



RINNO PROJECT

Report

**Transforming energy efficiency in
European building stock through
technology-enabled deep energy
renovation**

**Deliverable 6.5: Training of Stakeholders
(final)
Work Package 6**

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Title	RINNO - Training of Stakeholders (final)
Author(s)	Elsebeth Terkelsen, EGC, Vassilios Sougakis, Eirini Lithoxoidou, CERTH, Ilias Chrysovergis , CERTH, Devani Perera, BOUYGUES
Editor(s)	Elsebeth Terkelsen, EGC, Vassilios Sougakis, Eirini Lithoxoidou, CERTH, Ilias Chrysovergis , CERTH, Devani Perera, BOUYGUES
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Executive Summary

This document is the final report on the training activities of the RINNO project, an Innovation Action project supported by the European Union Horizon 2020 programme under Grant Agreement Number 892071. The main objective of RINNO is the transformation of the energy efficiency in European building stock through technology-enabled deep energy renovation. More information on this project can be found at <https://rinno-h2020.eu/>.

In detail, this document is a follow up on the activities, described D6.4 training of stakeholders in the RINNO SUITE. Within this task, the final version of the training of stakeholders, off-site and on-site workers, building owners, consultants and other stakeholders - is presented. This final version explains the process of the training, the target groups, the participants, the content of the training (program), and the evaluation of the training.

The planning of the training has taken place in two phases:

Phase 1: Preparations

1. Identification of stakeholders on the four demo-sites
2. Tailor-made training modules for different stakeholders in the RINNO SUITE
3. Setting up the user support system for new users and people who want to refresh their knowledge.

Phase 2: Execution:

1. Identification of skill of the trainer and allocation of appropriate personnel in each country (CERTH and BOUYGUES)
2. Preparation of consistent training for the RINNO SUITE (AR tool, and IT tools in WP3, WP4 and WP5) incl. train-the-trainer
3. Delivery of live training and ongoing support as a user hotline system.

The whole process has been thoroughly evaluated after each training session. The training, according to the actual time plans, has been performed between May 2024 and June 2025. The last training of the WP4 tools has not been possible to conduct before the end of the project.

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Abbreviations List

AR	Augmented Reality
DSS	Decision Support System
EC	European Commission
GA	General Assembly
GA	Grant Agreement
KPI	Key Performance Indicators
O&M	Operation & Maintenance
VR	Virtual Reality

1 Introduction

In the first version, D6.4 Training of Stakeholders, the training off-site and on-site of workers with the Augmented Reality tool (AR/VR tool) was presented. The report explained the purpose of the training, the target groups, the content, i.e. the AR toolkit and how it relates to the demo sites, and how the training was planned to be organized. The AR/VR tool is now a part of the RINNO SUITE and is included in this report.

D6.5 focuses on the training of the RINNO SUITE as a whole – the IT tools developed in WP3, WP4 and WP5. These tools have been developed to manage the renovation process from start to end, and it has been the intention to train stakeholders at the four demo sites to be able to integrate the use of the tools in their work processes. Because the development of the RINNO SUITE and the renovation process at the four demo sites have been running more or less in parallel, it has not been possible to integrate the whole RINNO SUITE in the planning and implementation of the demo sites. The tools have been used during the planning process (INTEMA, VERIFY and TEA tool) by the developers to decide the renovation scenarios. During the renovation, the AR tool have been presented at the pilot sites and partly used, and in the last period of the project, the RINNO SUITE tools have been presented.

Before the trainings started, a train-the-trainer session was performed. This was to have an internal dialogue in the RINNO project team about state-of-the-art and communication.

The training process – with the RINNO pilot projects and other relevant stakeholders (target groups) - is described in the following. The trainings have been performed between M36 and M60 (planned: M32-M36). See also chapter 3. Planning and timeline.

This report presents 1) the target groups, 2) the planning of the trainings, 3) the objectives of the trainings, 4) the programs and 5) the evaluation of the trainings. General purpose of the trainings is to test further development of the RINNO SUITE and how to present it to future users.

1.1 Which tools are included in the training

The IT-tools that have been objectives of the training are the following - short description of each tool can be found as APPENDIX 1:

1.1.1 Planning process (WP3)

Tool name	Digital Twin tool
Tool name	INTEMA.building
Tool name	VERIFY
Tool name	TEA TOOL
Tool name	RENOVATION SCENARIO DSS
Tool name	Job Scheduling Optimiser (JSO)
Tool name	Social LCA

1.1.2 Renovation process (WP4)

Tool name	RRM (This tool aggregates all the tools listed below)
Tool name	On/Off site
Tool name	E-cockpit

Tool name	E-logistic
Tool name	AR/VR tool

1.1.3 Operation and management (WP5)

Tool name	Performance Dashboard
Tool name	Sensor-Enabled Building Model
Tool name	Marketplace
Tool name	Social Collaboration

2 Description of the target groups

The target groups for the trainings can be divided in three main categories, relating to the three main processes in a renovation project – planning, implementation, operation and management:

- 1) **Planning process**
- 2) **Renovation process**
- 3) **Operation and management**

In fig. 1 is an overview of the target groups involved in the different parts of the renovation process. The project owner, the renovation manager, the architect and the design coordinator are continuous figures in the process and have the overview of the integration of the RINNO SUITE in the renovation processes.

Planning process (WP3)	Renovation process WP4)	Operation and management WP5)
architect,	construction director,	architect
Consultant,	construction logistic manager,	Project owner,
design coordinator,	construction site manager,	Design Manager
design manager,	construction team member,	design team member,
design team member,	design coordinator,	design coordinator,
engineer,	design manager,	construction director,
municipalities.	design team member,	construction site manager,
project owner,	project owner,	construction team member, ‘
renovation manager.	site supervisor,	site supervisor,
	architect,	site worker,
	warehouse manager.	sub-contractor,
	renovation manager.	construction logistic manager,
		warehouse manager,
		energy consultant,
		occupant,
		renovation manager.

Figure 1 Target groups – overview

For the planning of the trainings and the invitation to the stakeholders, we have a short description of what the stakeholders, involved in the design and planning of the renovation, can use the tools for. This has also been used in the invitations for the trainings – to explain the use of the IT tools. The description is presented in the following.

2.1 Planning process (WP3 tools)

In the **planning process**, the stakeholders in the target group can use the tools –

- To assess the energy consumption and production of the building before and after the renovation and to calculate specific energy related KPIs,
- To conduct an LCA/LCC analysis of alternative renovation scenarios for the building and to calculate specific environmental and cost/financial KPIs for these scenarios,
- Quick estimation of waste creation and management,
- Quick estimation of tenants and building owners expected disruption due to construction works - the TEA tool allows better communication among occupants, project managers, and contractors by giving different outcomes before the renovation phases begins,
- To select the best renovation scenario out of a range of alternative ones according to the user's preferences and the holistic evaluation of the scenarios where their performance is expressed through specific energy, environmental, cost/financial and disruption KPIs,
- To define the optimum sequence of works of the renovation project according to specific constraints (duration/cost and disruption) and the resources available.

2.2 Renovation process (WP4 tools)

In the **renovation process**, the stakeholders, responsible for the implementation of the building renovation, can get support on:

- Decision-making, based on whether an onsite or an offsite approach is most appropriate. The tool supports decisions concerning the building envelope, particularly the façade, identifying reasons for assisting or blocking off-site industrialised construction options,
- Quick and easy dashboard that has different types of construction progress data in a single view,
- Support for managing the logistics and the warehouse process,
- Easy to understand instructions to help site staff install a new technology.

2.3 Operation and management (WP5 tools)

In the **operation and management**, the stakeholders will be supported in the following:

- Better decision-making, optimized resource utilization, and ensuring that the renovation aligns with sustainability goals,
- Enabling stakeholders to monitor various aspects such as temperature, humidity, air quality, and energy usage within the building. By displaying real-time sensor data within the context of the building model, users can quickly identify patterns, anomalies, and potential issues, facilitating informed decision-making for building management, maintenance, and optimization,
- Vendor directories, product catalogues, and project collaboration tools.
- Real-time messaging, document sharing, and task assignment features. The tool streamlines coordination among stakeholders. It helps to ensure that everyone involved stays informed, deadlines are met, and issues are promptly addressed.

3 Planning and timeline for the trainings

3.1 General introduction

The planning of the trainings has been a challenge, as there have been problems and delays in the finishing of some of the IT tools as well as for finding a suitable timeslot suitable for the audience of internal (RINNO Consortium) and external participants. At the same time, the trainings should be related to the renovation processes at the four pilot sites. Especially for the AR tool, it has been important that it was introduced at a relevant time in the renovation process, where e.g. the workers were appointed. The processes at the pilot sites have not been without challenges and delays either.

The plan ended as follows:

AR Tool	France	Poland	Greece	Denmark
Augmented Reality tool	24/7-2023 13-14 CET Target group: Workers ++	TBD from 13-14 CET Target group: Workers ++	29/ 2024 12-16 and – 30/1 2024 17-19 2024 EEST Target group: Workers ++	2/4-2025 8:30-9:30 CET Target group: Workers ++
WP3	INTEMA	VERIFY + TEA TOOL	DSS+JSO	
Intema Verify Tea-tool DSS+JSO	24 th September 2024 14-16:30 CET Target group: Owner, Consultants	25 th September 2024 14-16:30 CET Target group: Owner, Consultants	2 nd October 2024 14-16:30 CET Target group: Owner, Consultants	
WP4	France	Poland	Greece	Denmark
RRM E-LOGISTIC	NA Target group: Site managers, consultants, owner	NA Target group: Site managers, consultants, owner	NA Target group: Site managers, consultants, owner	NA Target group: Site managers, consultants, owner
WP5	France	Poland	Greece	Denmark
Dashboard 3D Viewer MarketPlace Social LCA	28/11-2024 13-16 CET Target group: Owner, tenants	28/11-2024 13-16 CET Target group: Owner, tenants	28/11-2024 13-16 CET Target group: Owner, tenants	28/11-2024 13-16 CET Target group: Owner, tenants

Figure 2 Planning of the trainings

3.1.1 Train-the-trainer

The plan was to have a train-the-trainer session before the first training session to rehearse the presentations. We managed to have a session at the General Assembly in Dublin in May 2023 on the

AR-tool and on the 23rd of October 2023 in the RINNO SUITE (WP3, WP4 and WP5 IT-tools) with participation of the trainers and the WP-leaders. Both were before the trainings of the RINNO SUITE.

In total, 34 persons participated in Dublin, and 13 persons participated in the Train-the-Trainer session online.

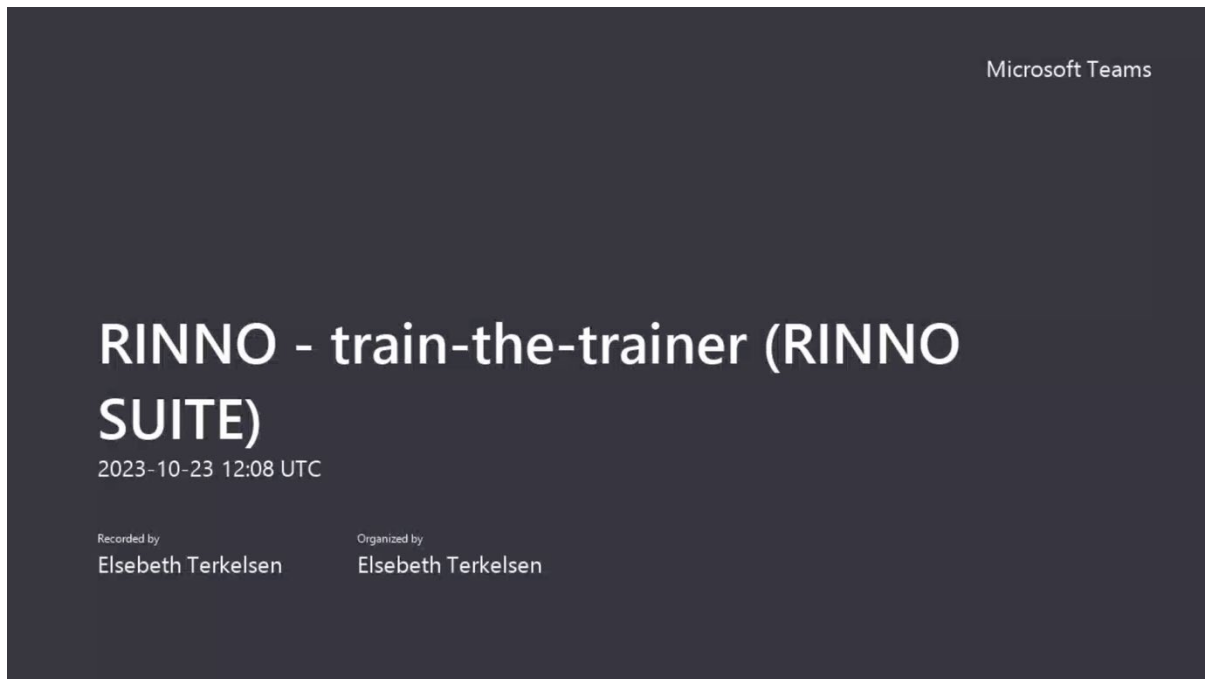


Figure 3 Train-the-Trainer webinar

3.1.2 Training of the IT-tools in the RINNO SUITE

As mentioned above, the training sessions with the stakeholders at the pilot sites were a challenge. And we have not succeeded in implementing all the trainings before the end of the project. But we have managed to make trainings in tools in all WPs (in WP4 only the AR-tool), which will be described in the following sections.

The RINNO Suite components are relevant to different stages of the renovation where different actors are involved, i.e. design/planning stage, construction stage and the use phase. As such, it was decided to conduct the training for the tools concerning each of these stages separately. Therefore, separate training sessions were scheduled for:

- I) the RPDA tools (WP3).
- II) the RRM tools (WP4)
- III) the RINNO Building Lifecycle Renovation Manager (WP5)

The training sessions for the WP3 and WP5 tools was conducted between September and November 2024. The training session for the WP4 tools had not yet been conducted (apart from the training of the AR/VR tool) at the time of writing this Deliverable due to technical issues of some of the tools.

