The catalogue is broken down into eleven modules and listed as an accordion menu as in Figure 4.
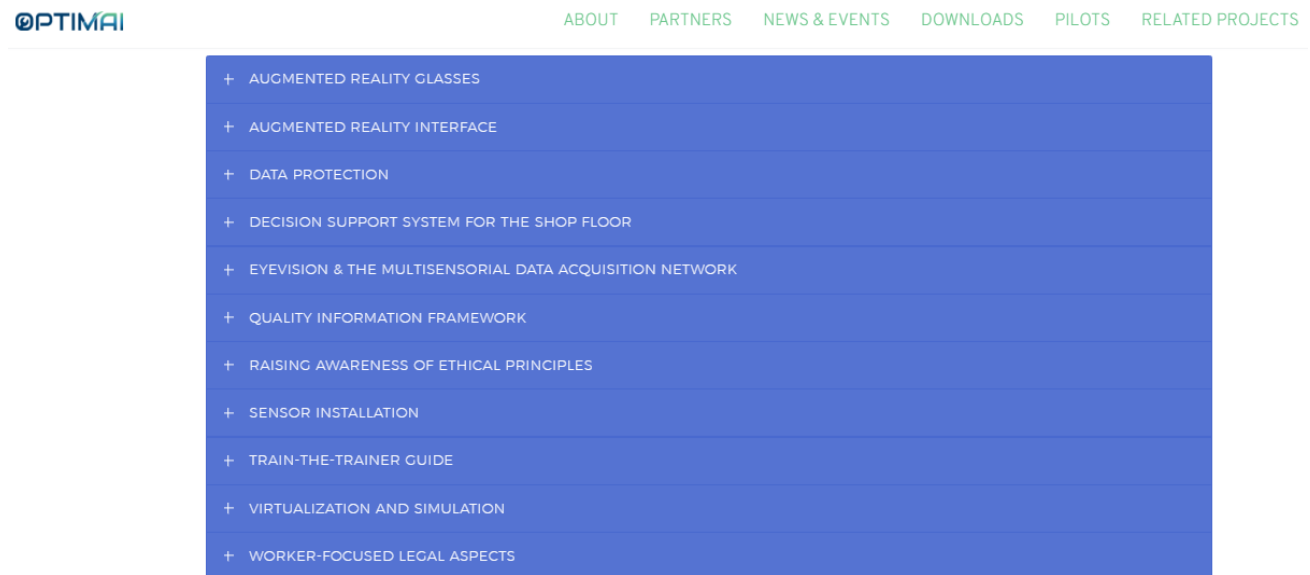


*Figure 4: List of training modules as displayed on website*

The individual training modules are described and linked to one by one in the following subsections.

## 4.1  Augmented Reality Glasses

Title of module: Augmented Reality Glasses

Brief description: In this module, you will learn about the OPTIMAI Augmented Reality (AR) glasses and their role in providing real-time assistance on the shop floor. You will learn about the device features, usage and interactive controls.

Format: Presentation

Target groups: OPTIMAI end-users and external stakeholders interested in context aware AR glasses for better human-machine collaboration.

Language: English

Point of contact: Youbiquo

Access training: Augmented Reality Glasses

*Figure 5: Augmented Reality Glasses module*

## 4.2 Augmented Reality Interface

Title of module: Augmented Reality Interface

Brief description: In this module, you will learn how the OPTIMAI Augmented Reality (AR) interface is used for human-machine interaction in the OPTIMAI pilot sites; how the virtual elements are displayed in the end-users' field of vision through the OPTIMAI smart glasses; and how the adaptive and adaptable graphical user interface (GUI) is visualized and how it allows users to address any deficiencies on the production line in situ.

Format: Presentation

Target groups: OPTIMAI end-users and external stakeholders interested in novel AR applications and visual analytics.

Language: English

Point of contact: The Institute of Computer Science (ICS) of FORTH – Foundation for Research and Technology Hellas
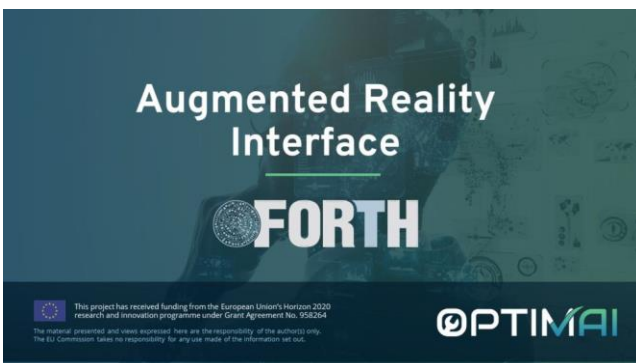
Access training: Augmented Reality Interface



*Figure 6: Augmented Reality Interface module*

## 4.3 Data Protection

Title of module: Data Protection

Brief description: In this module, you will learn about worker-focused legal aspects of the OPTIMAI pilots. You will learn about the General Data Protection Regulation (GDPR), about consent and legitimate interest, data processing and rights of data subjects. This module offers end-users horizontal guidance on legal aspects of the pilots.

