

Training Evaluation Report

EINSTEIN II INTRODUCTORY TRAINING IN THERMAL ENERGY AUDITING

Supplementary Report Additional introductory training courses in 2012

Deliverable 2.2a

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EINSTEIN II

**EXPERT SYSTEM FOR AN INTELLIGENT SUPPLY OF THERMAL ENERGY IN
INDUSTRY AND OTHER LARGE SCALE APPLICATIONS**

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INTRODUCTION

As part of the Intelligent Energy Europe funded project, EINSTEIN II, a series of training courses in thermal energy auditing was undertaken in the Spring of 2011, followed by advanced training courses in the second half of 2011. In addition to this, 4 additional introductory training courses were held during 2012 in Paris, Madrid, Barcelona and Newcastle. The feedback from these training courses is set out in this document.

This report is an addendum to Deliverable 2.2 which contained the feedback from the introductory training courses carried out in 2011.

FRANCE (Paris)

1.1 ORGANISATIONAL ISSUES

This section outlines background information on the nature of participants.

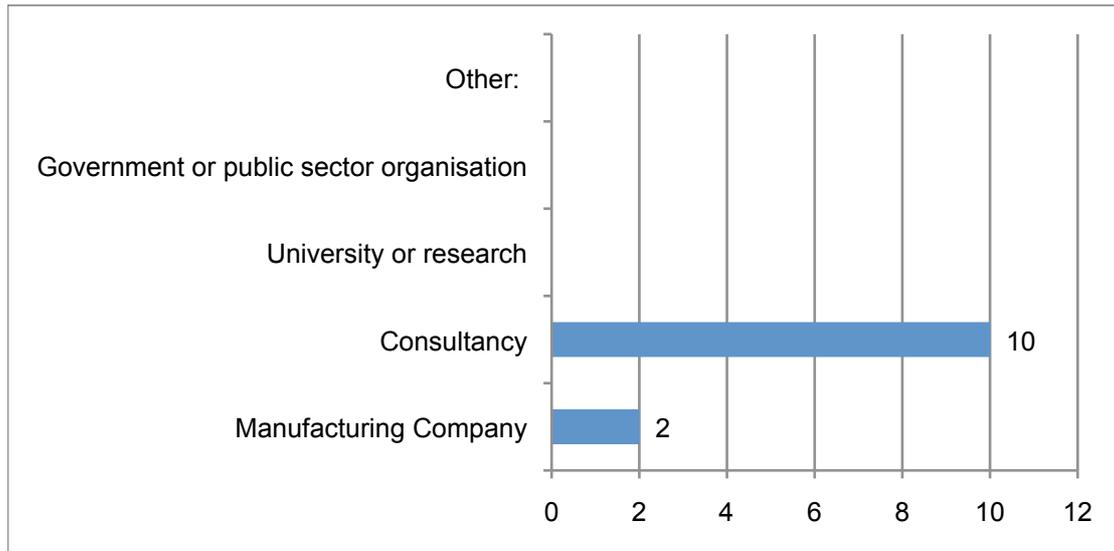


Figure 1. Sectors represented at the training event.

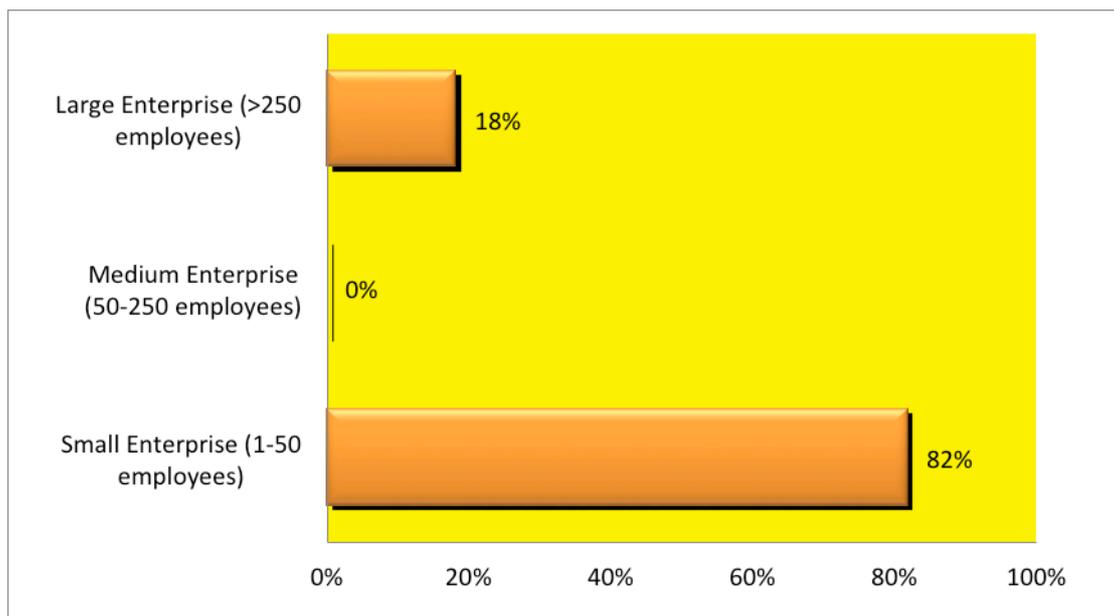


Figure 2. Structure of participants

Table 1. Current role of participant in their company or organisation

Consultant
Trainee of purchase service with regard to a cogeneration project
Responsible for renewable energy and masters in energy
Manager/Auditor ISO 50001
Consulting engineer and manager
Independent environmental consultant
Energy efficiency project manager

1.2 GENERAL ISSUES

This section provides information as to whether participants attended earlier EINSTEIN courses and some general overall feedback on the course.

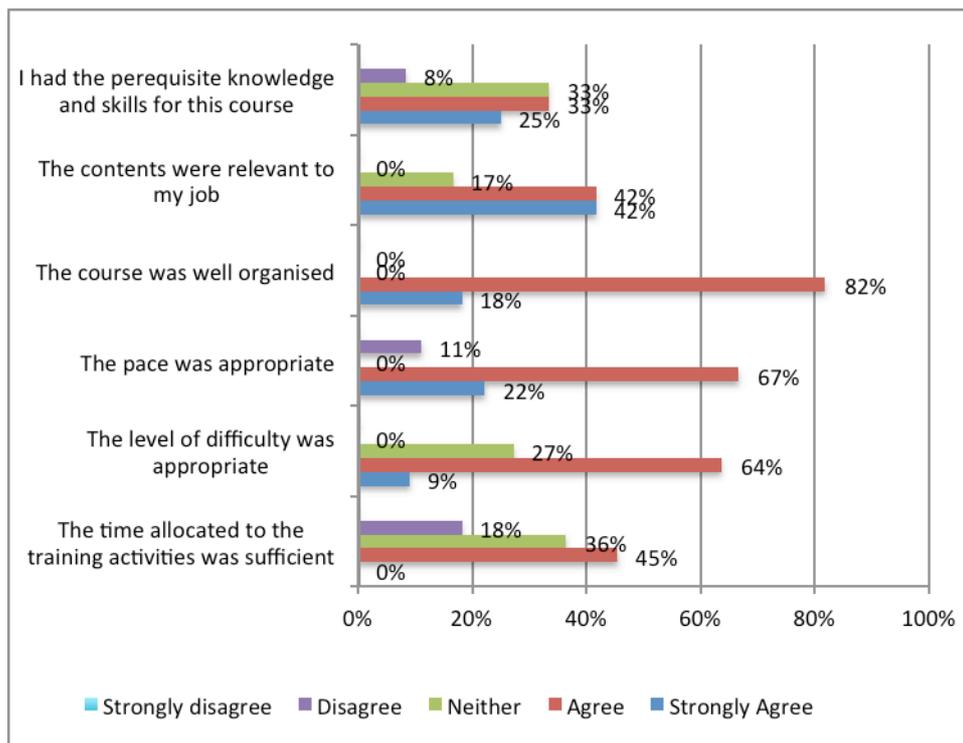


Figure 3. Questionnaire results on general issues

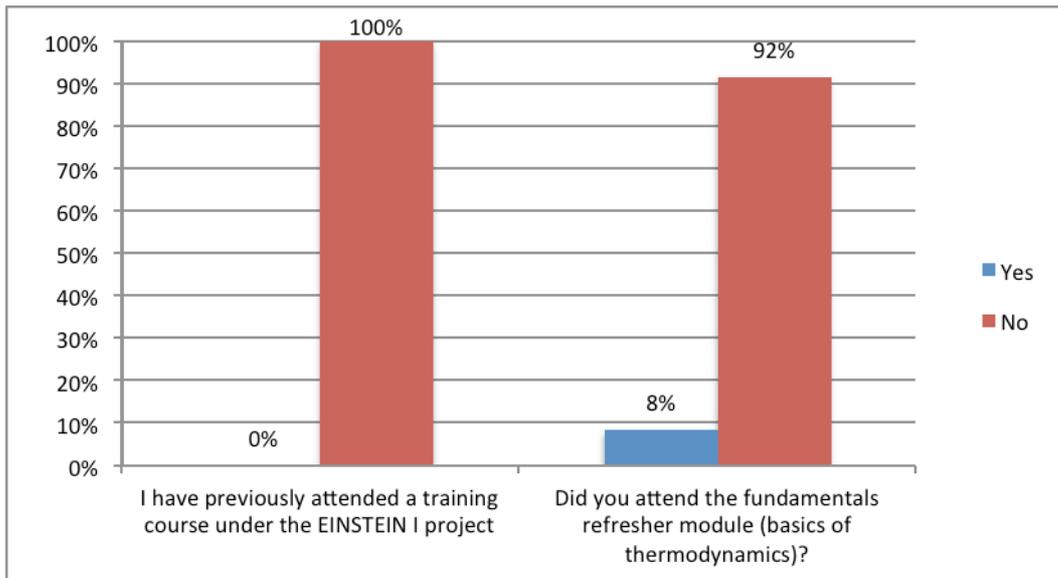


Figure 4. Previous attendance of EINSTEIN courses. (Note: answer of yes to the second question is likely in error, as this refresher option was not part of the training in 2012).