4 TRAINING OF THE PLANNING PROCES TOOLS (WP3)

4.1.1 Objectives of the trainings

The objective of the training has been to introduce to the tools and give the participants in the trainings the opportunity to try and use them themselves with their own data. Overall, the objective has also been to find a good way to distribute the information on the tool as mentioned in the introduction.

The tools having been introduced are the following (see also Appendix I):

Digital Twin tool – a web-based tool for conducting preliminary fast estimations of the baseline and drafting potential renovation scenarios

INTEMA.building - a web-based application for conducting accurate transient building energy simulations, able to model multiple energy systems (production, consumption and storage). The tool can estimate with high accuracy the electrical and heating needs of the building.

VERIFY - a web-based application designed to provide a holistic methodology and evaluation for the Lifecycle Assessment (LCA) and Lifecycle Cost (LCC) analysis performed on planned building renovations. The tool provides extensive analysis to support the user in deciding the best renovation plan for a building in terms of environmental and economic factors, by comparing its performance to that of the current building's infrastructure

The TEA tool evaluates and simulates renovation scenarios to select the optimum solution by creating a report. The output data from the tool is a valuable resource because it grants access to a report from 5 different categories:

- Utility disruption
- Traffic disruption
- Physical space disruption
- Internal environmental disruption

Renovation Scenario DSS - The tool is a Decision Support System which enables the informed decision by the user for the selection of the optimum renovation scenario based on a holistic assessment

The Job Scheduling Optimizer (JSO) - a web-based platform that supports the scheduling of a set of jobs which comprise a renovation scenario work plan. The tool's purpose is to generate the optimal sequence of the jobs included in a renovation scenario with respect to available resources

Social LCA

The Social LCA Assessment tool enables the quantification of the comfort and wellbeing solutions integrated into the project during the feasibility, design project and building phases.

Once the design and construction phases are complete, the S-LCA tool enables the calculation of the number of hours that the building is outside of comfortable and indoor quality ranges. Unlike the questionnaire phase, this evaluation is carried out offline due to the necessary processing of previous data.

4.1.2 Planning / tailor made modules for the training

Due to the nature and the number of the tools involved, the training for the WP3 tools was conducted in three separate training sessions where a detailed step-by-step presentation of the tools was demonstrated. At the end of each session a questionnaire was shared with the participants to capture their feedback on the use of the tools and their functionalities.

Program for the training – presentation by Vassilios Sougakis, CERTH:

Time	Activity	Presenter
Day 1 – September 24th, 2024 14:00 – 16:30 CEST	Introduction of whole RINNO Project Digital Twin INTEMA.building Q&A Questionnaire	Vassilios Sougakis - CERTH Mikko Tuomisto - VTT
Day 2 – September 25th, 2024 14:00 – 16:30 CEST	Introduction VERIFY TEA tool Q&A Questionnaire	Vassilios Sougakis - CERTH Jairis Alvarez Trujillo – RINA-C
Day 3 – October 2nd, 2024 14:00 – 16:30 CEST	Introduction Renovation Scenario DSS Job Scheduling Optimizer Social-LCA Q&A Questionnaire	Vassilios Sougakis - CERTH David Zambrana - CIRCE

Figure 4 Program for 3 days training: Digital Twin, INTEMA, VERIFY, TEA TOOL and DSS, JSO and Social LCA

4.1.3 Participants

REGISTRATION of participants in the training: (names cannot be part of a public report)

Day 1: 23 (Feedback responses: 12)

Day 2: 22 (Feedback responses: 6)

Day 3: 7 (Feedback responses: 5)

5 TRAINING OF THE RENOVATION PROCESS TOOLS (WP4)

5.1.1 Objectives of the trainings

The objective of the training has been to introduce to the tools and give the participants in the trainings the opportunity to try and use them themselves with their own data. Overall, the objective has also been to find a good way to distribute the information on the tool as mentioned in the introduction.

The tools having been introduced are the following (see also Appendix I):

On/off site - a decision-making tool based on a set of project criteria, that helps deciding whether an onsite or offsite approach is appropriate. This has been developed for building envelope, in particular the façade.

E-cockpit - uses real-time project-related data, analyses them, and then using a set of KPIs, to allow them better opportunities for problem-solving and effective decision-making.

E-logistic - tool to help develop delivery packages on site the right material, to the right place, at the right time.

RRM (This tool aggregates all the tools) - helps optimise, execute, analyse, monitor and manage the renovation process as well as guide and train onsite the workforce.

AR/VR tool - provides relevant training and guidance to the workforce onsite and offsite using Augmented and Virtual Reality (AR/VR) tools.

5.1.2 Planning / tailor made modules for the training

The program for the training was developed and was to be performed by Devani Perera, BOUYGUES. Ilias Chrisovergis and Evdoxia Eirini Lithoxidou from CERTH implemented the training of the AR/VR tool.

The plan for the training was an online training via TEAMS, where the participants were to have a laptop with internet access to use the RRM (WP4 tools).

Time	Activity	Presenter
10 min	Introduction to WP 4 tools and context	Devani Perera BOUYGUES
15 min	RRM overview and logging in to the tool.	Devani Perera BOUYGUES
15 min	On/off site tool and test by participants	Devani Perera BOUYGUES
10 min	Q/A and feedback questionnaire for On /Off site tool	Devani Perera BOUYGUES
15 min	E-cockpit data entry	Devani Perera BOUYGUES
10 min	E-cockpit visual outputs	Devani Perera BOUYGUES
10 min	Q/A and feedback questionnaire for E-cockpit tool	Devani Perera BOUYGUES

10 min	BREAK	Devani Perera BOUYGUES
10 min	Introduction to E-logistics	Devani Perera BOUYGUES
30 min	E-logistics tool trial with the demo owners	Devani Perera BOUYGUES
10 min	Q/A and feedback questionnaire for E-logistics tool	Devani Perera BOUYGUES
10 min	Feedback questionnaire RRM	Devani Perera BOUYGUES

Figure 5 Program for WP4 training

5.1.3 Participants

The tools have not yet been presented due to technical problems.

5.2 The AR/VR tool – program

The AR/VR tool training was performed individually at the four demo sites after a first presentation and test at the City University of Dublin. The test was successful and the result from the evaluation can be seen in APPENDIX 4.

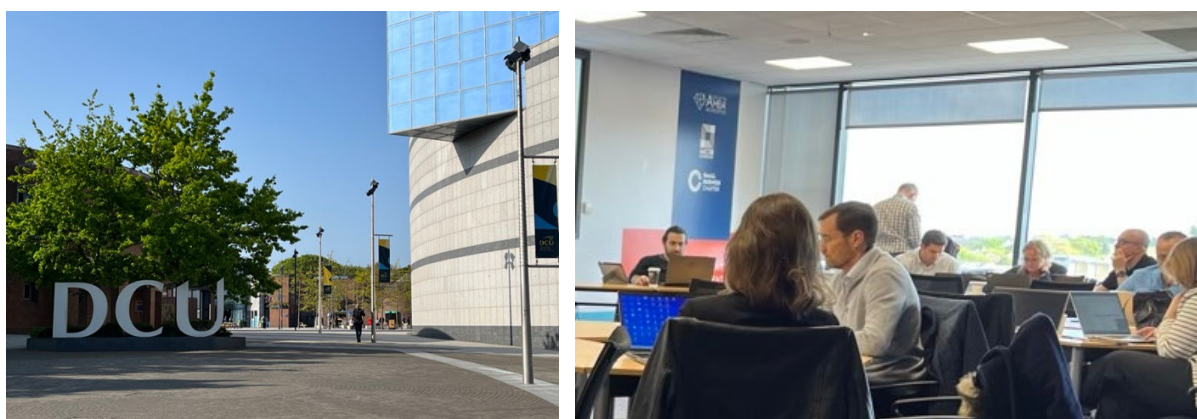


Figure 6 Presentation and test of the AR Tool at the City University of Dublin in June 2023

5.2.1 Objectives of the trainings

The AR-tool with tutorials show how different technologies are installed, used, maintained and repaired on different types of media (such as images, videos, and 3D models).

Workers can view these tutorials on demand either off or on site using their smartphones or tablets to understand how a specific task is performed. Finally, inexperienced workers can ask for remote assistance from more experienced ones to help them solve problems regarding the completion of tasks of the renovation, instantaneously and without adding delays to the retrofitting process.

Program for the training (time schedule varies from the different demo sites)

Time	Activity	Presenter
17.00 – 17:30	Get together, Meeting goals	Chris Douman CERTH

17:30 – 17:45	Introduction of the AR team	Chris Douman CERTH
17:45 – 18:15	Presentation of RINNO's AR suite of applications (AR Viewer, AR Creator, AR Manager, AR Constructor, AR Evaluator)	Chris Douman CERTH
18:15 – 19:30	AR Training Session – Interaction with the AR Viewer, assessment of understanding with the AR Evaluator, questionnaire for technology acceptance evaluation	Chris Douman CERTH
19.30-19.35	<i>Wrap up and GA closure</i>	

Figure 7 Program for the AR training

The devices, suggested for the trainings are the following:

1. Samsung Galaxy Tab S7 FE (https://www.gsmarena.com/samsung_galaxy_tab_s7_fe-10922.php), the version with 6GB of RAM.
2. Xiaomi Pad 5 (https://www.gsmarena.com/xiaomi_pad_5-11042.php).

See also appendix 3 - Compatible Android devices for the AR viewer - for further devices.

5.2.2 Participants in France

7 participants representing the following companies:

- Building owner
- Entrepreneur
- IT expert

5.2.3 Participants in Greece

14 participants representing the following companies:

- IT expert
- Architect
- Engineer
- PH Consultant
- Students

5.2.4 Participants in Poland

The training has not yet been performed.

5.2.5 Participants in Denmark

11 participants representing the following companies:

- Electricity installation
- Ventilation entrepreneur
- Plumbing installation
- Renovation manager
- Project manager

- Building owner
- Engineer

6 TRAINING THE OPERATION AND MANAGEMENT TOOLS (WP5)

6.1.1 Objectives of the trainings

The objective of the training was to introduce to the tools and give the participants in the trainings the opportunity to try and use them themselves with their own data.

This tool helps track and improve how well renovation projects are doing. It monitors things like energy use, cost, and air quality to make sure the renovation is efficient and sustainable. This tool gives real-time data and helps everyone involved in the project understand how it's progressing and where it can be improved.

The Sensor-Enabled Building Model tool integrates 3D modelling technology with sensor data to provide a comprehensive visualization of a building's infrastructure and real-time environmental conditions. It allows users to navigate through a digital representation of the building while simultaneously viewing the locations and status of installed sensors.

The Marketplace serves as a centralized platform for connecting stakeholders such as contractors, suppliers, designers, and building owners. It facilitates the procurement of materials, equipment, and services necessary for renovation projects.

This tool streamlines communication and project management for building renovation projects. It enables real-time messaging, document sharing, and task assignment among stakeholders. Users can coordinate schedules, track project progress, and resolve issues efficiently.

6.1.2 Planning / tailor made modules for the training

The session aims to introduce you to these tools and gather your impressions regarding their potential uses and trainer is Eirini, CERTH.

Date: 28/11/2024

Time	Activity	Presenter
Time: 5 minutes	Introduction to Monitoring Tools for Building Projects	Evdoxia Eirini Lithoxoidou CERTH
10-minutes segments	Tool Demonstrations Each tool will be introduced in a brief, 10-minute segment.	Evdoxia Eirini Lithoxoidou CERTH
Time: 10 minutes	Tool 1: Building Performance Dashboard and Monitoring System An overview of this tool's components: - Performance Dashboard: Offers a basic view into certain building performance indicators	Evdoxia Eirini Lithoxoidou CERTH

	- Monitoring System: Provides a way to track building conditions, though functionality and use cases may vary.	
Time: 10 minutes	Tool 2: Sensor-Enhanced Building Model This tool offers some level of monitoring capabilities by incorporating data from sensors. It may help in identifying general building conditions, though its use in specific contexts is still being evaluated.	Evdoxia Eirini Lithoxoidou CERTH
Time: 10 minutes	Tool 3: Digital Marketplace for Building Resources This tool is aimed at simplifying access to various resources for projects, though availability and suitability will depend on regional factors.	Evdoxia Eirini Lithoxoidou CERTH
Time: 10 minutes	Tool 4: Online Contract Management Platform A brief introduction to this platform, which may help organize and monitor contracts in a digital space.	Evdoxia Eirini Lithoxoidou CERTH
Time: 20 minutes	Group Discussion and Feedback Session Participants will join groups based on their countries' pilot projects to discuss each tool's applicability. Each group will complete a short questionnaire to share initial feedback on the potential usefulness and relevance of these tools.	Evdoxia Eirini Lithoxoidou CERTH All participants
Time: 10 minutes	Q&A, wrap up and closure	

Figure 8 Program for the training in the WP5 tools

6.1.3 Participants

15 participants representing the following companies:

- Technical Studies Office
- Project owner
- Architect
- Energy consultant
- Mechanical Engineer
- Building Physicists
- Civil Engineer
- WP6 leader

7 Evaluation of the trainings

The evaluation has been based on the following participants in the trainings:

	Number	France	Greece	Poland	Denmark
Train-the-trainer	13	A common workshop for partners involved in the trainings			
WP3 (3 sessions)	52	A common workshop for all demos as well as external participants			
WP4	-	-	-	-	-
AR tool - Dublin	34	A common workshop for all partners at the General Assembly in Dublin			
AR tool – pilot sites	32	7	14	-	11
WP5 (1 session)	15	A common workshop for all demos as well as external participants			
Total	146				

Figure 9 Participation in trainings

For the evaluation, an on-line survey has been performed after each training. The evaluation of the trainings has focussed on addressing the selling points identified by the IT tools providers. These vary depending on the tool but two elements are common to all the tools:

- User-friendliness - the ability of participants to navigate and operate the tool with minimal effort, benefitting from intuitive interfaces and clear instructions
- Results easily understandable - ensuring that the outputs can be interpreted and acted upon without requiring advanced technical expertise

To ensure that the evaluation moved beyond the promotional claims of tool providers and truly captured the perceptions and experiences of users, the assessment was structured to examine a number of key factors that influence whether tools are likely to be adopted and used in practice. The evaluation therefore looked not only at the immediate usability of the tools but also at their broader potential for sustained integration in professional contexts.