Format: Video with audio

Target groups: OPTIMAI end-users and external stakeholders interested in data protection and employees' rights.

Language: English

Point of contact: Trilateral Research

Access training: Data Protection



*Figure 7: Data Protection module*

## 4.4 Decision Support System for the Shopfloor

Title of module: Decision Support System

Brief description: In this module, you will learn how to use the OPTIMAI Decision support system. You will learn about how it supports different actors on the shop floor in their daily work. You will be presented with the interface that is easy to use, easy to learn how to use, available on multiple devices and personalized and adapted to the context, the preferences and behaviour of the user. You will learn about how the DSS notifies the user about the detection of defects, anomalies and suboptimal machinery operation in manufacturing processes.

Format: Presentation

Target groups: OPTIMAI end-users and external stakeholders interested in novel shop floor applications designed to improve efficiency and decision making in the production chain.

Language: English

Point of contact: Centre for Research and Technology Hellas (CERTH-ITI)

Access training: Decision Support System



*Figure 8: Decision Support System module*


## 4.5 EyeVision & the Multisensorial Data Acquisition Network

Title of module: EyeVision & the Multisensorial Data Acquisition Network

Brief description: In this module, you will learn about quality control sensors for defect detection and production monitoring, and more specifically about the role of industrial vision sensors in OPTIMAI. To help you familiarize yourself with the EyeVision software, this module offers you access to the EyeVision Wiki page, tutorials in the EyeCademy, webinars and technical support.

Format: Presentation

Target groups: OPTIMAI end-users and external stakeholders interested in industrial vision sensors.

Language: English

Point of contact: Eye Vision Technology GMBH

Access training: EyeVision & the Multisensorial Data Acquisition Network



*Figure 9: EyeVision module*

## 4.6   Quality Information Framework

Title of module: Quality Information Framework (QIF)

Brief description: In this module, you will learn about the QIF standard and about its role in OPTIMAI. This module defines QIF and explains who is involved. You will be familiarised with the QIF Version 3.0 Information Architecture and the QIF Results Information Model. Finally, you will learn how to approach a QIF XML document.

Format: Presentation

Target groups: OPTIMAI end-users and external stakeholders interested in the QIF community.

Language: English

Point of contact: UNIMETRIK

Access training: Quality Information Framework (QIF)



*Figure 10: Quality Information Framework module*

## 4.7   Raising Awareness of Ethical Principles

Title of module: Raising Awareness on Ethical Principles

Brief description: In this module, you will learn about worker-focused ethical aspects of the OPTIMAI pilots. The module covers the ethics research framework applicable to OPTIMAI, principles for ethical trustworthy AI, human autonomy, human dignity, voluntariness, informed decision-making, risk minimisation, prevention of harm, fairness and explicability. This module offers end-users horizontal guidance on ethical aspects of the pilots.

Format: Presentation

Target groups: OPTIMAI end-users and external stakeholders interested in ethical principles and responsible research.

Language: English

Point of contact: Universitat Autònoma de Barcelona, Institute of Law and Technology (IDT)

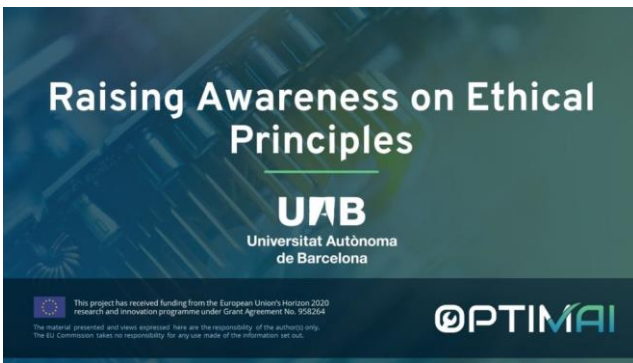Access training: Raising Awareness of Ethical Principles

*Figure 11: Raising Awareness of Ethical Principles module*

## 4.8 Sensor Installation

Title of module: Sensor Installation

Brief description: In this module, you will learn about quality control sensors for defect detection and production monitoring. This module explains 1) the installation of a modular supporting device for various types of cameras; 2) the installation of the hardware setup for automatic calibration of an elevator valve block.