1.3 TRAINING MODULES, MATERIALS AND TRAINERS

This section provides feedback regarding the training materials and the trainers.

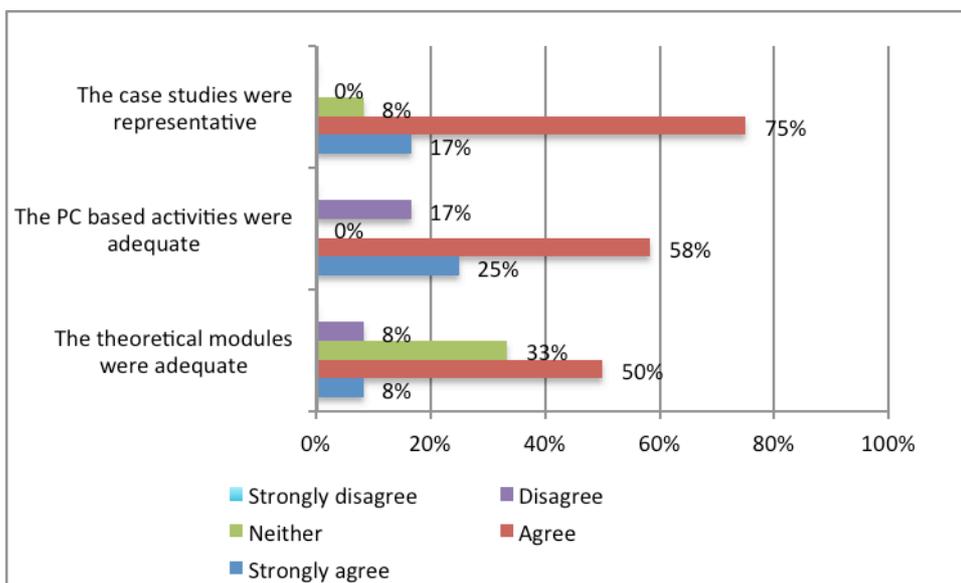


Figure 5. Questionnaire results on training modules, materials and trainers.

Suggestions for improvement of the course

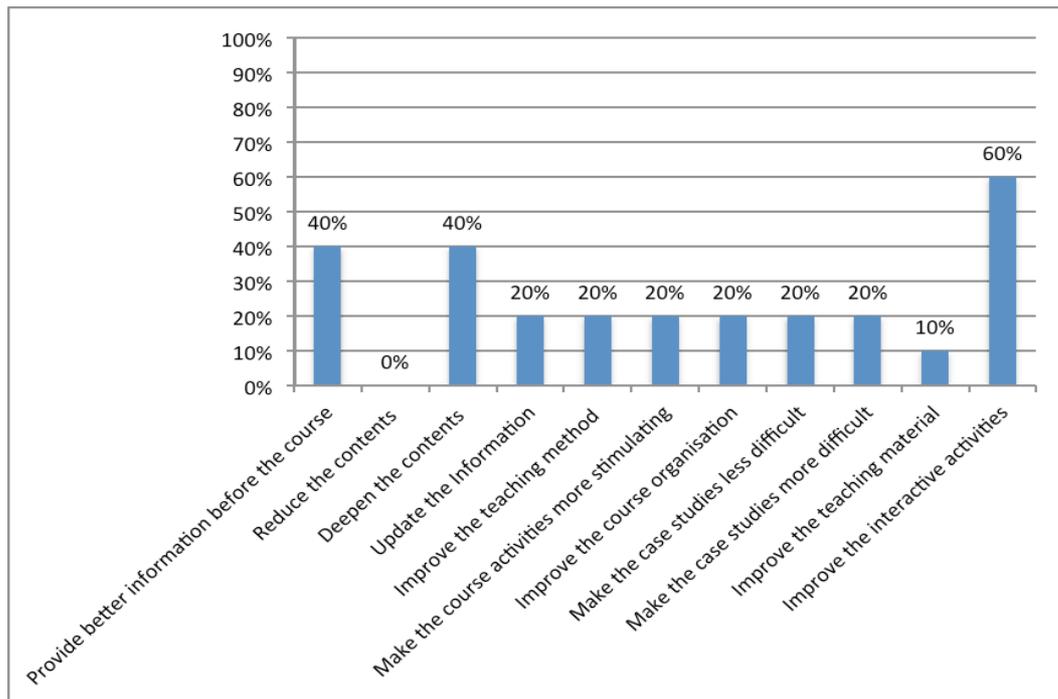


Figure 6. Suggestions for improvement of the course

Table 2. List of comments for suggestions by attendees to improve the course

<p>Might consider advising the chapters of the manual to look at corresponding to the presentations during the day. + A database of weather data "Drag & drop" menu for the schematic</p> <p>A follow up after the training - project tutorial</p> <p>1) Too little practice and the pedagogical approach, Use it logically to allow one to do an exercise 2) Revise the type of participants to render more homogeneous.</p> <p>The principal fault is the structure of the course: the mornings were too long, while the afternoons were very short.</p> <p>Start studying the basics to familiarise with the ergonomics of the software.</p> <p>Less slides and more exercises</p>

1.4 THE EINSTEIN TOOL

This section deals with feedback on various aspects of the EINSTEIN tool itself.

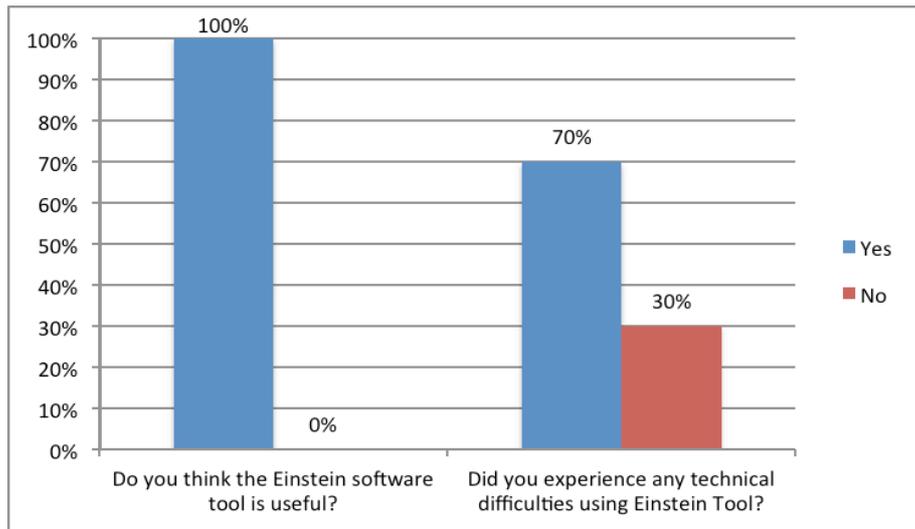


Figure 7. Participants' opinion on the usefulness of the EINSTEIN tool

Table 3. Participants' opinion as to why the EINSTEIN tool is useful

<p>It permits having a framework for energy</p> <p>Yes, for the thermal energy, but it is too limited in terms of process integration.</p> <p>It synthesises and represents the process in terms of its thermal energy . More reserved on the use of the simulation of alternatives.</p> <p>It allows thermal processes to be modelled and aids in the realisation of a thermal energy optimisation audit. It is particularly interesting for modelling the present state.</p> <p>The approach to the Pinch methodology.</p> <p>Analyses for the client and gives an appraisal of the possible solutions.</p> <p>Its responds to an economic problem for industrial processes.</p> <p>Yes, for the evaluation of thermodynamic, multiple sources of energy (production, electricity) and for the maintenance of the "cold" source. Recovery for a dynamic -.</p>

Table 4. Comments from the attendees relating to the technical difficulties they encountered while using the EINSTEIN tool.

<p>No familiarity with the utilities</p> <p>The consistency check is not easy to understand (practical!)</p> <p>Difficult interface – demands a certain amount of time to adapt to it</p> <p>It has the logic of a programmer and not of the user – needs to be ergonomic.</p> <p>It does not specialise in the field of process energy optimisation. It takes time to time to get to grips with the software.</p> <p>...the technical terms in French and the thermodynamic and philosophy ...</p> <p>Could be a little clearer</p>

- The interface is not at all ergonomic.
 - Technical difficulties (equations behind the software).

The automatic concept of the heat exchangers.

More on the initiation stage to use EINSTEIN.