The questionnaire used after the trainings addressed several interlinked dimensions. Participants were asked whether they believed the tools would genuinely improve their tasks and outcomes, thereby testing whether the tools delivered on promises of efficiency and added value. They were also asked how easy they found the tools to learn and use, which reflected directly on user-friendliness and the learning curve required. The evaluation further explored whether participants felt encouraged to adopt the tools because colleagues, managers, or the wider professional community endorsed or expected their use. In addition, participants were asked whether they believed that sufficient organisational and technical support—such as training resources, documentation, or helpdesks—was available to make the use of the tool sustainable beyond the training environment. Another dimension examined was the likelihood that participants would incorporate the tool into their regular work after the training had concluded, providing an indicator of potential adoption. In some cases, where follow-up was possible, the evaluation also considered actual usage, allowing for an assessment of real integration into daily practice rather than relying solely on reported intentions.

To capture these dimensions systematically, the evaluation employed a Likert scale format in which participants rated their level of agreement with a series of carefully designed statements. For example, they were asked to what extent they agreed that the tool helped them complete their tasks more efficiently or improved the quality of their outcomes. They also indicated whether they found the tool easy to learn and operate. Further statements invited them to reflect on whether colleagues or supervisors expected them to use the tool, whether they felt that adequate resources and support were in place to sustain use, and whether they intended to continue using the tool in their professional practice. Each of these items was rated on a five-point scale ranging from strong disagreement to strong agreement, providing quantitative data that could be aggregated and compared across the different tools under review.

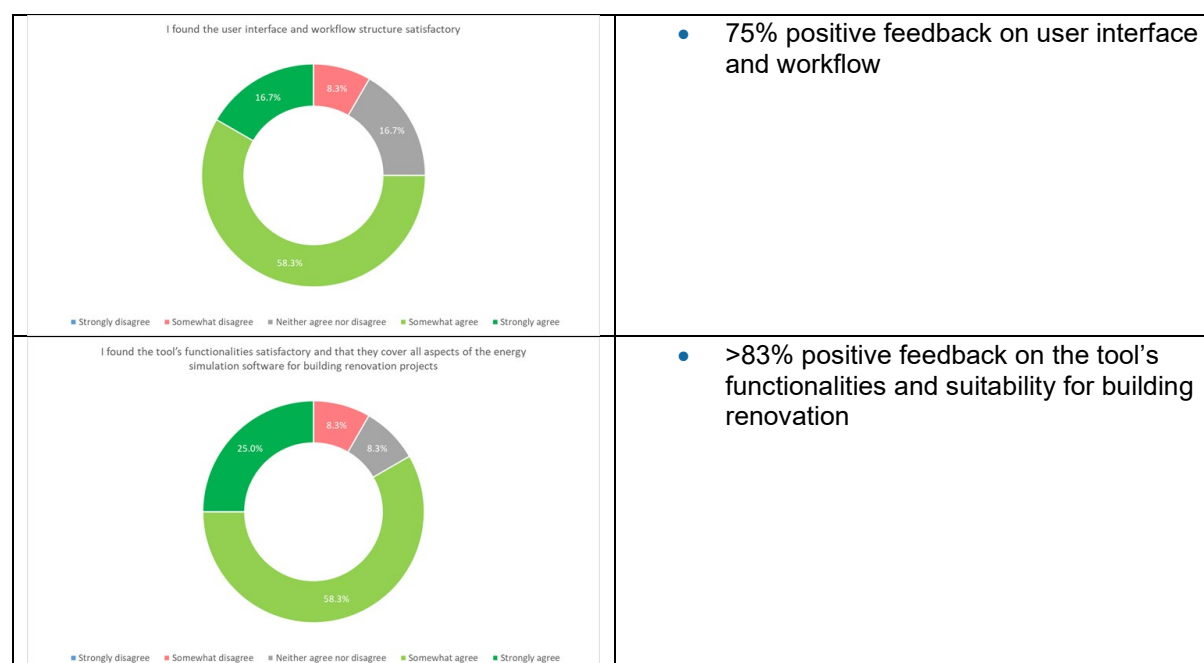
By combining the direct evaluation of user-friendliness and the clarity of outputs with these additional categories, the assessment moved beyond superficial impressions and generated evidence about the actual acceptance potential of the tools. This approach made it possible to compare the promises of tool providers with the lived experiences of end-users, to identify strengths and weaknesses in each case, and to develop concrete recommendations on the conditions under which adoption is most likely to succeed.

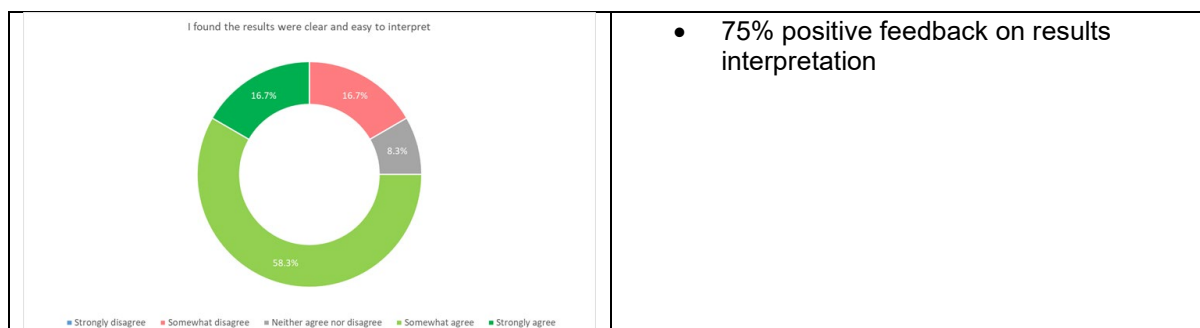
In general, it is important to understand that users of the RINNO SUITE are experts and familiar with the use of IT tools for renovation projects.

7.1 Evaluation of the WP3 tools

From WP3, summaries of the feedback for each tool are presented below:

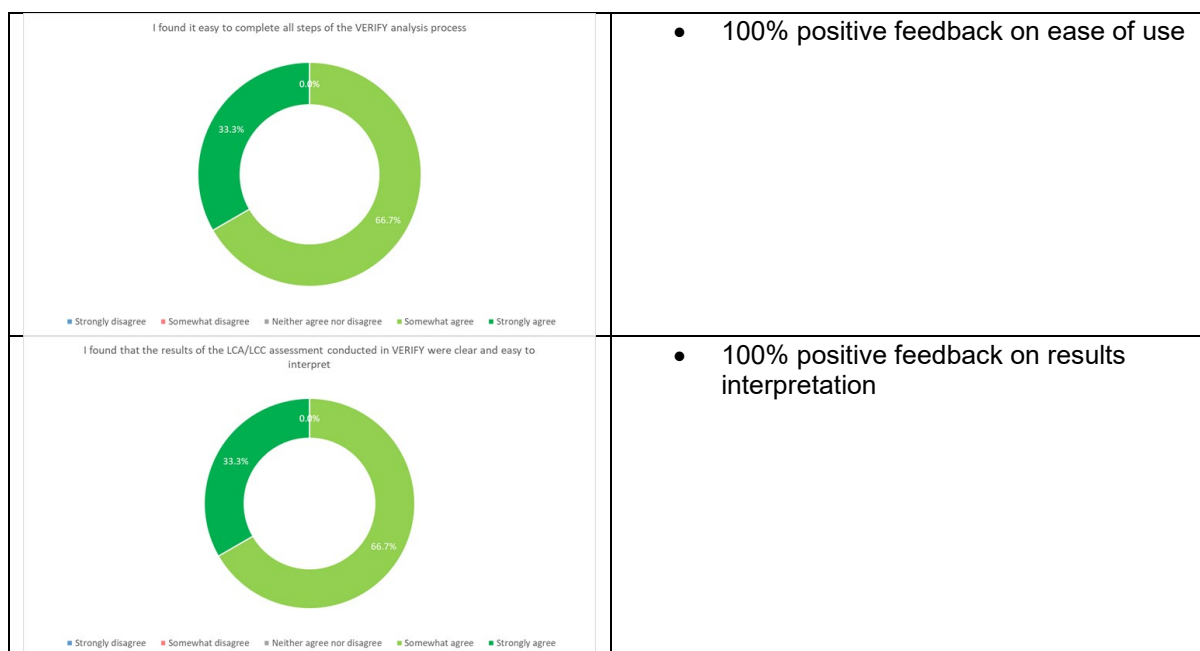
For INTEMA.building some key results are presented below:





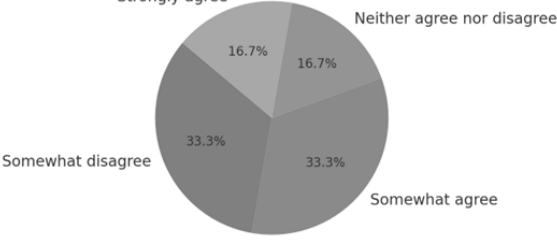
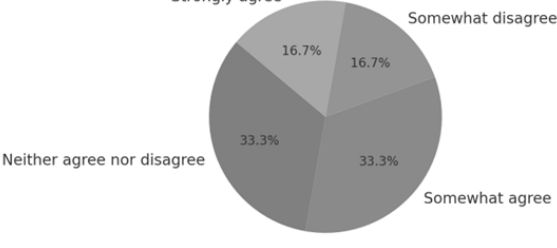
It can be seen that in general there was positive feedback on the user friendliness of INTEMA.building and the interpretation of the energy analysis results. In both cases 75% or more of the respondents considered the tool user-friendly with clear and easy to interpret results. Results are based on 12 responses.

For VERIFY some key results are presented below:



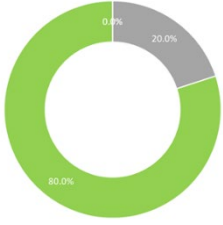
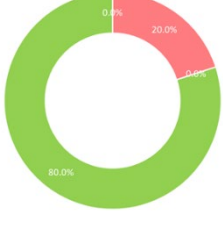
It is clear that the respondents considered that VERIFY is a user-friendly tool with clear and easy to interpret results. All participants responded positively. Results are based on 6 responses.

For the TEA tool:

Ease of Use - Overall Responses 	• 50% positive feedback • 33.3% negative feedback • 16.7% neutral feedback
Results Clarity - Overall Responses 	• 50% positive feedback • 33.3% neutral feedback • 16.7% negative feedback

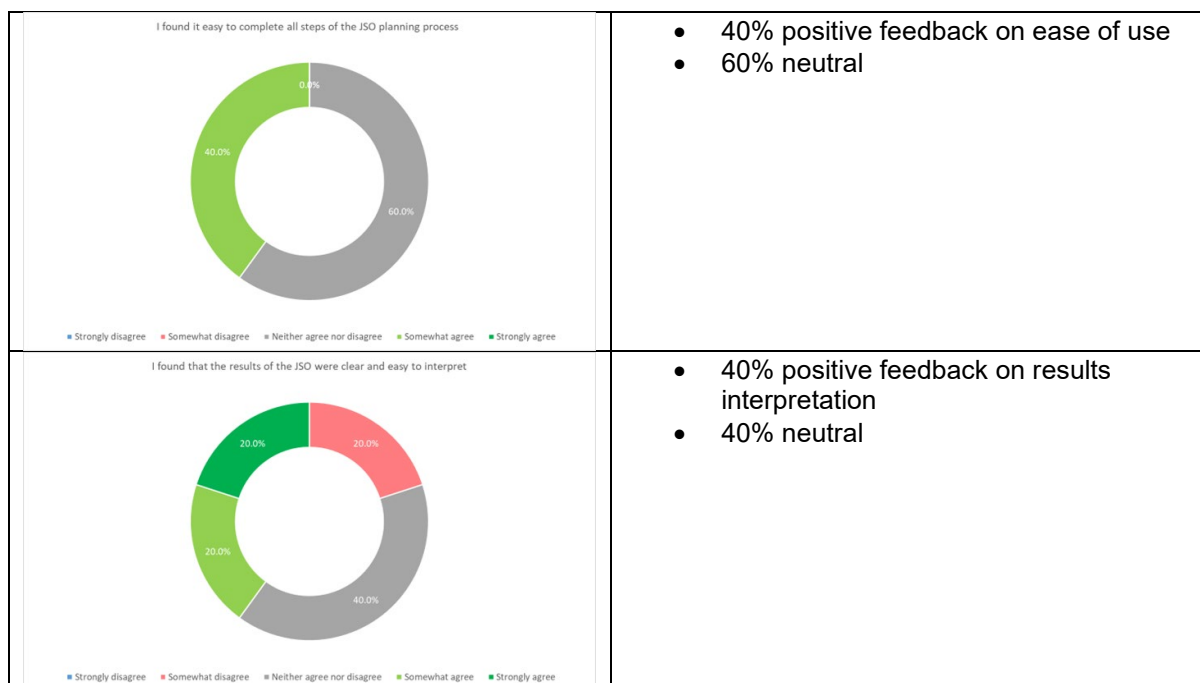
In general, there were mixed responses on the user-friendliness and the results clarity. It is concluded that there needs to be better guidance to the user on using the tool whilst results interpretation may be improved.

For the Renovation Scenario DSS:

I found the user interface of the Renovation Scenario DSS easy to navigate 	• 80% positive feedback on user friendliness
I found that the results of the Renovation Scenario DSS were clear and easy to interpret 	• 80% positive feedback on results interpretation

It can be seen that there was positive feedback on the user friendliness of the Renovation Scenario DSS and the interpretation analysis results. In both cases 80% of the respondents considered the tool user-friendly with clear and easy to interpret results. Results are based on 5 responses

For the Job Scheduling Optimiser:



Results for the Job Scheduling Optimiser were not conclusive on the ease of use and results interpretation. In both cases 40% of the participants responded positively with almost all remaining answers being neutral. It can be concluded that user-friendliness and results clarity may be improved. Results were based on 5 respondents.