Format: Presentation

Target groups: OPTIMAI end-users and external stakeholders interested in smart sensors for production quality control.

Language: English

Point of contact: Centre for Research and Technology Hellas (CERTH-ITI)

Access training: Sensor Installation



*Figure 12: Sensor installation module*

## 4.9 Train-the-Trainer Guide

![OPTIMAI]

Title of module: Train-the-Trainer Guide

Brief description: In this module, you will learn how to understand the role and identify the skills of an effective trainer; develop the skills to create training objectives, activities and materials for planned training activities; identify tools, techniques and approaches for the assessment of learning; and demonstrate the skills required for the effective delivery of training programmes.

Format: Presentation

Target groups: OPTIMAI team / project leaders responsible for facilitating and delivering technical and non-technical training in the end-user organisations; external stakeholders in the private, public or community sector looking to improve their facilitation skills and to train others.

Language: English

Point of contact: Carr Communications

Access training: Train-the-Trainer Guide



*Figure 13: Train-the-Trainer module*

## 4.10 Virtualization and Simulation

Title of module: Virtualization and Simulation

Brief description: In this module, you will familiarise yourself with the 3D simulation platform used to create digital models in OPTIMAI. You will learn how to build such virtual models in OPTIMAI following a process aligned with the life cycle of the production system. This module provides an introduction to Visual Components, to process modelling and to robotics and automation. It also provides links to a training library in the Visual Components Academy.

Format: Presentations

Target groups: OPTIMAI end-users and external stakeholders from any sector interested in novel virtualization and simulation approaches.

Language: English

Point of contact: Visual Components

Access training: Virtualization and Simulation



*Figure 14: Virtualization and simulation module*

## 4.11 Worked-focused legal aspects

Title of module: Worker-focused legal aspects of the pilots

Brief description: In this module, you will learn about worker-focused legal aspects of the OPTIMAI pilots. This module covers employee and equality rights, including dismissal and discrimination, and health and safety aspects including risk assessments and health and safety officers and developments. This module offers end-users horizontal guidance on legal aspects of the pilots.

Format: Video with audio

Target groups: OPTIMAI end-users and external stakeholders interested in employee and equality rights as well as health and safety.

Language: English

Point of contact: Trilateral Research

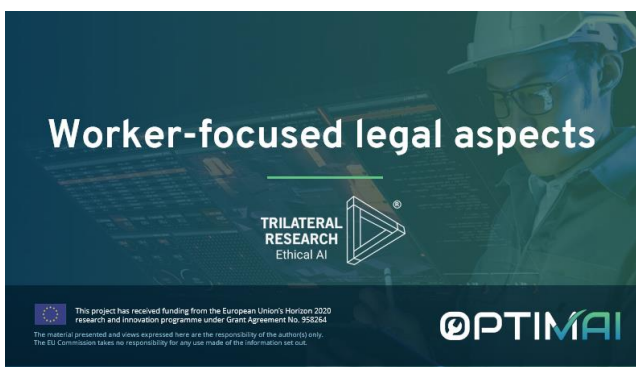Access training: Worker-focused legal aspects



*Figure 15: Worker-focused legal aspects module*

# 5 Conclusions and next steps

In conclusion, this deliverable has presented the OPTIMAI Training Catalogue and discussed why it was produced, by whom, when and how. It has provided an overview of the underlying requirements and the motivation for the development of the training material. It has also described the phases involved in the creation of the material as well as the structure, look and functions of the end product.

This deliverable also marks the achievement of milestone MS10 'Training for end-users is ready'.

This initial version of the OPTIMAI training material provides a solid base for the future development of the training material and training activities for end-users. The planning of training activities will go hand in hand with the progress made on the planning and execution of the pilots. Close collaboration with the pilot partners will ensure a smooth and meaningful continued development of appropriate training resources.

Feedback on the first version of modules will be elicited from end-users and other partners through feedback forms, informal verbal evaluation and trainer assessment. An updated needs and preferences assessment will be carried out through a survey. The findings will support the development of D7.2 Training material – 2$^{nd}$ version. D7.2 will include modules that were unavailable or not mature enough to be covered in D7.1, such as:
- Intelligent Marketplace;
- quality control process based on metrology;
- calibration and verification of the status of the metrology equipment;
- on-the-fly production (re)-configuration techniques.

The process for the development of the second version of the training material will follow the same five phases as earlier: I: Needs assessment; II: Design; III: Development; IV: Delivery and V: Evaluation.

The next steps will also include translation of relevant material into the pilot languages. The options for translating the training material into Spanish and Greek will be discussed, including in-house translation, outsourced translation or a combination of using advanced translation software and human translators.