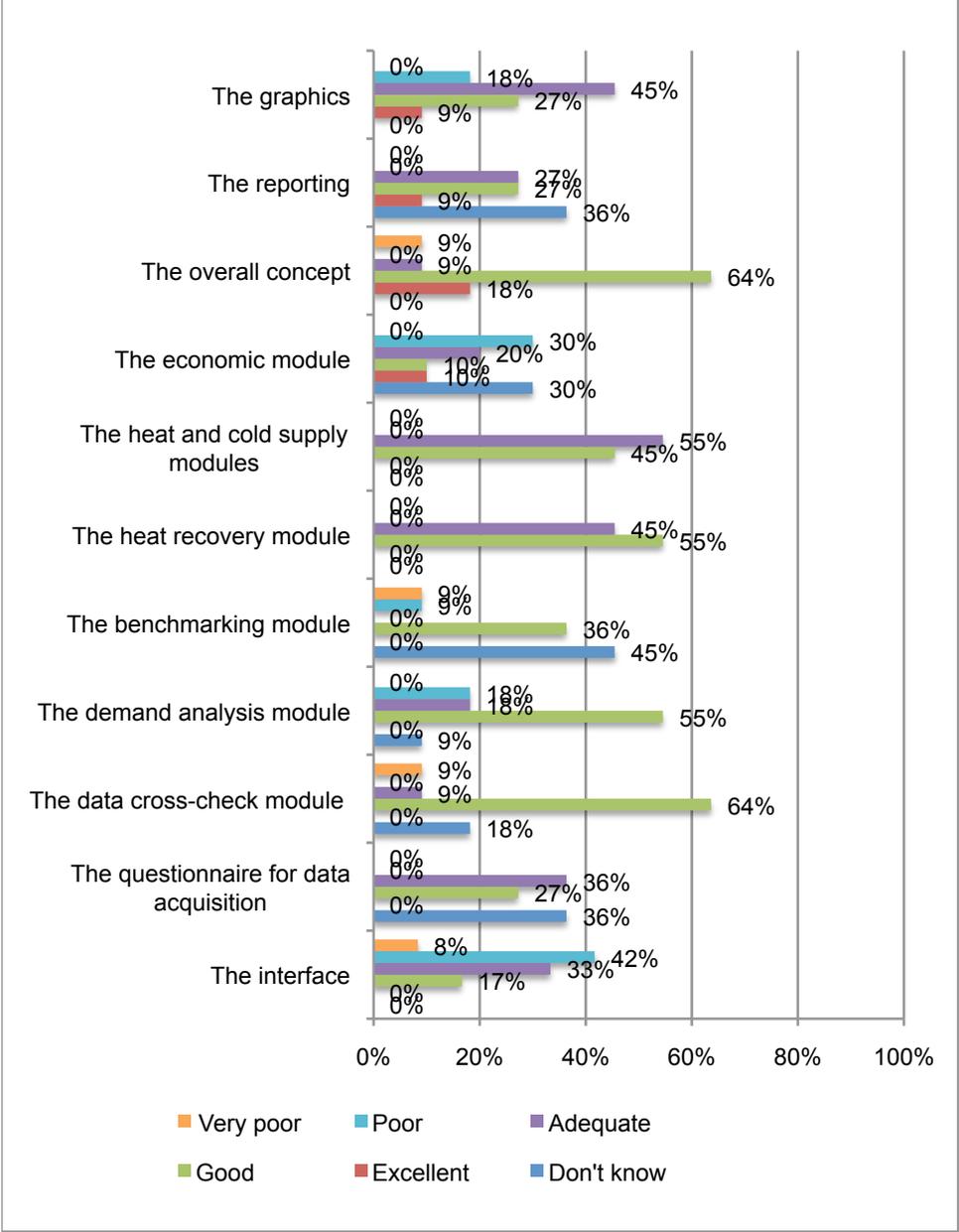


Figure 8. Participants' ratings of parts of the EINSTEIN tool

Table 5. Suggestions for improvement of the EINSTEIN tool

More ergonomic, reduced calculation time; some manipulations are not intuitive or appropriate. Can put the fields of the software in a different colour!

Table 6. 'Which important feature and/or functions are missing?'

The possibility to consider several fuels at the same time (KLIMAATIV) in the same boiler.
 The logic for entering data
 Make it usable for electric processes
 Exchanger cascade
 Shared database?
 Examples to use where electricity provides heat.

1.5 TRAINING RESULTS

This section deals with the outcome of the training for the individual trainees.

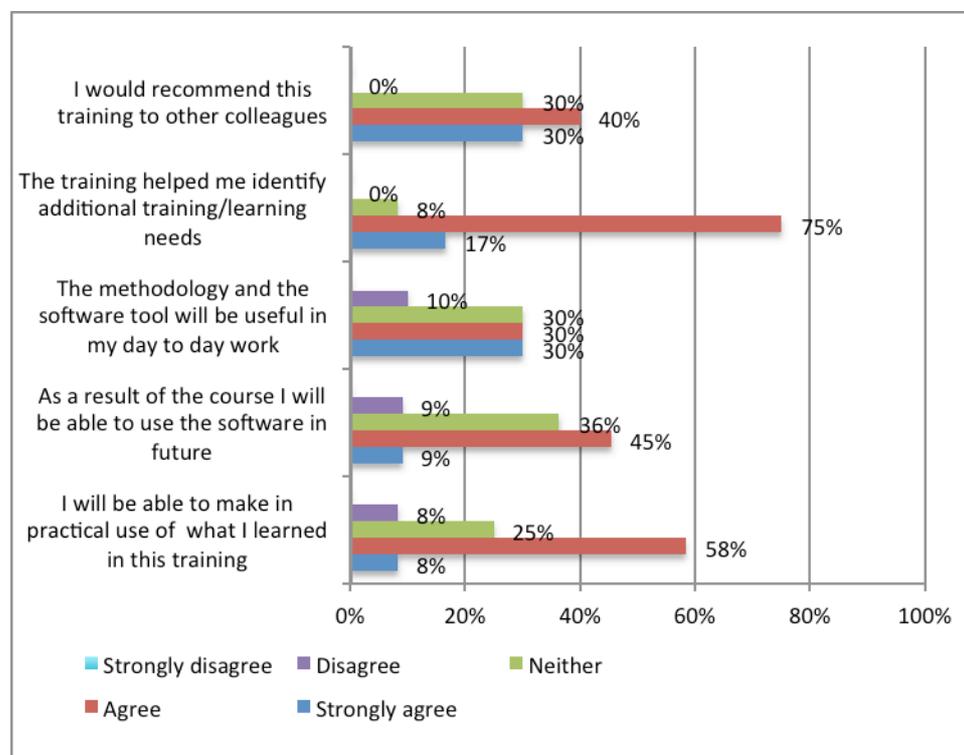


Figure 9. Results of EINSTEIN training course

Table 7. 'What was least valuable about this training?'

<p>Over 3 days, all has been helpful.</p> <p>The theory.</p> <p>Very complicated to see, too complicated..... for recovery of information.</p> <p>Nothing.</p> <p>Simplify the circulation through the menus , perhaps masking the unnesscessary steps.</p>

Table 8. 'What was most valuable about this training?'

<p>The practice on the software.</p> <p>The exercises.</p> <p>Not enough practice. Perhaps more training and utilisation of the software would punctuate the theoretical aspect. 1st day is a little long.</p> <p>Getting familiar with the software.</p> <p>The concept Is not made clear.</p> <p>- notion of flux not clear (material, energy)</p> <p>Getting a good appreciation of the software and its capacity.</p> <p>Getting a good appreciation of the limits of application</p>

Table 9. Other comments

<p>.....For my part I specialise in thermal energy analysis, not preparation for an ISO 50001 audit. However, the approach is very good to prepare for an ISO 50001 audit, but it is not logical in its use.</p> <p>Development of the user interface should follow.</p> <p>The software is complicated to get used to.....is not optimal.</p> <p>Thanks to the trainers Alex and Cristina for their work.</p>

1.6 FEEDBACK FROM TRAINING ORGANISERS AND TRAINERS

Table 10. Comments from the course trainers (feedback to trainers from trainees)

Methodology not easy to understand – the user has to adopt the view of the developer
Thought that EINSTEIN would be an added value for ISO 50001 audits, which is not completely the case
Some documentation/explanations on how and what data to enter should be given

Main difficulty in France: term of auditor is very specific for experts accompanying ISO 9001, ISO 50001 management systems! Communications in FR should be conducted differently, focus on the message that the tool is meant for consulting, technical, firms.
Tool goes rather in detail in a specific domain – general good impression
Rather happy about the result, first part of the tool (energy assessment) most interesting
First part of the tool much too difficult, preferred the second part on the alternatives
Ergonomics of the tool should be adapted – too much switching between several identical fields – tool could be simplified in such a way that identical data are taken up repeatedly, and if there is a need to change the data, then the user can do so.
Maybe less slides during the training and more tool use
Would be a need for a reference person, in case of problems
Heat recovery tool is not sufficiently optimised, other available tools are more helpful
EINSTEIN an added value for the clients - are going to use the tool in the future
CCheck is really causing problems

SPAIN (Madrid)

2.1 ORGANISATIONAL ISSUES

This section outlines background information on the nature of participants.

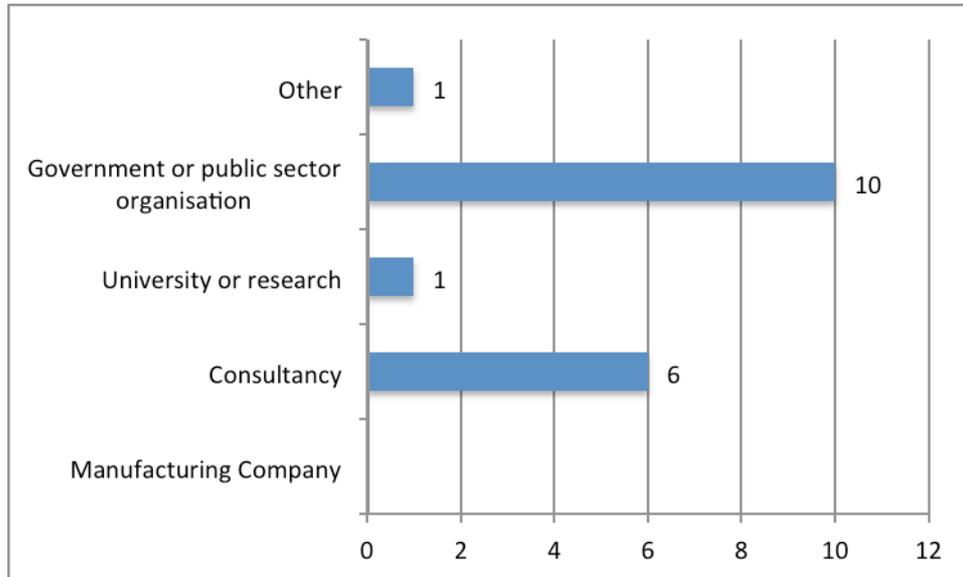


Figure 10. Sectors represented at the training event

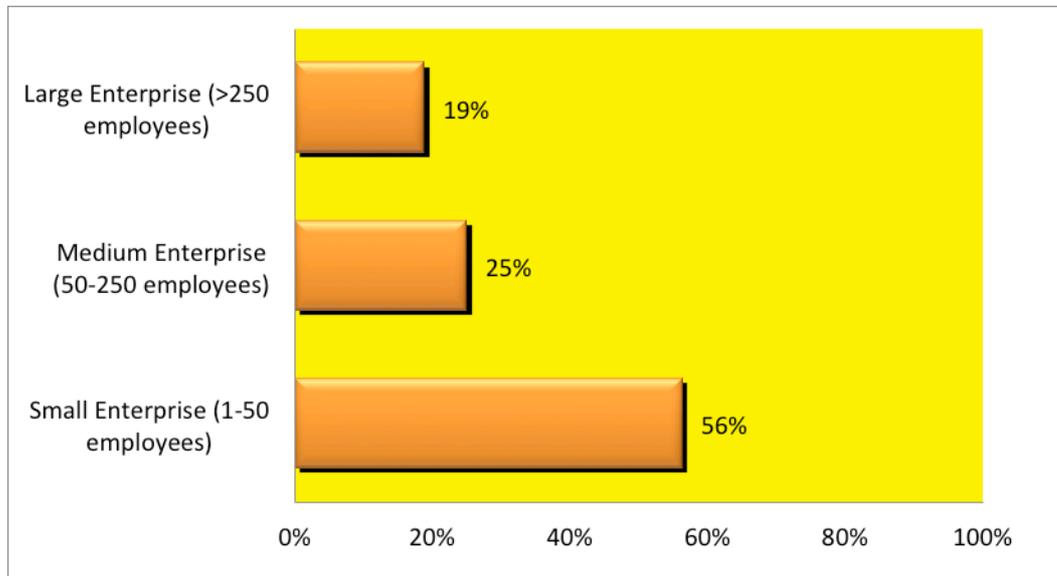


Figure 11. Structure of participants

Table 11. Current role of participants in their company or organisation

Occupation	Number
Technical Manager	1
Investigator	2
Technical	1
Maintenance Technician	1
Manager	2
Maintenance Manager	1
Project Engineer	2
Energy saving technical	1
Administrator	1
Adviser	1
Technical designer	1
Consultant	2
Quality, Environment and Prevention of occupational hazards Manager	1

2.2 GENERAL ISSUES

This section provides information as to whether participants attended earlier EINSTEIN courses and some general overall feedback on the course.