For the S-LCA tool:

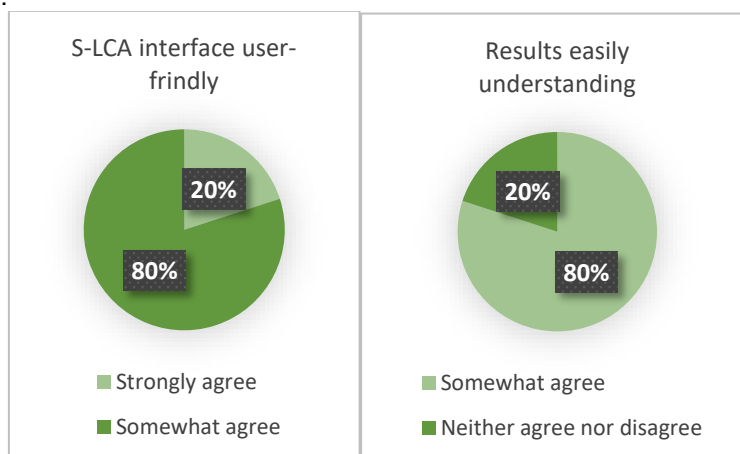


Figure 10 Evaluation of WP3 - S-SLA

The evaluation of the training of the S-LCA tool shows that the tool is user friendly, but that we need to work with the presentation of the results.

7.2 Evaluation of the WP4 tools

For WP4 – only the AR-training has been performed.

For the **AR tool**, trainings have been performed in France, Greece and Denmark. At the evaluation in Denmark, the participants emphasized that the introduction should have been video recorded so that the listeners shouldn't have had to sit around waiting for the application to upload. Furthermore, it wasn't smart that it couldn't show the central "AR viewer".

In the introduction, the trainers should have explained what the AR-tool is for, who will use the tool and in which contexts. It was the general opinion that if the AR-tool was a regular App, easily available on both Android and iPhone, the person who was going to install a technology would benefit from just seeing on their phone how a technology is installed or getting some background information. But there's still a bit of development to do before that happens.

The AR tool was thoroughly evaluated at the first testing in Dublin. The survey results indicate a generally positive outlook toward the adoption of AR technology, particularly among young males aged 25 to 44, who made up 64% of respondents. While only 46% are currently familiar with AR and 23% are unfamiliar, there is a strong openness to learning: 86% believe AR can help them acquire important knowledge, and 82% see its potential to boost productivity. Most notably, 91% expressed willingness to use AR in the future, suggesting a promising landscape for further implementation and user engagement, especially if supported by educational initiatives and user-friendly integration.

Documentation is enclosed as APPENDIX 4.

7.3 Evaluation of the WP5 tools

WP5 – Summaries of the feedback received for the three main tools of WP5

The evaluation results from training session of WP5 tools provide detailed user feedback on three specific tools: the Building Monitoring System, the Digital Marketplace, and the Online Contract Management Platform. Each tool was assessed based on participants' experience with its interface, functionalities, clarity of communication, and practical value, including potential time savings and likelihood of future use.

The **Building Monitoring System** received strong positive feedback regarding its interface and workflow structure, with all respondents either agreeing or strongly agreeing that it was satisfactory. This level of approval extended to the tool's functionalities, particularly in its coverage of energy simulation, where 75% agreed and the remaining participants were neutral. Users also responded favourably to the clarity and interpretability of notifications, with all expressing agreement or strong agreement. However, when it came to the accuracy of those alerts, responses were more cautious, with feedback evenly divided between agreement and neutrality. The tool's perceived impact on reducing time through performance monitoring was acknowledged by most, with 50% agreeing and 25% strongly agreeing, although a quarter of participants remained neutral. On the question of whether users would continue to access and use the tool in the future, most adopted a neutral position, suggesting tentative interest that may depend on further exposure or integration support.

Turning to the **Digital Marketplace**, the evaluation highlighted solid approval of the user interface and workflow, with 75% agreeing and 25% strongly agreeing. The tool's functionalities in facilitating access to building resources were also well received, with three-quarters of users expressing satisfaction. In contrast, when asked about the ease of completing actions within the tool, 75% of

participants remained neutral, possibly indicating either limited usage or uncertainty. Notification clarity was generally well received, but not without concern—while 75% agreed that messages were clear, a notable 25% disagreed. A similar split was seen in the perceived accuracy of notifications and alerts, where only half agreed, with the remainder neutral or disagreeing. Nonetheless, 75% of respondents agreed that the tool helped facilitate decision making, though most were again neutral regarding future use. This suggests the tool shows promise but may require refinement or additional validation before broader adoption.

The **Online Contract Management Platform** generated mixed but generally encouraging feedback. All participants agreed that the interface and workflow were satisfactory, making it the top-scoring tool in that specific category. Its renovation simulation functionalities, however, drew more divided responses: 50% were satisfied, 25% neutral, and 25% disagreed. Ease of contract creation was judged more evenly, with responses split between neutrality and agreement. Most participants agreed that notifications were clear, and half also agreed they were accurate, although the remaining half were neutral. When evaluating the tool's contribution to time reduction, responses were again balanced, half agreed and half were neutral. This pattern repeated when users were asked about the likelihood of continued use: while none expressed negative opinions, half were undecided, showing interest but also signalling the need for more thorough practical engagement or demonstrable benefits.

For a clearer overview of the results, the figure below visualises the percentage of positive feedback across all evaluation questions and tools:

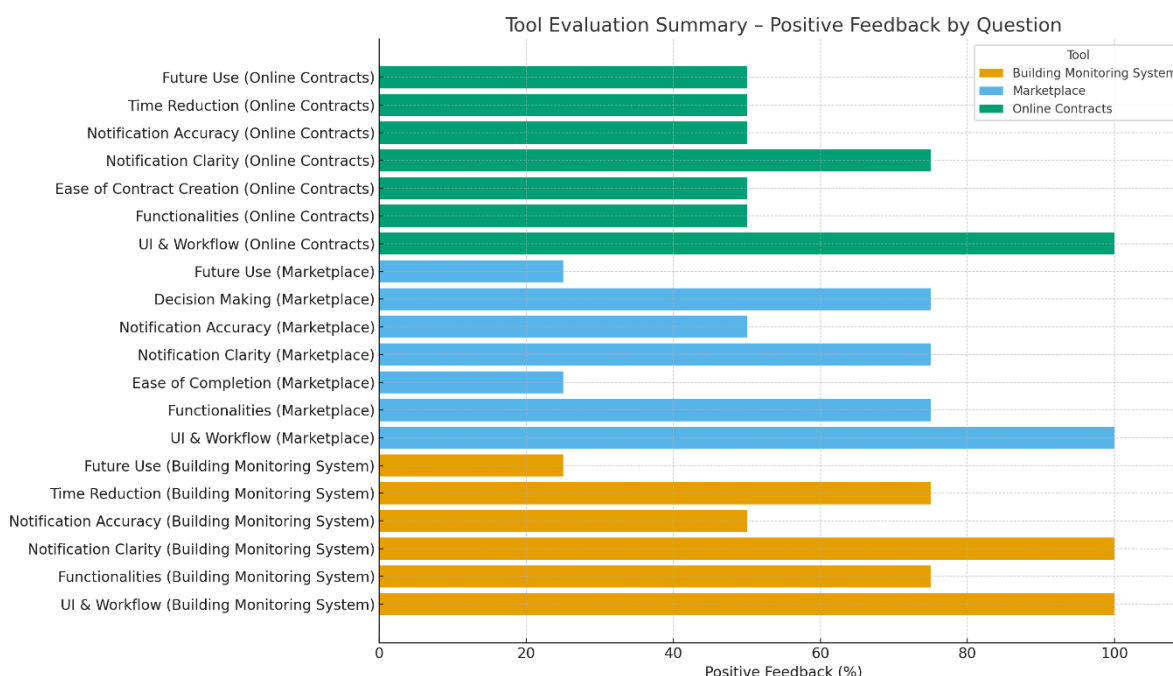


Figure 11 Feedback from users on different features of the Building Monitoring System, Marketplace, and Online Contracts tools.

8 Conclusion

The trainings have primarily been led by IT experts, which, combined with project delays, shifted the focus from pedagogical learning towards tool testing. As a result, the evaluation concentrated more on the tools themselves than on the training process.

Participation has included stakeholders from pilot renovation projects, consultants, administrators, consortium partners, and in some cases students. The final project presentation was also opened to external participants. Feedback has consistently been positive, although the advanced nature of the tools requires time to master. The RINNO SUITE has been recognized as innovative and highly relevant for the building sector.

Looking ahead, broader user involvement and improved training models — potentially combining live sessions with recorded demonstrations — will be essential to expand adoption and ensure effective use of the tools.

Appendix I – description of the tools and equipment

WP3	
Tool name	INTEMA.building
Equipment required	Computer with an internet connection
What does the tool do?	INTEMA.building is a web based application for conducting accurate transient building energy simulations, able to model multiple energy systems (production, consumption and storage). The tool is able to estimate with high accuracy the electrical and heating needs of the building.
Why use the tool?	To assess the energy consumption and production of the building before and after the renovation and to calculate specific energy related KPIs
Who could use it?	Energy Consultant, Renovation Manager, Architect, Design Manager, Design Team Member, Design Coordinator, Project Owner

Tool name	VERIFY
Equipment required	Computer with an internet connection
What does the tool do?	VERIFY is a web-based platform designed to provide a holistic methodology and evaluation for the Lifecycle Assessment (LCA) and Lifecycle Cost (LCC) analysis performed on planned building renovations. The platform provides extensive analysis to support the user in deciding the best renovation plan for a building in terms of environmental and economic factors, by comparing its performance to that of the current building's infrastructure
Why use the tool?	To conduct an LCA/LCC analysis of alternative renovation scenarios for the building under investigation and to calculate specific environmental and cost/financial KPIs for these scenarios
Who could use it?	Energy Consultant, Renovation Manager, Architect, Design Manager, Design Team Member, Design Coordinator, Project Owner

Tool name	TEA TOOL
Equipment required	Computer with Revit 2022 installed
What does the tool do?	The TEA tool evaluates and simulates renovation scenarios to select the optimum solution by creating a report. The output data from the tool is a valuable resource because it grants access to a report from 5 different categories: -Utility disruption -traffic disruption -physical space disruption -internal environmental disruption -waste.

Why use the tool?	Quick estimation of waste creation and management, Quick estimation of tenants and building owners expected disruption due to construction works, Disruption to occupants during renovation phases was inevitable; now, the TEA tool allows better communication among occupants, project managers, and contractors by giving different outcomes before the renovation phases begins.
Who could use it?	Energy Consultant, Renovation Manager, Architect, Design Manager, Design Team Member, Design Coordinator, Project Owner

Tool name	RENOVATION SCENARIO DSS
Equipment required	Computer with an internet connection
What does the tool do?	The tool is a Decision Support System which enables the informed decision by the user for the selection of the optimum renovation scenario based on a holistic assessment
Why use the tool?	To select the best renovation scenario out of a range of alternative ones according to the user's preferences and the holistic evaluation of the scenarios where their performance is expressed through specific energy, environmental, cost/financial and disruption KPIS
Who could use it?	Energy Consultant, Renovation Manager, Architect, Design Manager, Design Team Member, Design Coordinator, Project Owner

Tool name	JSO
Equipment required	Computer with an internet connection
What does the tool do?	The Job Scheduling Optimizer (JSO) is a web-based platform that supports the scheduling of a set of jobs which comprise a renovation scenario work plan. The tool's purpose is to generate the optimal sequence of the jobs included in a renovation scenario with respect to available resources
Why use the tool?	To define the optimum sequence of works of the renovation project according to specific constraints (duration/cost and disruption) and the resources available. The tool may be used for the preliminary planning of general activities based on feedback received from the TEA tool (automated process at the design phase) or for the detailed planning of day-to-day activities during the renovation/installation phase (manual process)
Who could use it?	Energy Consultant, Renovation Manager, Architect, Design Manager, Design Team Member, Design Coordinator, Project Owner

WP4	
Tool name	On/Off site
Equipment required	Computer with an internet connection
What does the tool do?	A decision-making tool based on a set of project criteria, that helps deciding whether an onsite or offsite approach is appropriate. This has been developed for building envelope, in particular the façade.