The relevance of issuing certificates of completion of modules to participants will be evaluated.

The OPTIMAI Training task (T7.1) will run in parallel with the piloting tasks (T7.3, T7.4 and T7.5) until M30. The pilot activities will inform future training development and cross-fertilisation of ideas will take place between the tasks in WP7, leading to a further strengthening of the approach to training in OPTIMAI.

The Training Catalogue will stay live on the OPTIMAI website for 5 years after the project ends.

# References

[1] Burch, N. (1970). The Four Stages of Learning. Developed for Gordon Training International. Retrieved 1 June 2022 from: https://www.gordontraining.com/free-workplace-articles/learning-a-new-skill-is-easier-said-than-done/

[2] Learn 3D Simulation using Visual Components. (2022). Visual Components Academy. Retrieved 15 May 2022 from: https://academy.visualcomponents.com/

[3] EVT EyeCademy Tutorials, Webinars, Commands. (2022). Vision EyeCademy. Retrieved 20 June 2022 from https://www.evt-web.com/en/eyecademy/.

[4] OPTIMAI D2.1 User and ethics and legal requirements – 1st version.

[5] OPTIMAI D2.2 User and ethics and legal requirements – 2nd version.

[6] OPTIMAI D6.1 Decision support and early notification framework – 1st version.

[7] OPTIMAI D7.3 Ethics Recommendations and Regulatory Framework.

# Appendices

## A1: Feedback form

The feedback form is available [here](#) and a screenshot of it is included below.

# OPTIMAI training feedback form

Thank you for taking part in this OPTIMAI Training. Please take a few moments to respond to the questions below.

Title of training module: *

Short answer text

Date: *

Month, day, year 📅

Participant name, title and organisation: *

Short answer text

Please indicate your level of agreement with the statements listed below.

Description (optional)

a) The training was relevant to my needs

|  | 1 | 2 | 3 | 4 | 5 |  |
|---|---|---|---|---|---|---|
| Strongly disagree | ○ | ○ | ○ | ○ | ○ | Strongly agree |

b) The training was presented in a meaningful way

|  | 1 | 2 | 3 | 4 | 5 |  |
|---|---|---|---|---|---|---|
| Strongly disagree | ○ | ○ | ○ | ○ | ○ | Strongly agree |

c) The training met my learning objectives

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Strongly disagree | ○ | ○ | ○ | ○ | ○ | Strongly agree |

d) I can apply the skills/knowledge that I learned

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Strongly disagree | ○ | ○ | ○ | ○ | ○ | Strongly agree |

e) The duration/length of the training was appropriate

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Strongly disagree | ○ | ○ | ○ | ○ | ○ | Strongly agree |

f) The training format was suitable

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Strongly disagree | ○ | ○ | ○ | ○ | ○ | Strongly agree |

g) I would recommend the training to others

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Strongly disagree | ○ | ○ | ○ | ○ | ○ | Strongly agree |

What was/were the most useful part(s) of the training for you?

Long answer text

OPTIMAI

What aspect(s) of the training programme could be improved?

Long answer text

Please provide any suggestions or additional comments below.

Long answer text

Thank you for your collaboration!

The OPTIMAI Team

## A2: Questions for end-users

**List of questions sent to pilot partners by email in February 2022:**

- Please describe the current in-house training setup in (MTCL, KLEE and TVES)
  - Are training resources accessible to employees through a shared workspace/intranet or similar? If so, will it be possible to provide access to the OPTIMAI training material in the same way?
  - Is training in (MTCL, KLEE and TVES) generally organised through guided sessions (classroom style), self-study, a combination or some other way?
  - Additional comments?
- Language: Please indicate what language(s) the training material in (MTCL, KLEE and TVES) will be required in
- Please describe any accessibility issues that need to be taken into account in the development of training material for (MTCL, KLEE and TVES).
  - Is there need for sign language (any deaf or hard of hearing employees)?
  - Is there need for Braille or audio only resources (any blind employees)?
  - Is there need for simplified language (dyslexic employees)?
  - Anything else?
- Digital vs. printed training material: will there be a need for printed material, or can the training resources be exclusively digital to minimise the environmental footprint?
- What OPTIMAI technologies will be introduced on the pilot site by spring/summer 2022 (before the submission of D7.1 Training material in August 2022)?
  - The sensor network: estimated date of installation?
  - Other technologies?
- In April 2021, you completed the Questionnaire for D2.1. You were asked: *In addition to technical training regarding the functionalities of OPTIMAI, what other issues should be included in the training sessions designed for the human operators?*
  - Your answer was:
  - Is there anything you would like to add now?