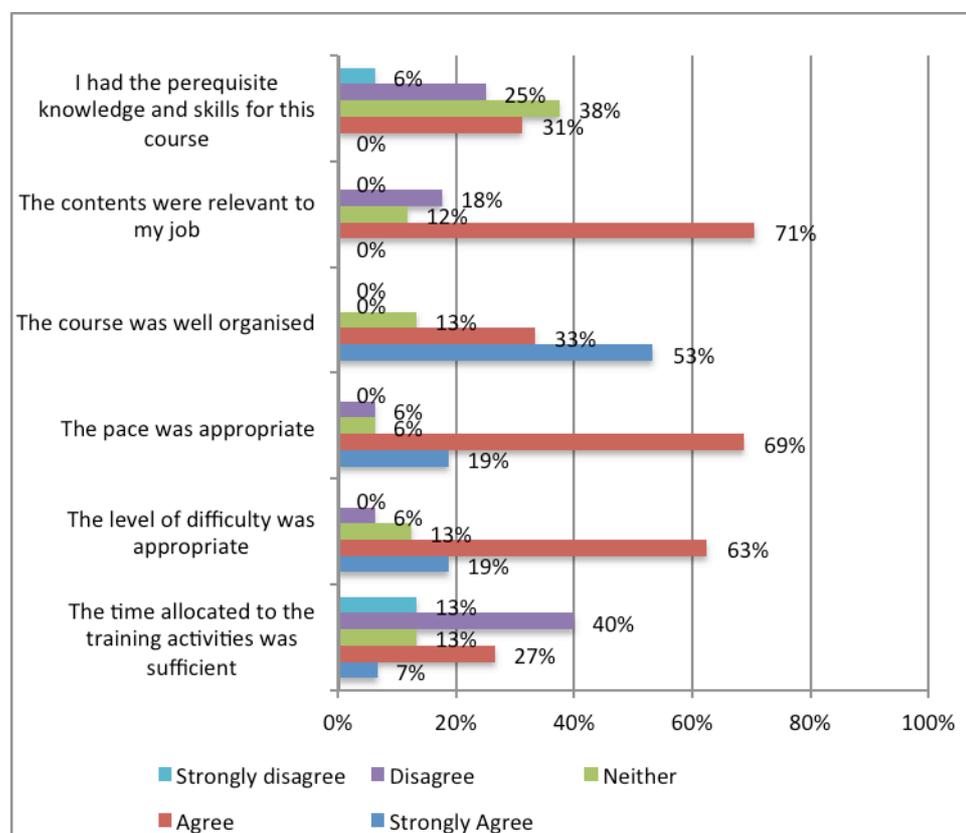


Figure 12. Questionnaire results on general issues.

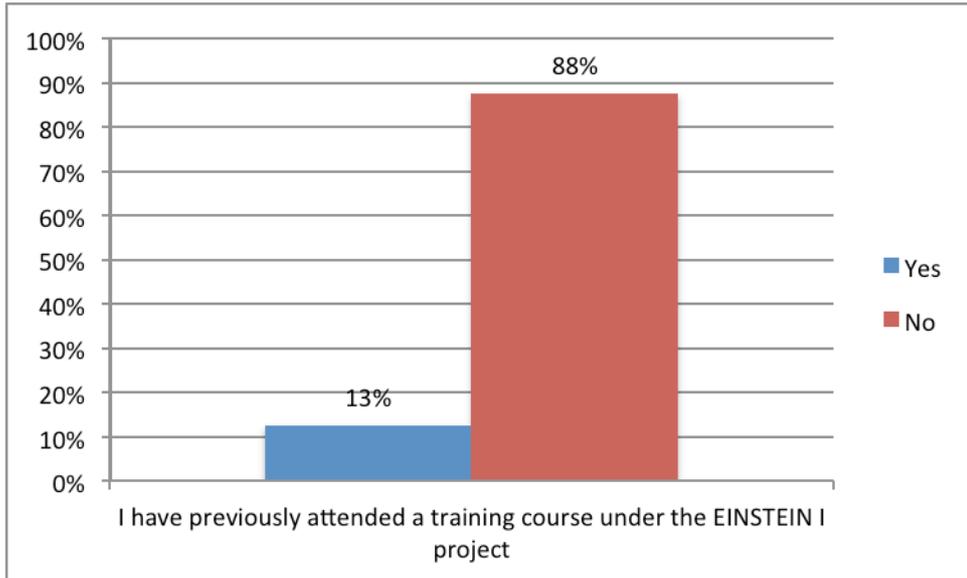


Figure 13. Previous attendance of EINSTEIN courses.

2.3 TRAINING MODULES, MATERIALS AND TRAINERS

This section provides feedback regarding the training materials and the trainers.

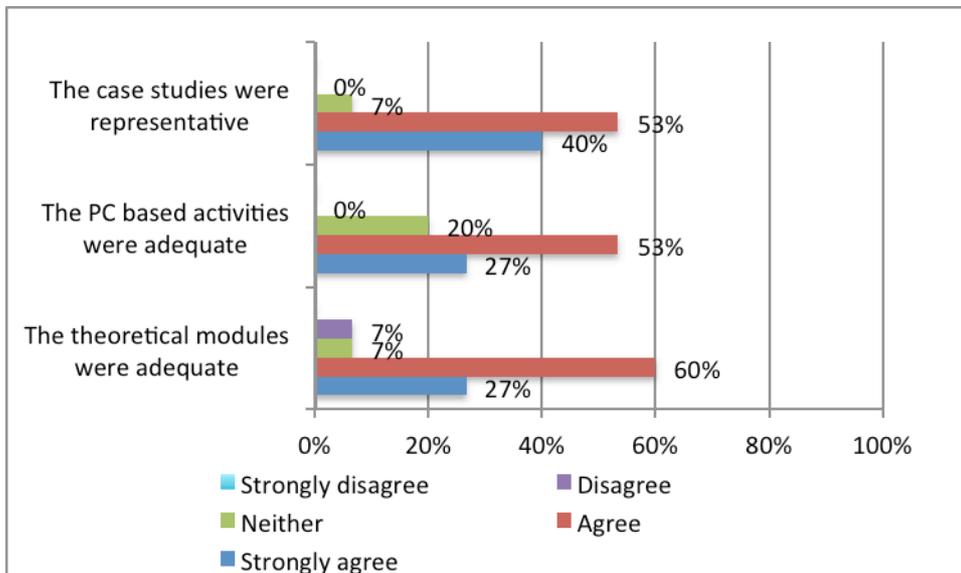


Figure 14. Questionnaire results on training modules, material and trainers.

Suggestions for improvement of the course

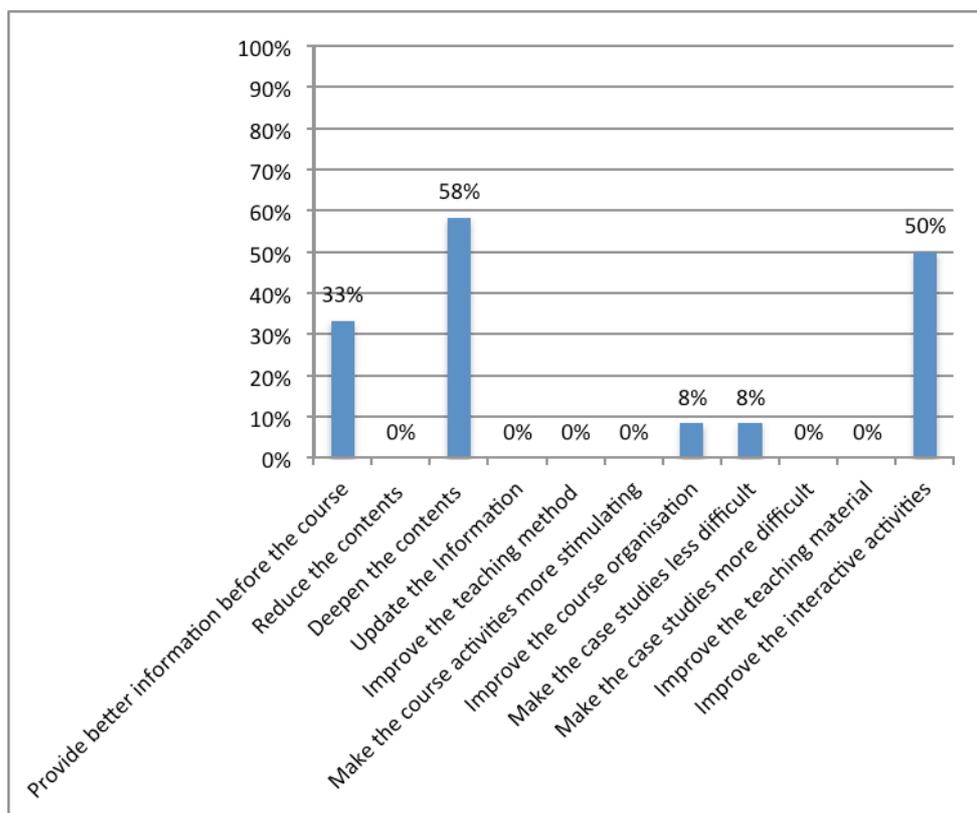


Figure 15. Suggestions for improvement of the course.