Why use the tool?	Helps identify reasons assisting or blocking off-site industrialised construction options.
Who could use it?	Architect, Project owner, Design manager, Design team member, Design coordinator, Construction director, Construction site manager, Construction team member

Tool name	E-cockpit
Equipment required	Computer with an internet connection
What does the tool do?	Uses real-time project-related data, analyses them, and then using a set of KPIs, to allow them better opportunities for problem-solving and effective decision-making
Why use the tool?	Quick and easy dashboard that has different type of construction progress data in a single view.
Who could use it?	Design manager, Design coordinator, Construction director, Construction site manager, Construction team member, Site supervisor, Site worker

Tool name	E-logistic
Equipment required	Computer with an internet connection
What does the tool do?	Tool to help develop delivery packages on site the right materiel, to the right place, at the right time.
Why use the tool?	Helps manage the logistics and the warehouse management process.
Who could use it?	Site supervisor, Construction logistic manager, Warehouse manager

Tool name	AR/VR tool
Equipment required	Computer with an internet connection
What does the tool do?	Provides relevant training and guidance to the workforce onsite and offsite using Augmented and Virtual Reality (AR/VR) tools
Why use the tool?	Easy to understand instructions to help site staff install a new technology.
Who could use it?	Construction director, Construction site manager, Construction team member, Site supervisor, Site worker, sub contractor

Tool name	RRM (This tool aggregates all the tools listed above)
Equipment required	Computer with an internet connection
What does the tool do?	helps optimise, execute, analyse, monitor and manage the renovation process as well as guide and train onsite the workforce
Why use the tool?	It is a tool that includes several tools in one single platform.
Who could use it?	Project owner, Design manager, Design team member, Design coordinator, Construction director, Construction site manager, Construction team member, Site supervisor, site worker, sub contractor, Construction logistic manager, Warehouse manager

WP5

Tool name	Performance Dashboard
Equipment required	Computer with an internet connection
What does the tool do?	This tool helps track and improve how well renovation projects are doing. It monitors things like energy use, cost, and air quality to make sure the renovation is efficient and sustainable. This tool gives real-time data and helps everyone involved in the project understand how it's progressing and where it can be improved.
Why use the tool?	It enables better decision-making, optimizes resource utilization, and ensures that the renovation aligns with sustainability goals.
Who could use it?	Building owner, Project owner, Construction team member, Renovation Manager

Tool name	Sensor-Enabled Building Model
Equipment required	Computer with an internet connection
What does the tool do?	The Sensor-Enabled Building Model tool integrates 3D modeling technology with sensor data to provide a comprehensive visualization of a building's infrastructure and real-time environmental conditions. It allows users to navigate through a digital representation of the building while simultaneously viewing the locations and status of installed sensors.
Why use the tool?	This tool enables stakeholders to monitor various aspects such as temperature, humidity, air quality, and energy usage within the building. By displaying real-time sensor data within the context of the building model, users can quickly identify patterns, anomalies, and potential issues, facilitating informed decision-making for building management, maintenance, and optimization.
Who could use it?	Building owner, Project owner, Construction team member, Occupant, Renovation Manager

Tool name	Marketplace
Equipment required	Computer with an internet connection
What does the tool do?	The Marketplace serves as a centralized platform for connecting stakeholders such as contractors, suppliers, designers, and building owners. It facilitates the procurement of materials, equipment, and services necessary for renovation projects.
Why use the tool?	This tool offers vendor directories, product catalogs, and project collaboration tools. Contractors can submit bids, suppliers can showcase their products and services, and building owners can compare options and make informed decisions.
Who could use it?	Architect, <i>Building Owner</i> , Project owner, Design manager, Design team member, Design coordinator, Construction director, Construction site manager, Construction team member, Site supervisor, Site worker, Sub-contractor, Construction logistic manager, Warehouse manager, Energy Consultant, Occupant, Renovation Manager

Tool name	Social Collaboration
Equipment required	Computer with an internet connection
What does the tool do?	This tool streamlines communication and project management for building renovation projects. It enables real-time messaging, document sharing, and task assignment among stakeholders. Users can coordinate schedules, track project progress, and resolve issues efficiently.
Why use the tool?	It provides real-time messaging, document sharing, and task assignment features, the tool streamlines coordination among stakeholders. It helps to ensure that everyone involved stays informed, deadlines are met, and issues are promptly addressed.
Who could use it?	Architect, <i>Building Owner</i> , Project owner, Design manager, Design team member, Design coordinator, Construction director, Construction site manager, Construction team member, Site supervisor, Site worker, Sub-contractor, Construction logistic manager, Warehouse manager, Energy Consultant, Occupant, Renovation Manager

Appendix 2 – Invitation to webinar - example

Date: [insert the date here]

INVITATION TO WEBINAR

Dear [Participant's Name],

You are invited to a training session focused on introducing and exploring RINNO's IT tools for continuous monitoring in the context of building reconstruction and renovation. This session is intended to give a high-level overview of these tools, which are designed to support various aspects of project tracking, resource management, and contract administration.

During the session, we will present four tools, each offering functionalities that may assist in managing project needs more effectively. Afterward, there will be an interactive group activity to gather your feedback on these tools' potential applications across different countries.

Date: 28/11/2024

Time: [insert the time here]

Location: [insert the link here]

Agenda

1	Introduction to Monitoring Tools for Building Projects
2	Tool Demonstrations
	Each tool will be introduced in a brief, 10-minute segment.
	Tool 1: Building Performance Dashboard and Monitoring System
	An overview of this tool's components:
	Performance Dashboard: Offers a basic view into certain building performance indicators.
	Monitoring System: Provides a way to track building conditions, though functionality and use cases may vary.
	Tool 2: Sensor-Enhanced Building Model
	This tool offers some level of monitoring capabilities by incorporating data from sensors. It may help in identifying general building conditions, though its use in specific contexts is still being evaluated.
	Tool 3: Digital Marketplace for Building Resources
	This tool is aimed at simplifying access to various resources for projects, though availability and suitability will depend on regional factors.
	Tool 4: Online Contract Management Platform
	A brief introduction to this platform, which may help organize and monitor contracts in a digital space.
3	Group Discussion and Feedback Session
	Time: 20 minutes
	Participants will join groups based on their countries' pilot projects to discuss each tool's applicability. Each group will complete a short questionnaire to share initial feedback on the potential usefulness and relevance of these tools.

4	Q&A and Wrap-Up
	This session aims to introduce you to these tools and gather your impressions regarding their potential uses.

Best regards,

.....the person who sends the invitation.....

APPENDIX

Further information on the IT-tools

Tool name	Performance Dashboard
Equipment required	Computer with an internet connection
What does the tool do?	This tool helps track and improve how well renovation projects are doing. It monitors things like energy use, cost, and air quality to make sure the renovation is efficient and sustainable. This tool gives real-time data and helps everyone involved in the project understand how it's progressing and where it can be improved.
Why use the tool?	It enables better decision-making, optimizes resource utilization, and ensures that the renovation aligns with sustainability goals.
Who could use it?	Building owner, Project owner, Construction team member, Renovation Manager
Tool name	Sensor-Enabled Building Model
Equipment required	Computer with an internet connection
What does the tool do?	The Sensor-Enabled Building Model tool integrates 3D modeling technology with sensor data to provide a comprehensive visualization of a building's infrastructure and real-time environmental conditions. It allows users to navigate through a digital representation of the building while simultaneously viewing the locations and status of installed sensors.
Why use the tool?	This tool enables stakeholders to monitor various aspects such as temperature, humidity, air quality, and energy usage within the building. By displaying real-time sensor data within the context of the building model, users can quickly identify patterns, anomalies, and potential issues, facilitating informed decision-making for building management, maintenance, and optimization.
Who could use it?	Building owner, Project owner, Construction team member, Occupant, Renovation Manager
Tool name	Marketplace
Equipment required	Computer with an internet connection
What does the tool do?	The Marketplace serves as a centralized platform for connecting stakeholders such as contractors, suppliers, designers, and building owners. It facilitates the procurement of materials, equipment, and services necessary for renovation projects.

Why use the tool?	This tool offers vendor directories, product catalogs, and project collaboration tools. Contractors can submit bids, suppliers can showcase their products and services, and building owners can compare options and make informed decisions.
Who could use it?	Architect, <i>Building Owner</i> , Project owner, Design manager, Design team member, Design coordinator, Construction director, Construction site manager, Construction team member, Site supervisor, Site worker, Sub-contractor, Construction logistic manager, Warehouse manager, Energy Consultant, Occupant, Renovation Manager
Tool name	Social Collaboration
Equipment required	Computer with an internet connection
What does the tool do?	This tool streamlines communication and project management for building renovation projects. It enables real-time messaging, document sharing, and task assignment among stakeholders. Users can coordinate schedules, track project progress, and resolve issues efficiently.
Why use the tool?	It provides real-time messaging, document sharing, and task assignment features, the tool streamlines coordination among stakeholders. It helps to ensure that everyone involved stays informed, deadlines are met, and issues are promptly addressed.
Who could use it?	Architect, <i>Building Owner</i> , Project owner, Design manager, Design team member, Design coordinator, Construction director, Construction site manager, Construction team member, Site supervisor, Site worker, Sub-contractor, Construction logistic manager, Warehouse manager, Energy Consultant, Occupant, Renovation Manager

Appendix 3 – Compatible Android devices for the AR viewer

IPads are not compatible with the AR viewer.

Proposed devices:

1. *Samsung Galaxy Tab S7 FE* (https://www.gsmarena.com/samsung_galaxy_tab_s7_fe-10922.php). *It is better to buy the version with 6GB of RAM.*
2. *Xiaomi Pad 5* (https://www.gsmarena.com/xiaomi_pad_5-11042.php).

Compatible Android devices for the AR viewer – e.g.:

Manufacturer	Device model
Asus	ROG Phone
Asus	ROG Phone II
Asus	ROG Phone III
Asus	ROG Phone 5
Asus	Zenfone 6
Asus	Zenfone 7/7 Pro
Asus	Zenfone 8
Asus	Zenfone AR
Asus	Zenfone ARES
Balmuda	Balmuda Phone
Fujitsu	arrows 5G F-51A
Fujitsu	arrows NX9 F-52A
FCNT	arrows We A101FC
FCNT	arrows We-F-51
FCNT	arrows We FCG01
General Mobile	GM 9 Plus
Google	Nexus 5X
Google	Nexus 6P
Google	Pixel
Google	Pixel XL
Google	Pixel 2
Google	Pixel 2 XL
Google	Pixel 3
Google	Pixel 3 XL
Google	Pixel 3a
Google	Pixel 3a XL
Google	Pixel 4
Google	Pixel 4 XL
Google	Pixel 4a
Google	Pixel 4a 5G
Google	Pixel 5
Google	Pixel 5a 5G
Google	Pixel 6
Google	Pixel 6 Pro
HMD Global	Nokia 3.4
HMD Global	Nokia 5.4
HMD Global	Nokia 6 (2018)
HMD Global	Nokia 6.1 Plus
HMD Global	Nokia 6.2
Huawei	Honor 8X
Huawei	Honor 10

Huawei	Honor View 10 Lite
Huawei	Honor V20
Huawei	Mate 20 Lite
Huawei	Mate 20
Huawei	Mate 20 Pro
Huawei	Mate 20 X
Huawei	Nova 3
Huawei	Nova 3i
Huawei	Nova 4
Huawei	P20
Huawei	P20 Pro
Huawei	P30
Huawei	P30 Pro
Huawei	Porsche Design Mate RS
Huawei	Porsche Design Mate 20 RS
Huawei	Y9 2019
Infinix Mobile	Note 6
Infinix Mobile	Note 7
Infinix Mobile	Zero 5G
Infinix Mobile	Zero 8
Infinix Mobile	Zero 8i
Infinix Mobile	Zero X
Infinix Mobile	Zero X Pro
Infinix Mobile	Zero X Neo
Infinix Mobile	Note 10 Pro
Infinix Mobile	Note 11
Infinix Mobile	Note 11 Pro
Infinix Mobile	Note 11S
Infinix Mobile	Note 12
Kyocera	Torque 5G
Kyocera	Torque G04
Kyocera	Duraforce Ultra 5G
Kyocera	DuraSport 5G
Kyocera	Android One S9
Kyocera	DIGNO SANGA edition
Lenovo	Lenovo K13 Note
Lenovo	Lenovo Tab P11 Pro
Lenovo	Lenovo Tab P11 5G
Lenovo	Lenovo Tab P11 Plus
Lenovo	Lenovo Yoga Tab 11
Lenovo	Lenovo Tab P12 Pro
Lenovo	Lenovo LAVIETab T12 12QHD1
LitByLeia	Lume Pad
LG	G6
LG	G7 Fit
LG	G7 One
LG	G7 ThinQ
LG	G8 ThinQ
LG	G8S ThinQ
LG	G8X ThinQ

LG	G Pad 5 10.1 FHD
LG	K61
LG	K71
LG	K92
LG	Q6
LG	Q70
LG	Q8
LG	Q92
LG	style2
LG	style3
LG	Stylo 5
LG	Stylo 6
LG	Stylo 7
LG	V30
LG	V30+
LG	V30+ JOJO
LG	LG Signature Edition 2017
Motorola	moto g ^{5s} plus
Motorola	moto g ⁶
Motorola	moto g ⁶ plus
Motorola	moto g ⁷
Motorola	moto g ⁷ play
Motorola	moto g ⁷ plus
Motorola	moto g ⁷ power
Motorola	moto g ⁷ play
Motorola	moto g ⁸
Motorola	moto g ⁸ play
Motorola	moto g ⁸ plus
Motorola	moto g ⁸ power
Motorola	moto g ⁸ power lite
Motorola	moto g ⁹ play
Motorola	moto g ⁹ plus
Motorola	moto g ⁹ power
Motorola	moto g 5G
Motorola	moto g 5G (2022)
Motorola	moto g power 2021
Motorola	moto g power
Motorola	moto g pro
Motorola	moto g stylus
Motorola	moto g stylus (2021)
Motorola	moto g stylus (2022)
Motorola	moto g stylus 5G (2022)
Motorola	moto g stylus 5G
Motorola	moto g(30)
Motorola	moto g(40) fusion
OnePlus	OnePlus 3T
OnePlus	OnePlus 5
OnePlus	OnePlus 5T
OnePlus	OnePlus 6
OnePlus	OnePlus 6T
OnePlus	OnePlus 7

OnePlus	OnePlus 7 Pro
OnePlus	OnePlus 7 Pro 5G
OnePlus	OnePlus 7T
OnePlus	OnePlus 7T Pro
OnePlus	OnePlus 8
OnePlus	OnePlus 8 Pro
OnePlus	OnePlus 8T
OnePlus	OnePlus 9
OnePlus	OnePlus 9 Pro
OnePlus	OnePlus 9R
OnePlus	OnePlus 9RT 5G
OnePlus	OnePlus 10 Pro
OnePlus	OnePlus 10 Pro 5G
OnePlus	OnePlus 10R 5G
OnePlus	OnePlus Nord
OnePlus	OnePlus N10
OnePlus	OnePlus Nord CE
OnePlus	OnePlus Nord CE 2
OnePlus	OnePlus Nord CE 2
	Lite 5G
OnePlus	OnePlus Nord2 5G
OnePlus	OnePlus Nord N200 5G
Oppo	A52
Oppo	A72
Oppo	A72 5G
Oppo	A92
Oppo	A92s
Oppo	A93 5G
Oppo	A94
Oppo	F11 Pro
Oppo	F15
Oppo	F17 Pro
Oppo	F19 Pro+
Oppo	F21 Pro 5G
Oppo	Find X2
Oppo	Find X2 Pro
Rakuten	Hand5G
realme	5
realme	5 Pro
realme	6
realme	6 Pro
realme	7
realme	7i
realme	7 Pro
realme	8 Pro
realme	Narzo 20 Pro
Samsung	Galaxy A3 (2017)
Samsung	Galaxy A5 (2017)
Samsung	Galaxy A6 (2018)
Samsung	Galaxy A7 (2017)
Samsung	Galaxy A7 (2018)
Samsung	Galaxy A8
Samsung	Galaxy A8+ (2018)