Table 12. List of comments or suggestions by attendees to improve the course.

Comments	No. of opinions
Schematic summary of the instruction manual, a quick guide	1
Cases performed or solved exercises	2
More time for training	3
Develop a real, mentored project	1

2.4 THE EINSTEIN TOOL

This section deals with feedback on various aspects of the EINSTEIN tool itself.

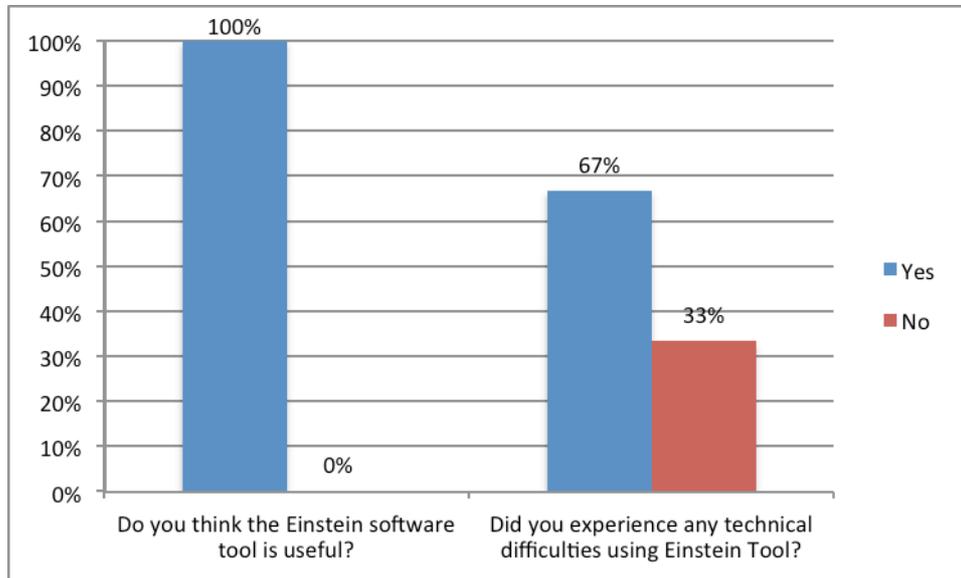


Figure 16. Participants' opinion on the usefulness of the EINSTEIN tool.

Table 13. Participants' opinion as to why the EINSTEIN tool is useful.

Comments	No. of opinions
It offers quick and reliable improvements in the facility or the study process	2
It addresses energy efficiency in industry and helps make decisions to save energy	1
Because of its versatility and methodology - proposed Energy Savings	1
Much future	1
It helps, but the tool needs be developed further to give the results validity	1
It is convenient to use and simplifies the development of the audit	1
Flash estimates for pre-audits and audits	1
Process improvement cost savings	1
Increase energy efficiency with minimum cost	1
Used to optimise and visualise the possibilities of improving processes and industries	1
Very technical and free	1

Quick tool for assessing potential savings	1
--------------------------------------------	---

Table 14. Comments from the attendees relating to the technical difficulties they encountered while using the EINSTEIN tool.

Comments
Computer management
Spanish Guide
The software version is beta and still have to improve some things
Thermodynamic knowledge
Management is difficult if you do not have the necessary training
Software Problems. Collection and data entry unintuitive
Data inconsistency
Overview of possible applications
Translation and assimilation of concepts derived from the translation
Sometimes unstable

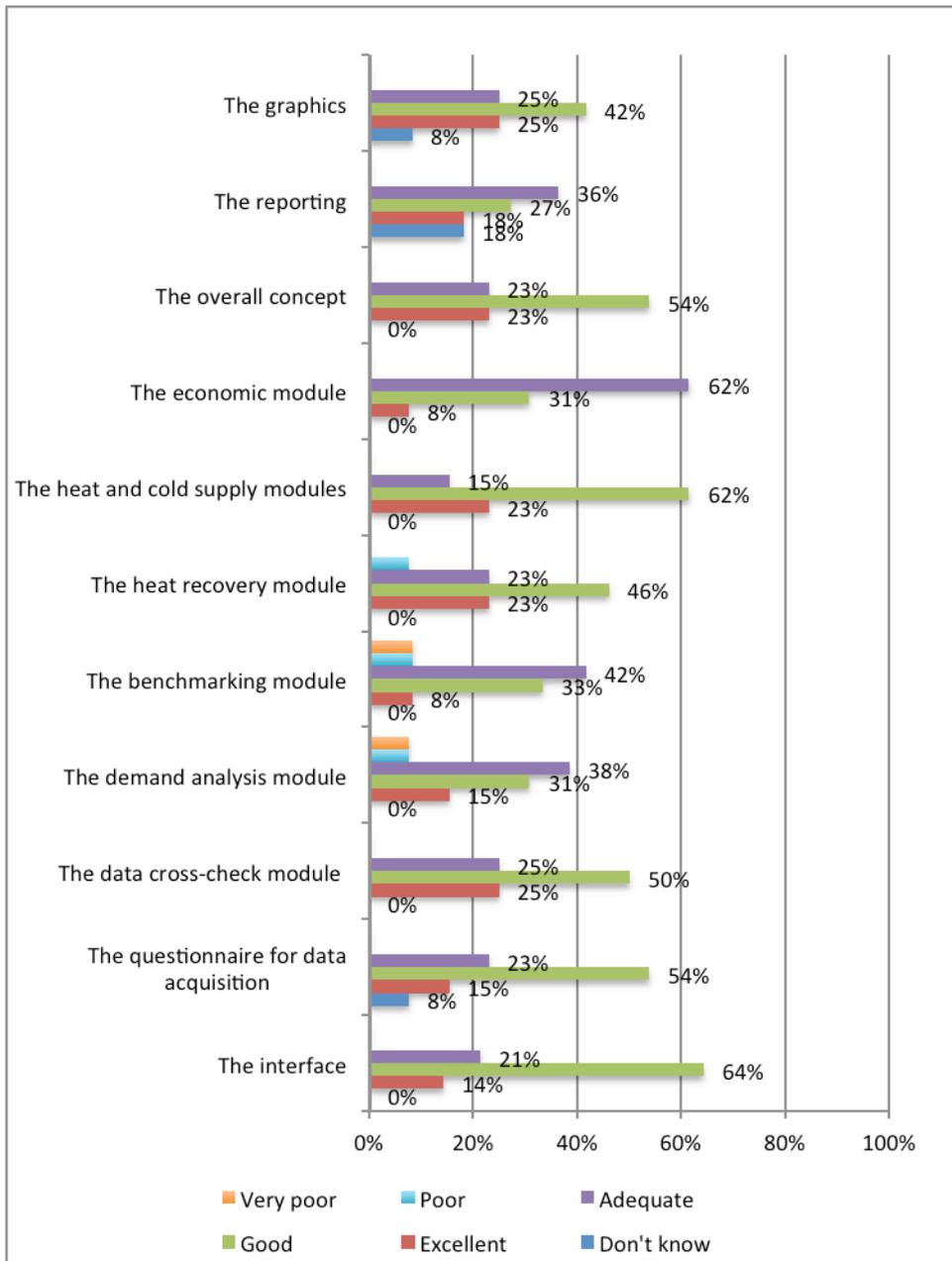


Figure 17. Participants' ratings of the parts of the EINSTEIN tool

Table 15. Suggestions for improvement of the EINSTEIN tool

Comments
Not enough experience using the tool to say

Table 16. 'Which important feature and/or functions are missing?'

Comments	No. of opinions
Schedule and temporal analysis	2
I do not have enough experience to comment	2

2.5 TRAINING RESULTS

This section deals with the outcome of the training for the individual trainees.

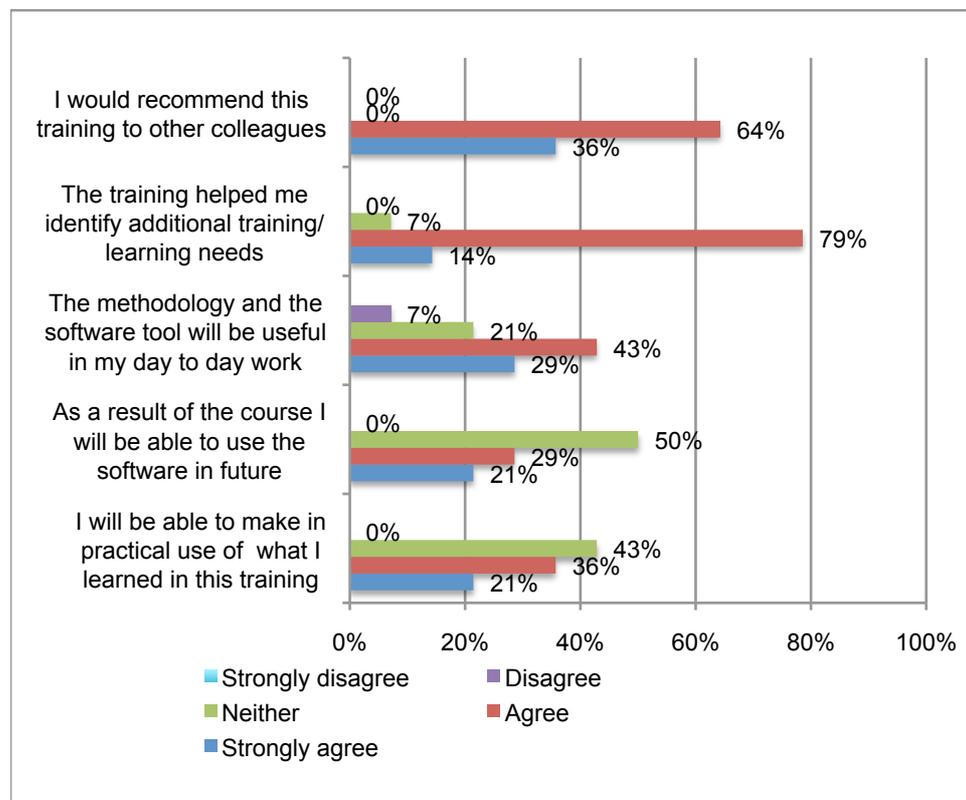


Figure 18. Results of EINSTEIN training course

Table 17. 'What was least valuable about this training?'