Samsung	Galaxy A20
Samsung	Galaxy A20s
Samsung	Galaxy A20e
Samsung	Galaxy A22 5G
Samsung	Galaxy A23
Samsung	Galaxy A30
Samsung	Galaxy A30s
Samsung	Galaxy A31
Samsung	Galaxy A32
Samsung	Galaxy A32 5G
Samsung	Galaxy A33 5G
Samsung	Galaxy A40
Sharp	AQUOS R3
Sharp	AQUOS R5G
Sharp	AQUOS R6
Sharp	AQUOS R7
Sharp	AQUOS sense3
Sharp	AQUOS sense3 basic
Sharp	AQUOS sense3 plus
Sharp	AQUOS sense4
Sharp	AQUOS sense4 basic
Sharp	AQUOS sense4 lite
Sharp	AQUOS sense4 plus
Sharp	AQUOS sense5G
Sharp	AQUOS sense6
Sharp	AQUOS zero2
Sharp	AQUOS zero6
Sharp	AQUOS zero5G basic
Sharp	AQUOS zero5G basic
	DX
Sharp	Leitz Phone1
Sharp	S7
Sony	Xperia Ace III
Sony	Xperia XZ Premium
Sony	Xperia XZ1
Sony	Xperia XZ1 Compact
TCL	10 5G UW
Tecno	Camon 18P
Tecno	Camon 12 Pro
Tecno	Camon 16 Premier
Tecno	Camon 16 Pro
Tecno	Camon 17 Pro
Tecno	Camon 18 Premier
Tecno	Camon 19 Pro
Tecno	Camon 19 Pro 5G
Tecno	Phantom 9
Tecno	Phantom X
Tecno	Pova 2
Tecno	Pova 5G
Umx(Ultimate Mobile Experience)	U3AR
Vinsmart	Live 4
Vinsmart	Aris Pro

Vivo	Nex 3
Vivo	Nex 3 5G
Vivo	NEX S
Vivo	NEX Dual Display Edition
Vivo	iQOO 3 4G
Vivo	iQOO 3 5G
Wiko	View 3 Pro
Xiaomi	Xiaomi 11T
Xiaomi	Xiaomi 12
Xiaomi	Xiaomi 12X
Xiaomi	Xiaomi 12 Pro
Xiaomi	Mi 8
Xiaomi	Mi 8 SE
Xiaomi	Mi 9
Xiaomi	Mi 9 Lite
Xiaomi	Mi 9 SE
Xiaomi	Mi 10
Xiaomi	Mi 10i
Xiaomi	Mi 10 Lite
Xiaomi	Mi 10 Lite 5G
Xiaomi	Mi 10 Lite Zoom
Xiaomi	Mi 10 Pro
Xiaomi	Mi 10T Pro
Xiaomi	Mi 11
Xiaomi	Mi 11 Pro
Xiaomi	Mi 11 Ultra
Zebra	ET51s 8" Enterprise Tablet
Zebra	ET51L 10" Enterprise Tablet
Zebra	ET56L 10" Enterprise Tablet
Zebra	ET56s 8" Enterprise Tablet
Zebra	ET56 10" Enterprise Tablet
Zebra	TC21 WLAN Touch Computer
Zebra	TC26 WWAN Touch Computer
Zebra	EC50 WLAN Enterprise Computer
Zebra	EC55 WWAN Enterprise Computer
Zebra	TC52 WLAN Touch Computer
Zebra	TC52x WLAN Touch Computer
Zebra	TC52ax WLAN Touch Computer
Zebra	TC53 WLAN Touch Computer

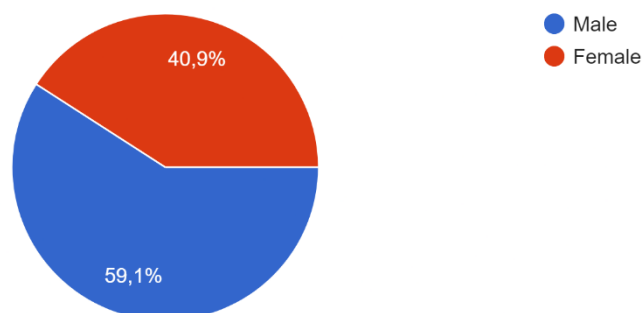
Zebra	TC57 WWAN Touch Computer
Zebra	TC57x WWAN Touch Computer
Zebra	TC58 WWAN Touch Computer
Zebra	TC72 WLAN Touch Computer
Zebra	TC77 WWAN Touch Computer
Zebra	MC20
ZTE	Libero 5G
ZTE	Libero 5G II

Appendix 4 – evaluation of the AR tool in Dublin

22 participants in the evaluation (of 34 participants - see p. 22).

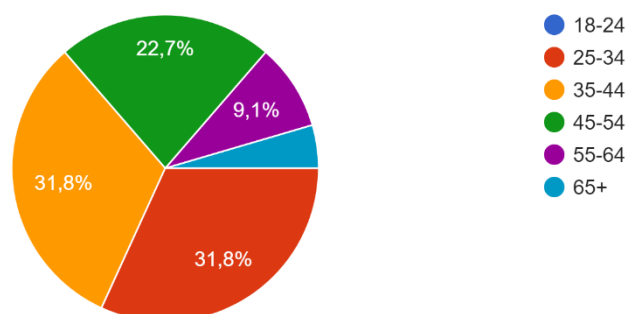
What is your gender?

22 απαντήσεις



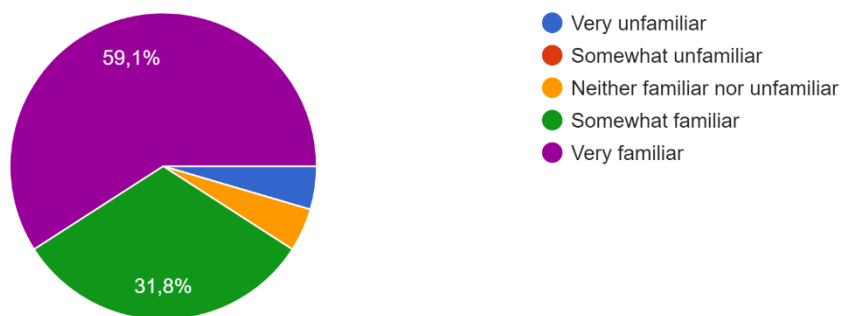
What is your age category? Please select the appropriate age range from the options below.

22 απαντήσεις



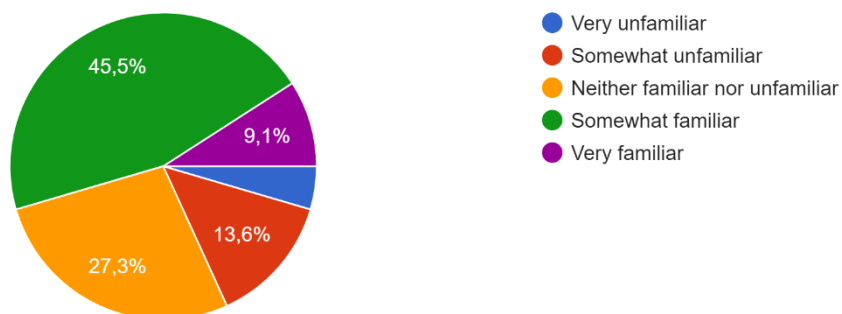
What is your familiarity with smartphone technology?

22 απαντήσεις



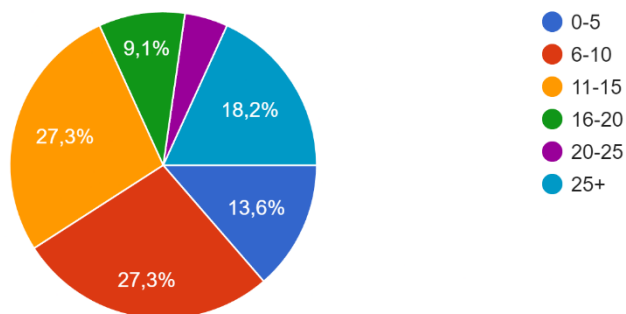
What is your familiarity with Augmented Reality (AR) technology?

22 απαντήσεις



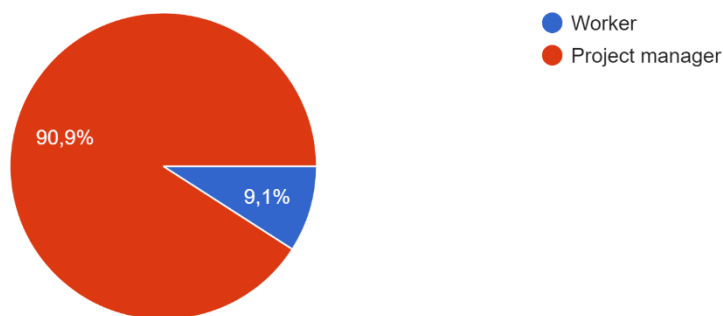
How many years of working experience do you have?

22 απαντήσεις



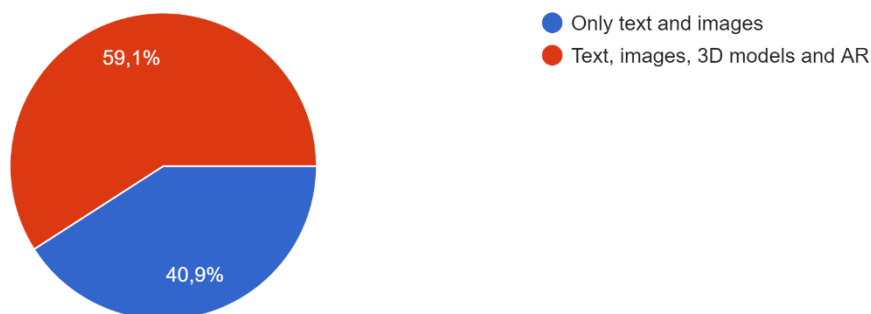
What is your job position?

22 απαντήσεις



Which version of the application did you use?

22 απαντήσεις

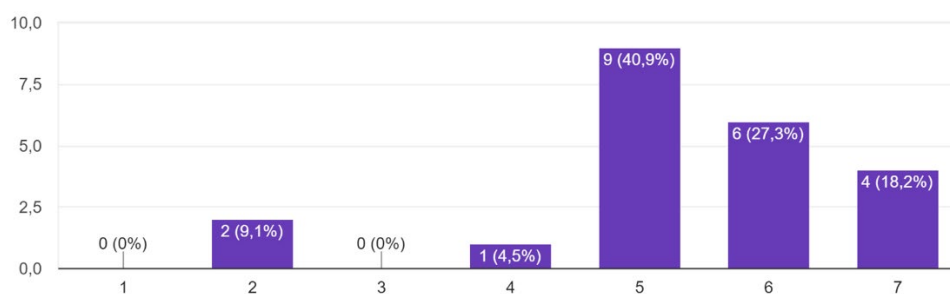


In the following – 7 is best.

1

Learning how to use the AR-Viewer application is easy for me.

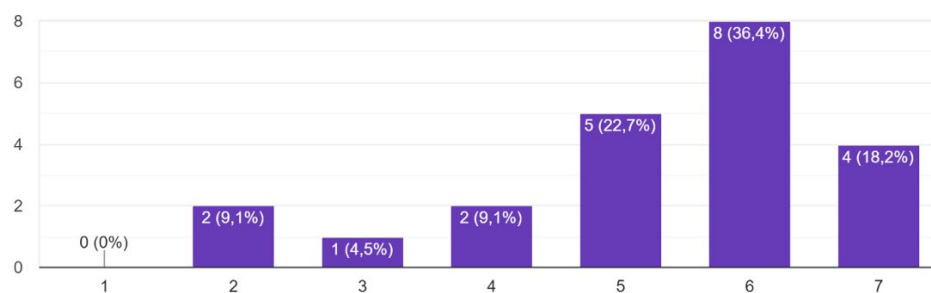
22 απαντήσεις



2

My interaction with the AR-Viewer application is clear and understandable.

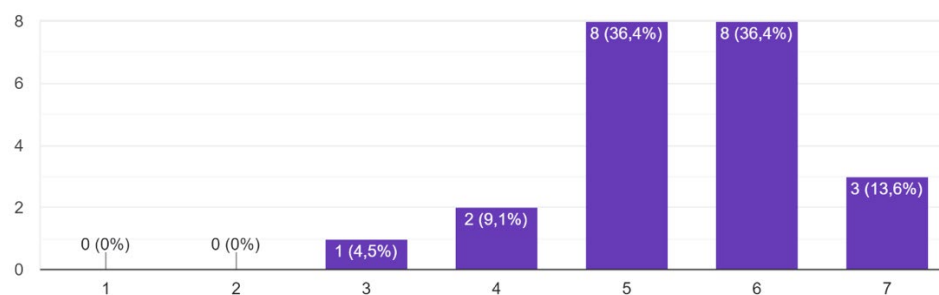
22 απαντήσεις



3

I find the AR-Viewer easy to use.

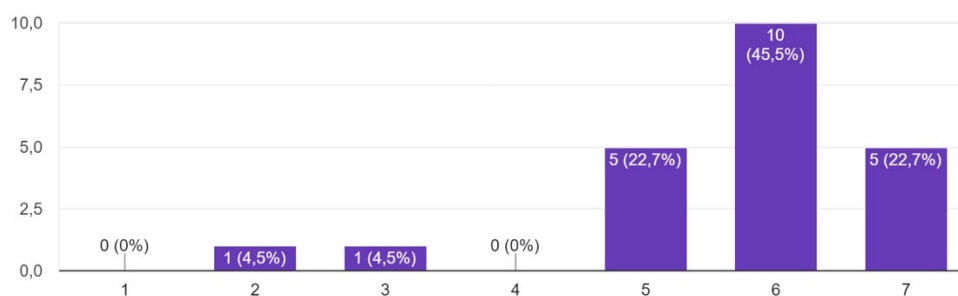
22 απαντήσεις



4

It is easy for me to become skilled at using the AR-Viewer.