Comments	No. of opinions
Lack of time	6
Too short and very fast	1
Too few examples	2
Management data in the program	1
Lack of support from a tutor after completion of the course	1
It would be interesting to perform: an audit course tutored and advanced deeper into the knowledge of Einstein	1

Table 18. 'What was most valuable about this training?'

Comments
The Course and the teachers
Great potential for application
It offers a high potential prospect
The preparation of teachers
Project with good future prospects
Very well organized and explained
The organisation
The provision and availability of teachers

Table 19. Other comments

Comments
Thanks to the teachers; Hans and Cristina
Be recommended to resolve technical support questions and do a complete project
Interesting to do the advanced course in a short time
Extended training is needed to use it correctly and apply it to workplace

2.6 FEEDBACK FROM TRAINING ORGANISERS AND TRAINERS

Table 20. Comments from the training organisers regarding the course

The course organisation was very good. Many SMEs in Spain showed an interest in the EINSTEIN tool kit. They believe it is very useful for working in thermal audits, the dissemination made with long time before. For some participants comments, we think it would be interesting for the next course to have a translation of the main manual for EINSTEIN.

Table 21. Comments from the course trainers (feedback to trainers from trainees)

The overall assessment of training in the EINSTEIN tool kit is very positive and that professionals find it really useful to make judgments and estimates quickly on build with elevated cost of thermal energy.

SPAIN (Barcelona)

3.1 ORGANISATIONAL ISSUES

This section outlines background information on the nature of participants.

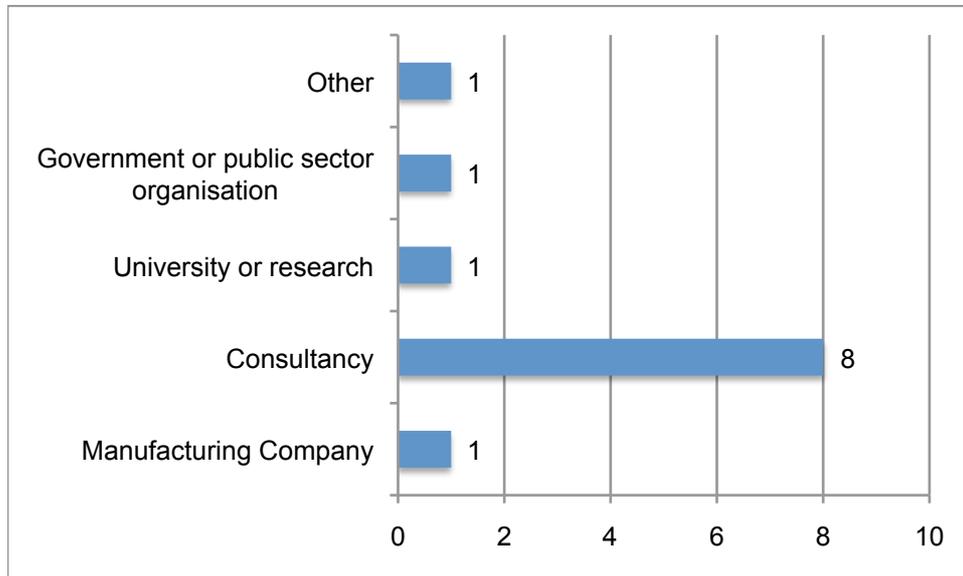


Figure 19. Sectors represented at the training event

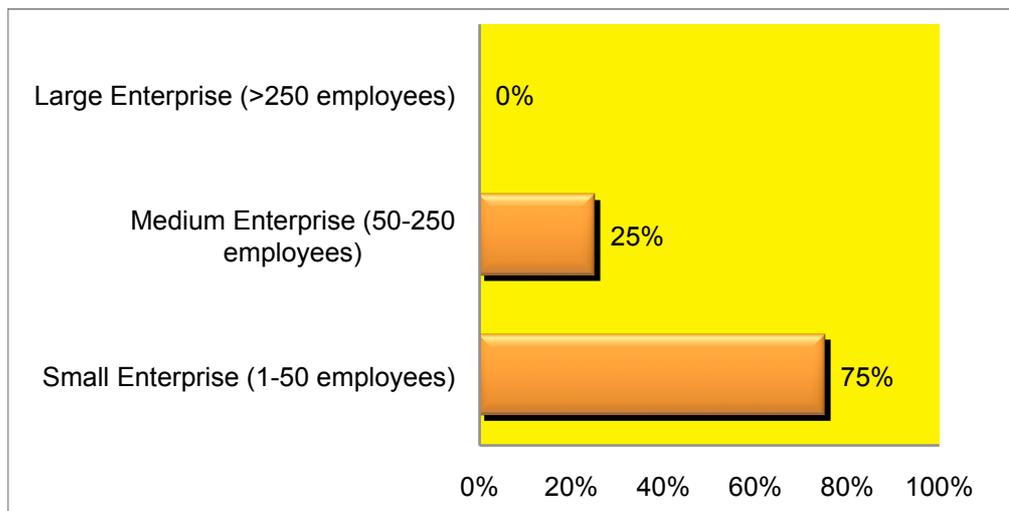


Figure 20. Structure of participants

Table 22. Current role of participant in their company or organisation

Comments	No. of opinions
Energy efficiency technician	1
Consultant	7
Project engineer	2
Unemployed	1
Production	1

3.2 GENERAL ISSUES

This section provides information as to whether participants attended earlier EINSTEIN courses and some general overall feedback on the course.

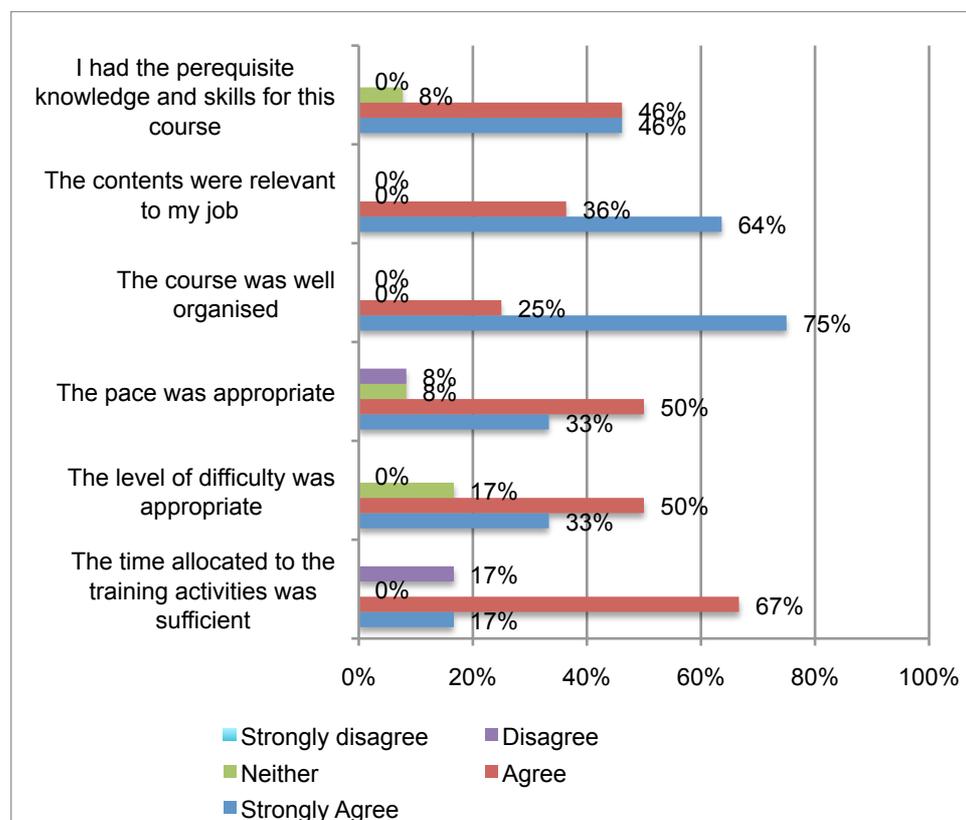


Figure 21. Questionnaire results on general issues

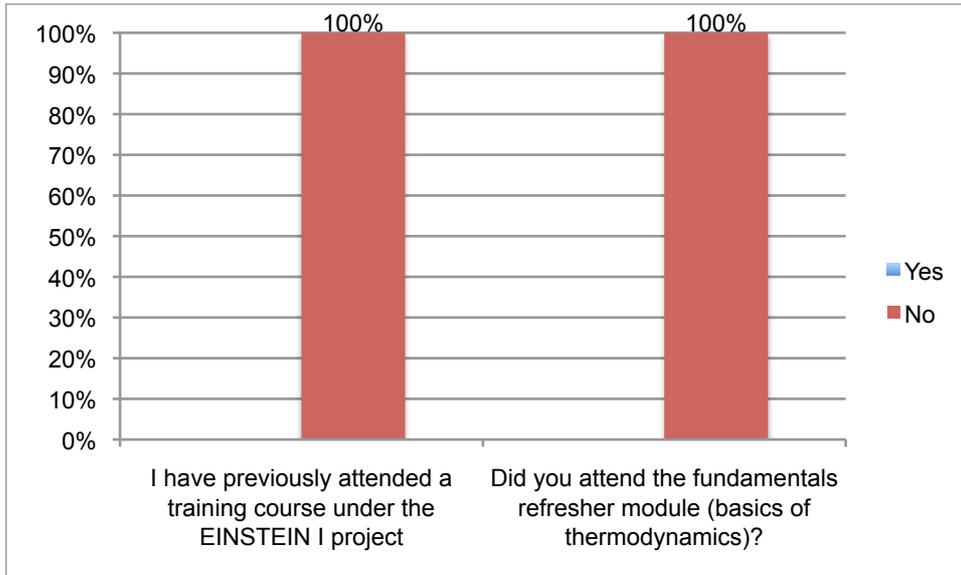


Figure 22. Previous attendance of EINSTEIN courses (this question may have been misinterpreted)

3.3 TRAINING MODULES, MATERIALS AND TRAINERS

This section provides feedback regarding the training materials and the trainers.