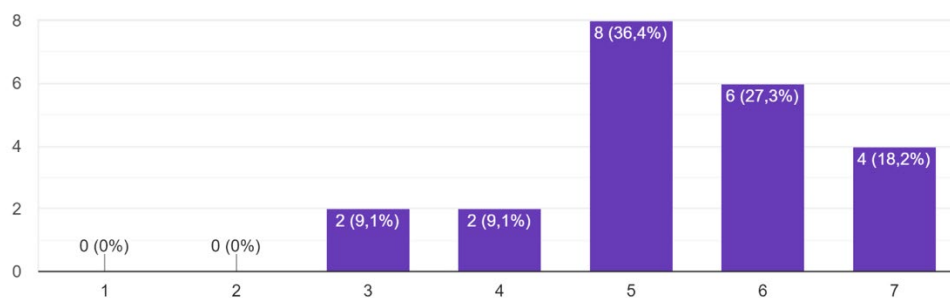
22 απαντήσεις



5

The AR-Viewer does not require mental effort.

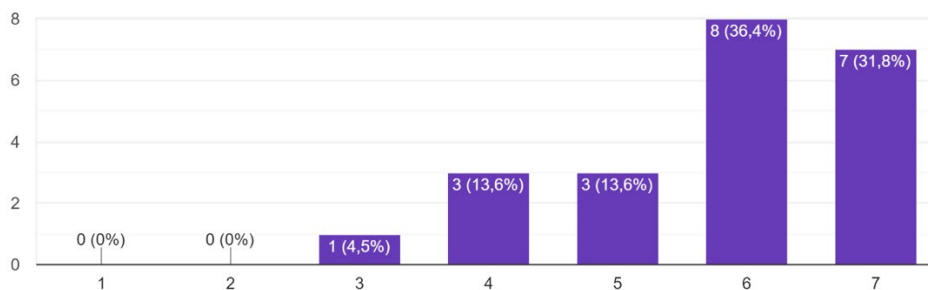
22 απαντήσεις



6

Using the AR-Viewer application would improve my learning performance.

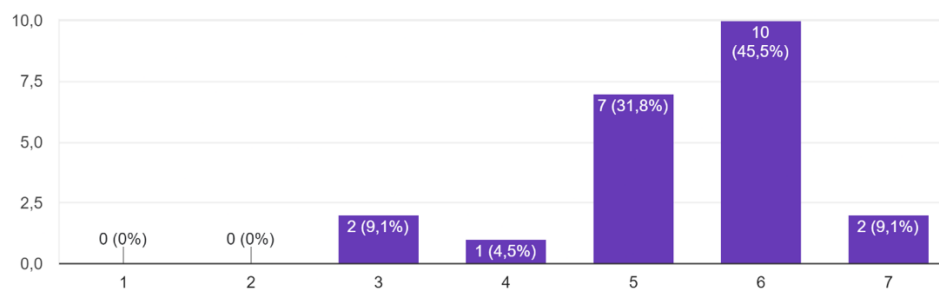
22 απαντήσεις



7

Using the AR-Viewer increases my chances of achieving knowledge that is important to me.

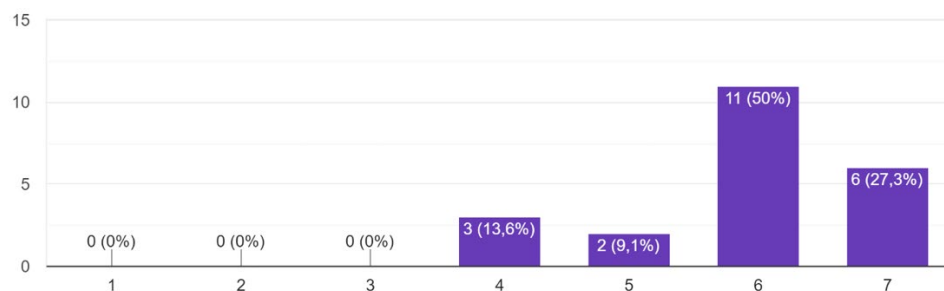
22 απαντήσεις



8

Using the AR-Viewer would allow me to accomplish learning tasks more quickly.

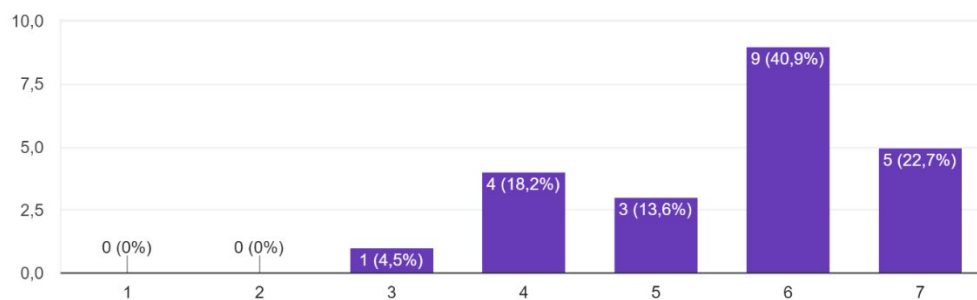
22 απαντήσεις



9

Using the AR-Viewer would enhance my effectiveness in learning.

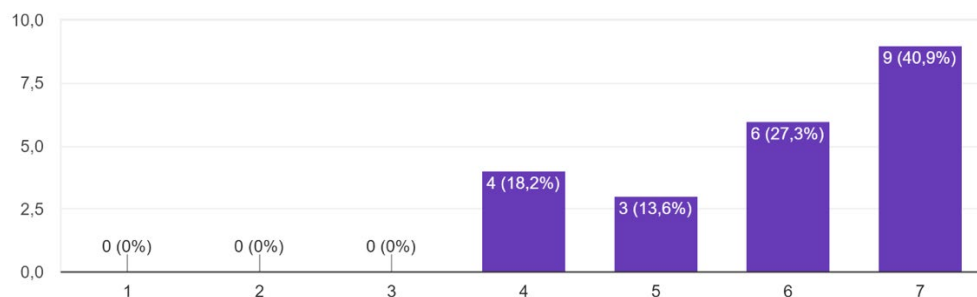
22 απαντήσεις



10

I find using the AR-Viewer enjoyable.

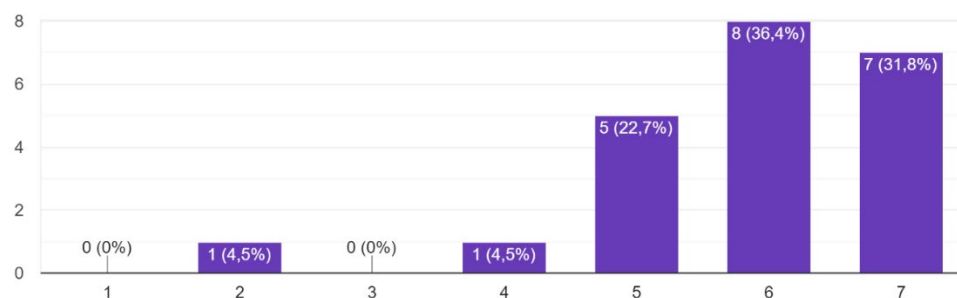
22 απαντήσεις



11

The actual process of using the AR-Viewer is pleasant.

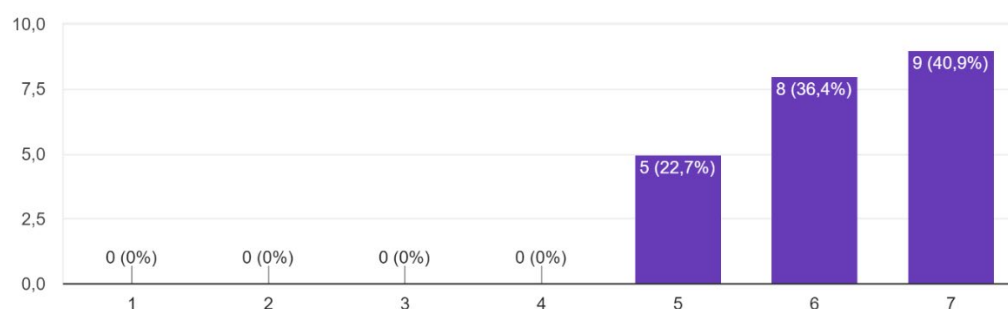
22 απαντήσεις



12

I have fun using the AR-Viewer.

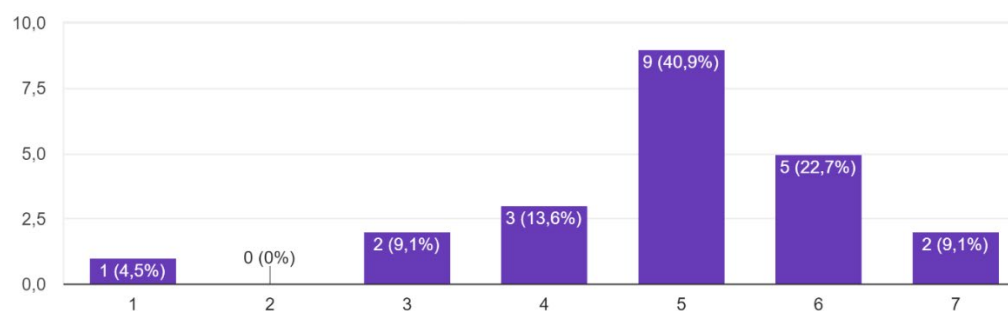
22 απαντήσεις



13

I am confident of using the AR-Viewer even if there is no one around to show me how to do it.

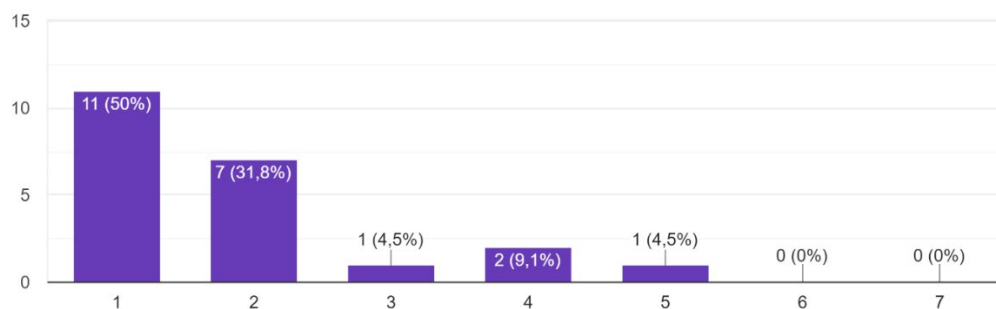
22 απαντήσεις



14

I think using the AR-Viewer puts my privacy at risk.

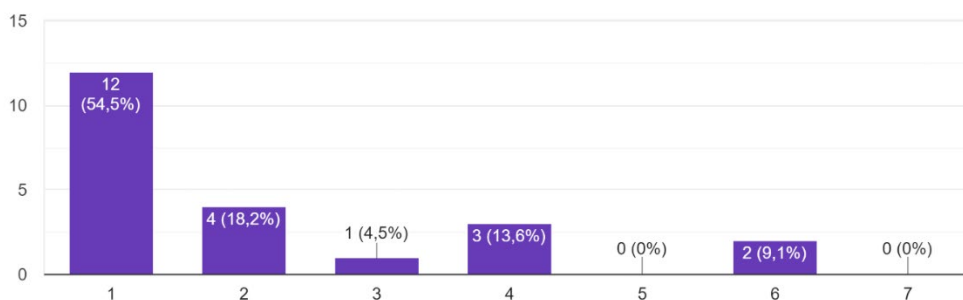
22 απαντήσεις



15

Using the AR-Viewer exposes me to an overall risk.

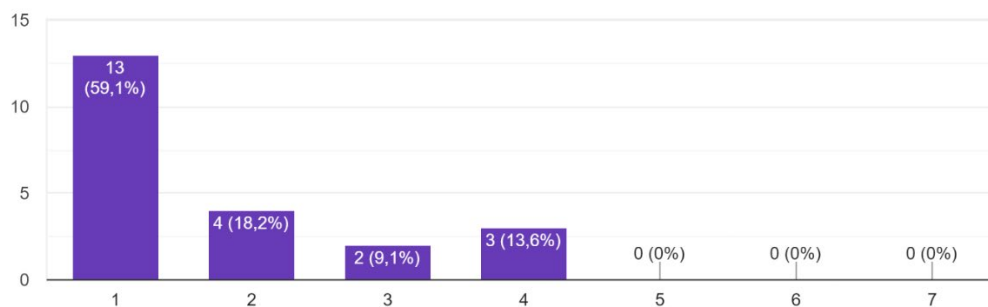
22 απαντήσεις



16

Using the AR-Viewer will not fit well with my self-image.

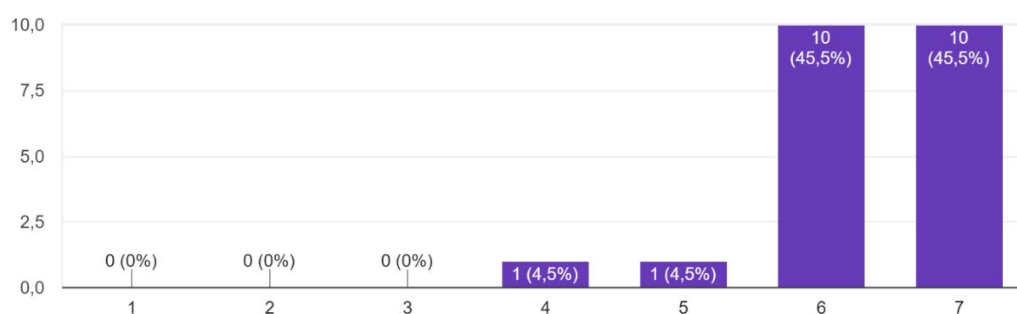
22 απαντήσεις



17

Using the AR-Viewer is a good idea.