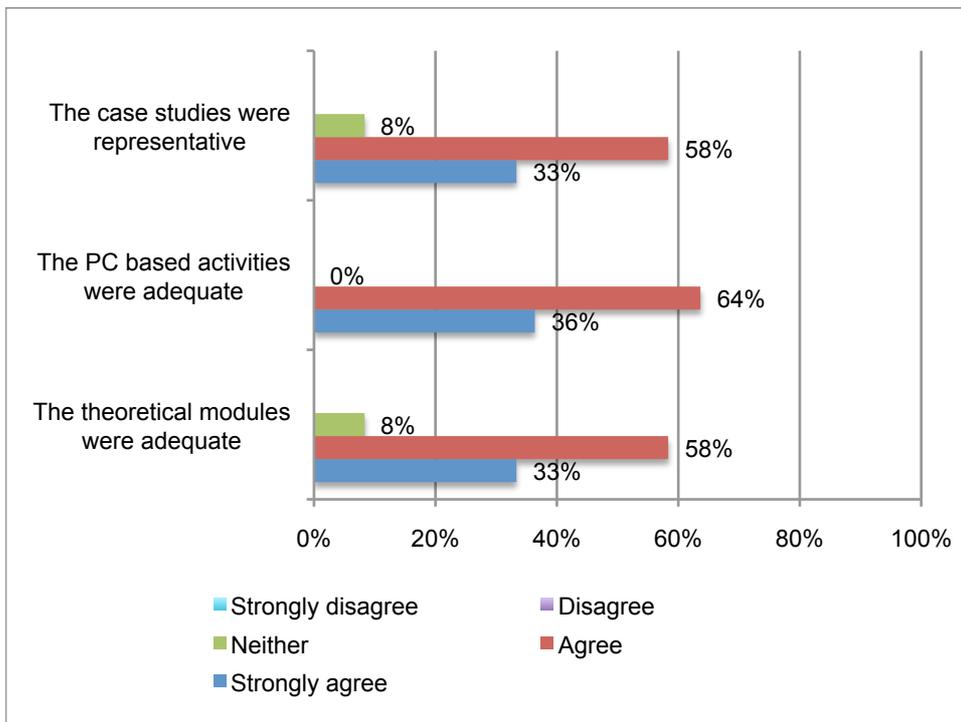


Figure 23. Questionnaire results on training modules, materials and trainers

Suggestions for improvement of the course

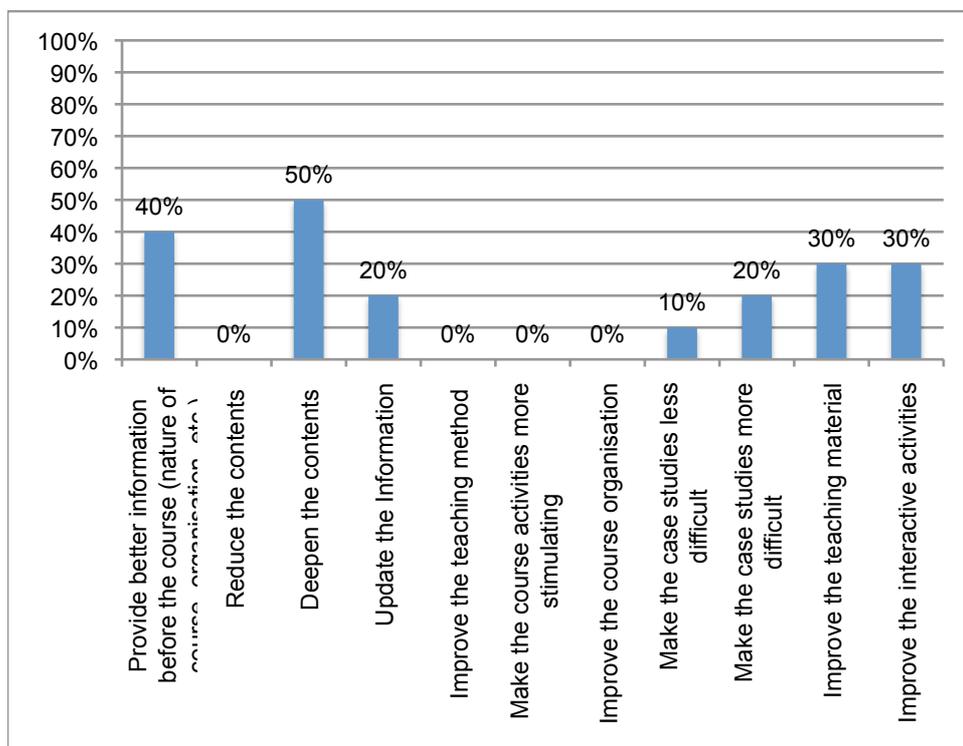


Figure 24. Suggestions for improvement of the course

Table 23. List of comments or suggestions by attendees to improve the course

Comments
Not easy to understand the errors
It is necessary to develop the software. We know that is not the last version. It has much potential.
Streamline the calculation method and the proposed alternatives

3.4 THE EINSTEIN TOOL

This section deals with feedback on various aspects of the EINSTEIN tool itself.

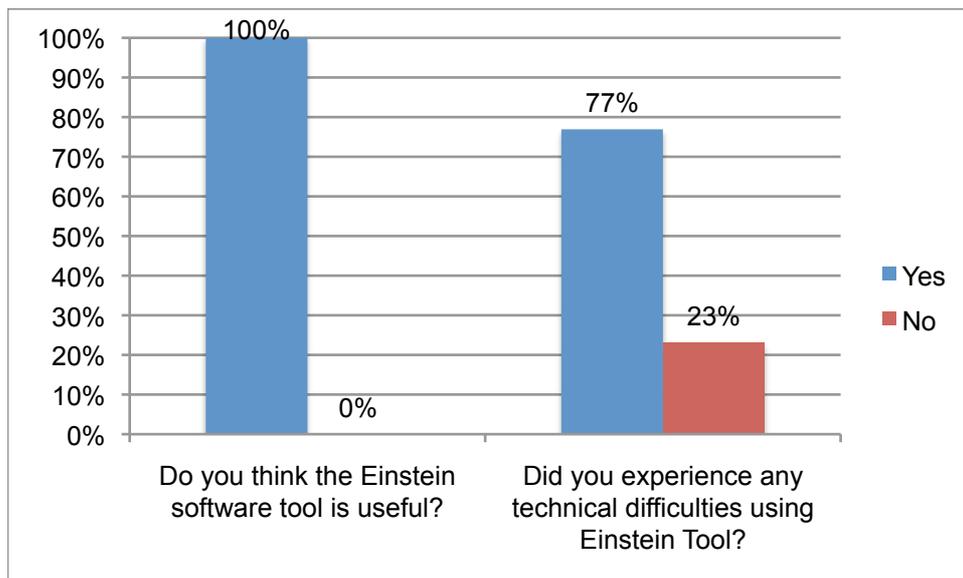


Figure 25. Participants' opinion on the usefulness of the EINSTEIN tool

Table 24. Participant's opinion as to why the EINSTEIN tool is useful

Comments
It is necessary to have a tool like Einstein in order to do a qualitative [sic: quantitative?] audit
Easy and visual way to evaluate a project
It will contribute to do audits with high quality contents
Audit methodology standarisation
Practical tool in order to do energy audits and concrete calculations
It makes the calculation easy to do and to find energy efficiency proposals in industry.
The thermal anaylsis and the proposal validation are easy to obtain
Reduced number of engineering and consultancies are doing thermal analysis of the industrial processes
Good methodology. Thermal processes and be easily and globally studied.
Improvement solution modelling
Allows audit summaries
Makes thermal analysis of the industries systematic. This analysis is not commonly used.
Energy audit sector with reduced number of software solutions

Table 25. Comments from the attendees relating to the technical difficulties they encountered while using the EINSTEIN tool

Comments	No. of opinions
Too quick	1
To fix an easy introduction data steps and make proposals and simulations	1
Roadmap with the different steps and possible alternatives	1
The most important steps are clear but some of the detailed steps are not clear enough	1
In some cases, it is difficult to know which are the errors that the estimative method is giving	1
Small software errors	1
Process design.	1
Difficult interface without basic knowledge	1