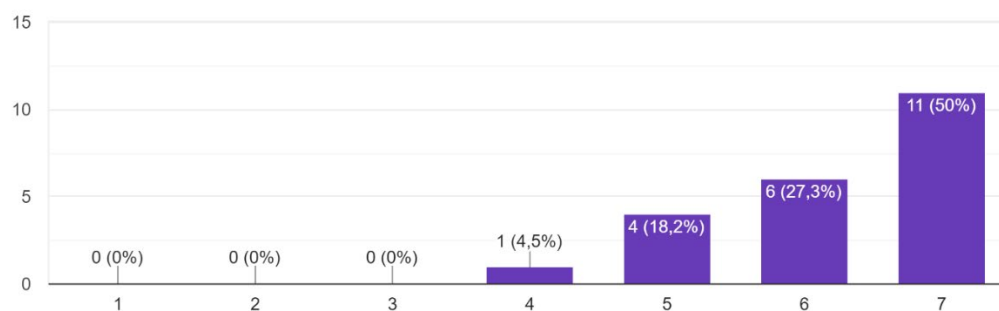
22 απαντήσεις



18

I would like to use the AR-Viewer.

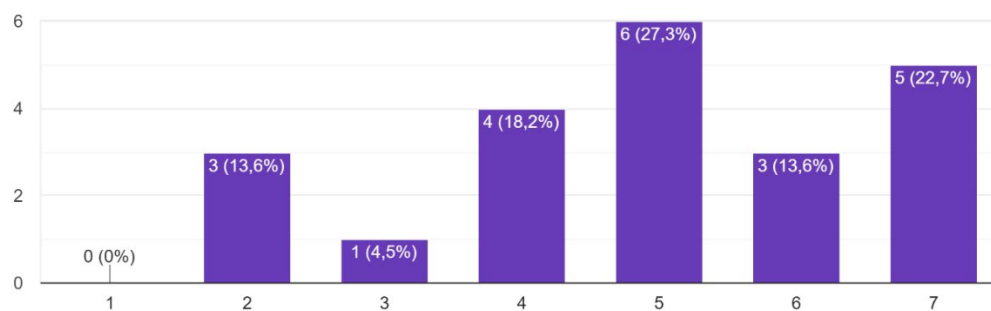
22 απαντήσεις



19

AR-Viewer users have more prestige.

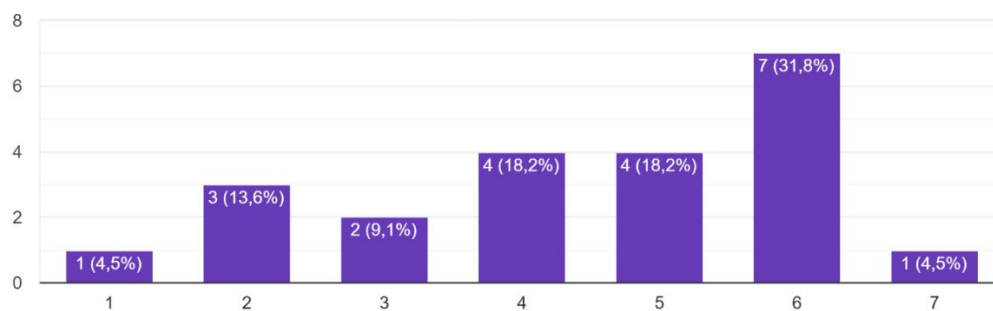
22 απαντήσεις



20

Using the AR-Viewer is a status symbol.

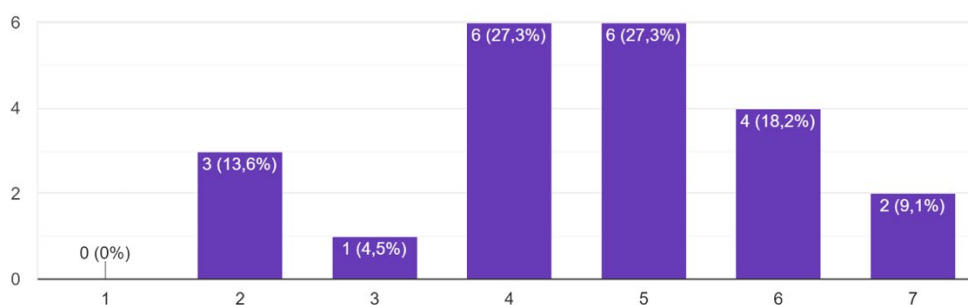
22 απαντήσεις



21

AR-Viewer users have a higher profile.

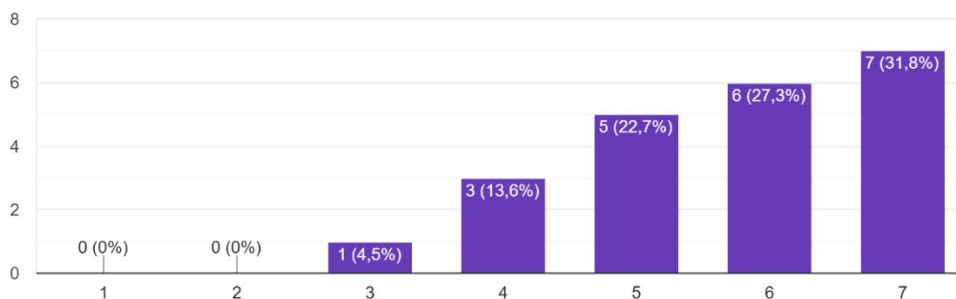
22 απαντήσεις



22

The AR-Viewer could increase my productivity.

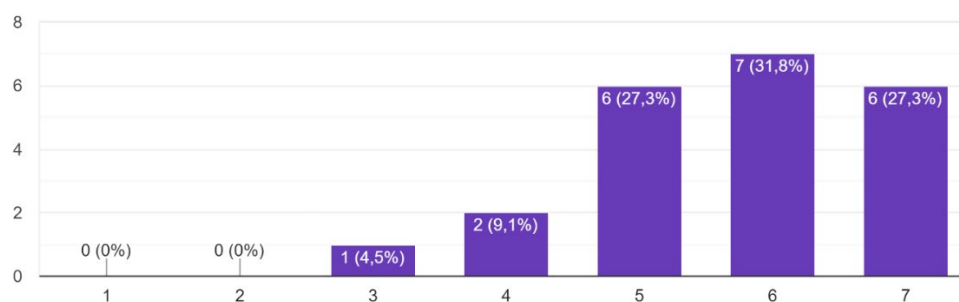
22 απαντήσεις



23

The AR-Viewer could improve my job performance.

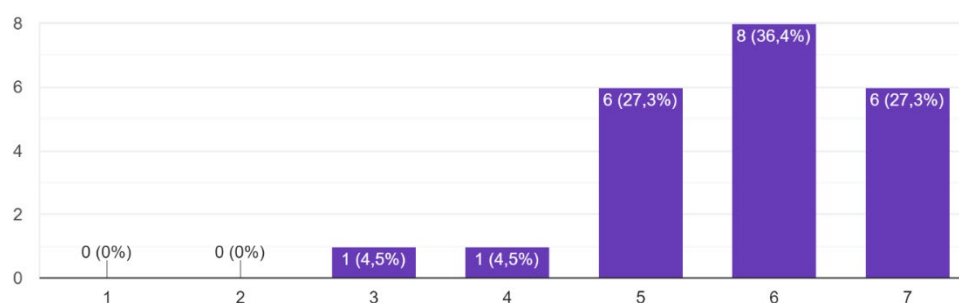
22 απαντήσεις



24

The AR-Viewer could enhance effectiveness in the job.

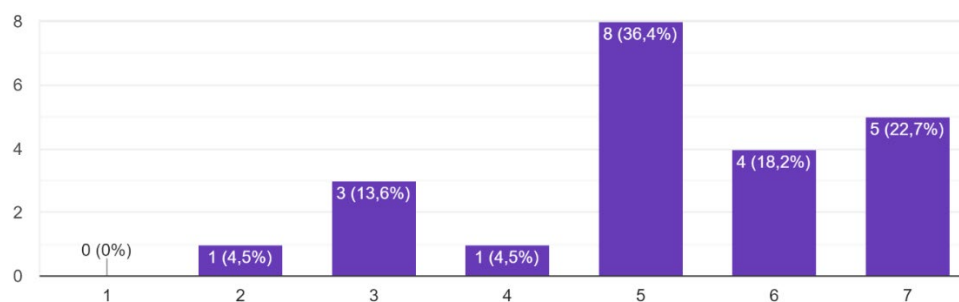
22 απαντήσεις



25

I have the resources necessary to use the AR-Viewer application.

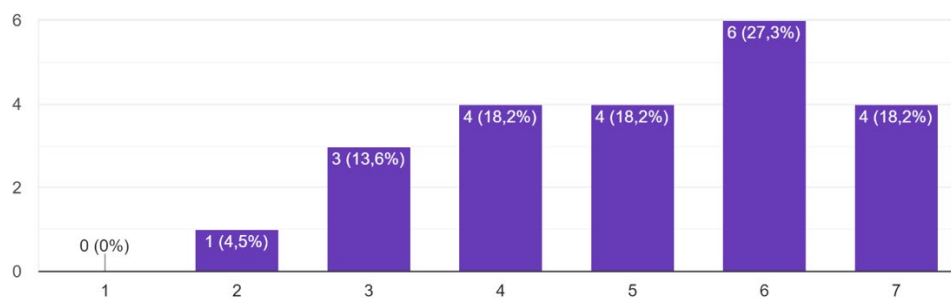
22 απαντήσεις



26

Support from an individual or service is available when problems are encountered with the AR-Viewer technology.

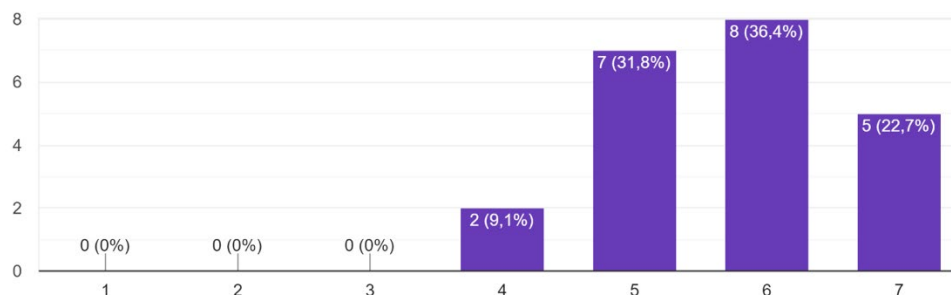
22 απαντήσεις



27

Assuming I had access to the AR-Viewer, I intend to use it.

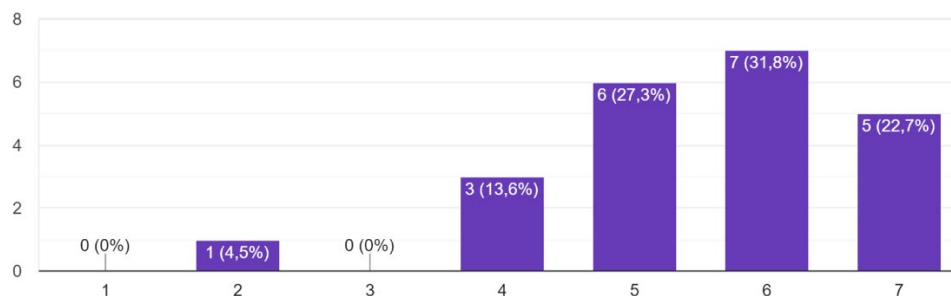
22 απαντήσεις



28

Given that I had access to the AR-Viewer, I predict that I would use it.

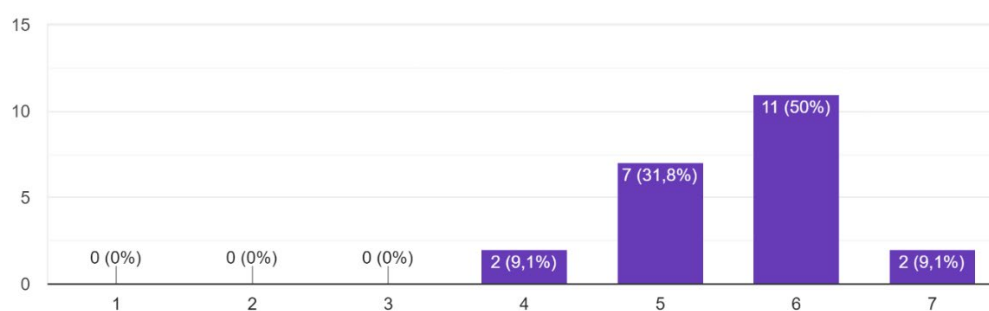
22 απαντήσεις



29

I plan to use the AR-Viewer in the future.

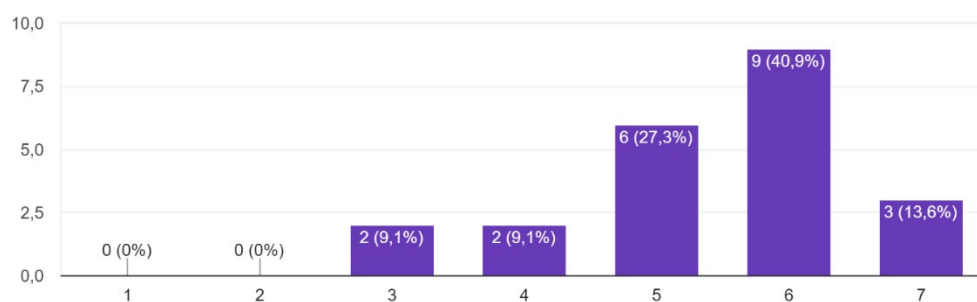
22 απαντήσεις



30

I intend to use the AR-Viewer again during the renovation period.

22 απαντήσεις



31

Overall, I was satisfied with the AR-Viewer.

22 απαντήσεις