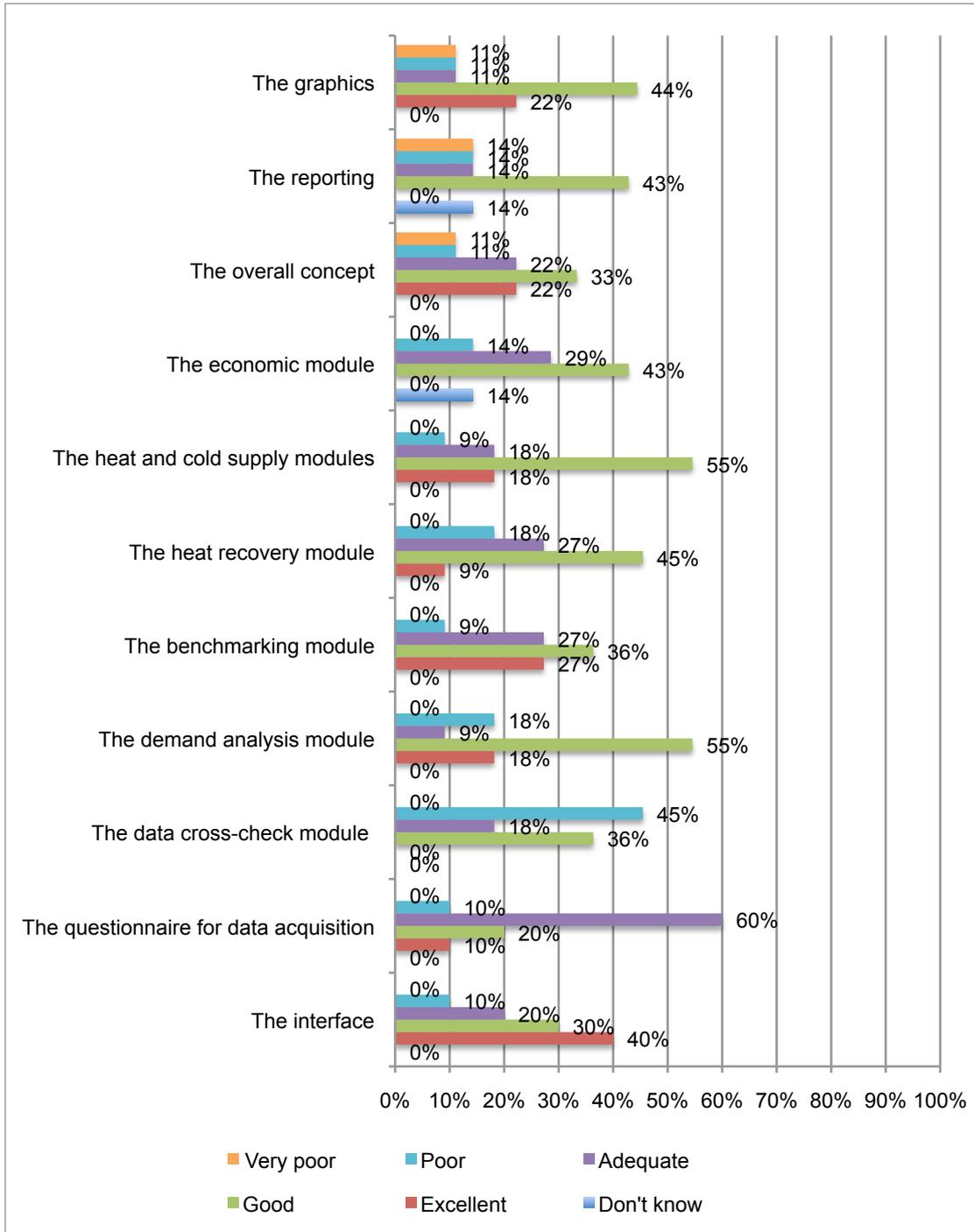


Figure 26. Participants' rating of parts of the EINSTEIN tool

Table 26. Suggestions for improvement of the EINSTEIN tool

Comments
Do an example of a global energy consumption optimisation
Exercises with objectives (concrete results)
Exercises with several distribution lines
Exercises with multiple connections
Time losses during the simulation that could be used in order to improve the course contents
Printed documentation in order to take some notes.
Sheet with FAQ
Forum to be used in order to ask future questions, or a contact email
The course duration is not long enough
More practice exercises in order to solve more problems

Table 27. 'Which important feature and/or functions are missing?'

Comments	No. of opinions
Improvements on the steam lines: flash recuperator. Visualise the heat flows.	1
Quick energy demand introduction	1
Simulated productions	1
Sankey diagram	1
Add indicators in the connections graphs	1
Biomass	2
Allow the adding of historic energy bills	1
Thousands values with "." Or ","	1
Version for commercial buildings	1
Visual view of all the recuperation systems in a unique graph including all the energy flows	1

3.5 TRAINING RESULTS

This section deals with the outcome of the training for the individual trainees.

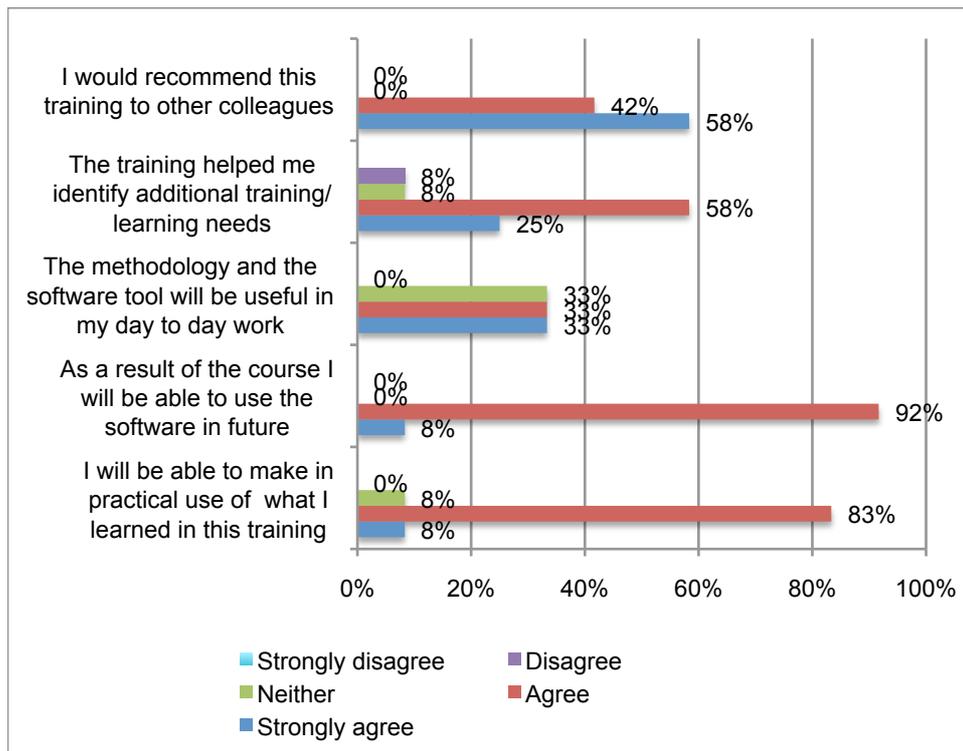


Figure 27. Results of EINSTEIN training course

Table 28. 'What was least valuable about this training?'

Comments
Intensive training. More tutored exercises needed
Software improvement needed
Too much time spent in the simulations

Table 29. 'What was most valuable about this training?'

Comments
To know a useful software that I need in my job
Useful software and interactive training
Facilitate the thermal energy audits
Technical support in thermal energy consumption
High technical value of the software

Table 30. Other comments

Comments
Other course proposals: 3 days + supervised project (at home) + group results sharing

UK (Newcastle)

4.1 ORGANISATIONAL ISSUES

This section outlines background information on the nature of participants.

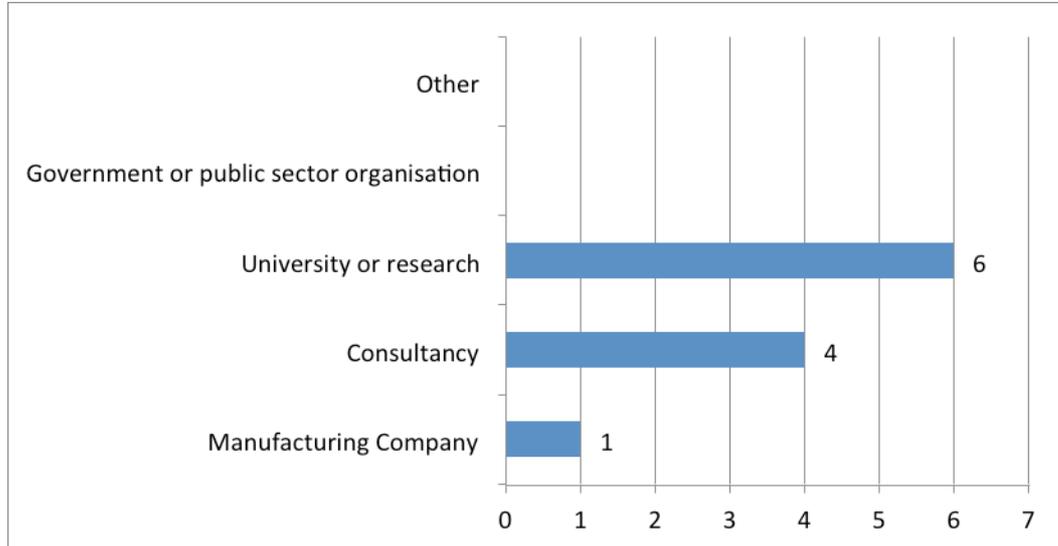


Figure 28. Sectors represented at the training event

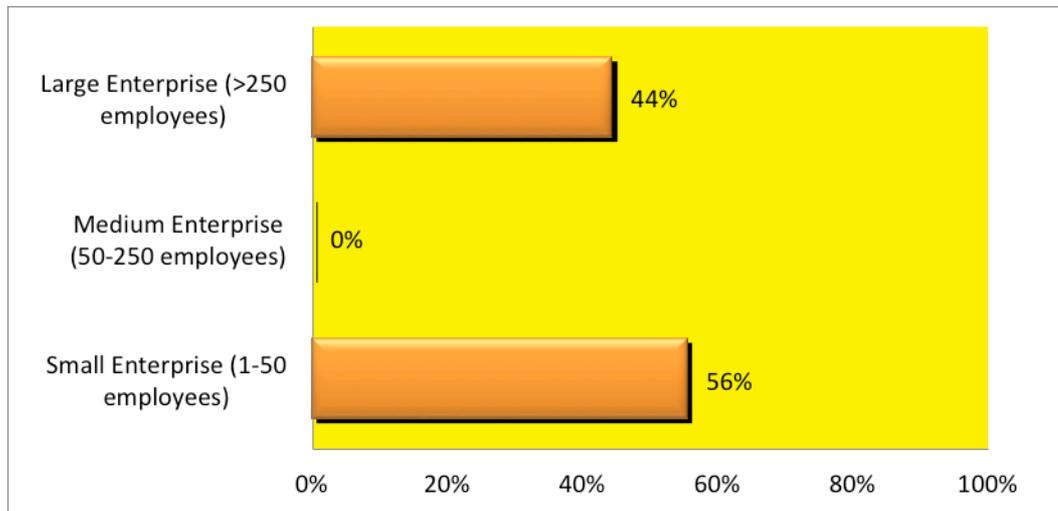


Figure 29. Structure of participants

Table 31. Current role of participant in their company or organisation

Occupation
Research Group Manager and Teaching Fellow
Student
M Phil Student
Postgraduate Student
MSc Student
Director
Energy and Environment Researcher
Energy Engineer
Director

4.2 GENERAL ISSUES

This section provides information as to whether participants attended earlier EINSTEIN courses and some general overall feedback on the course.

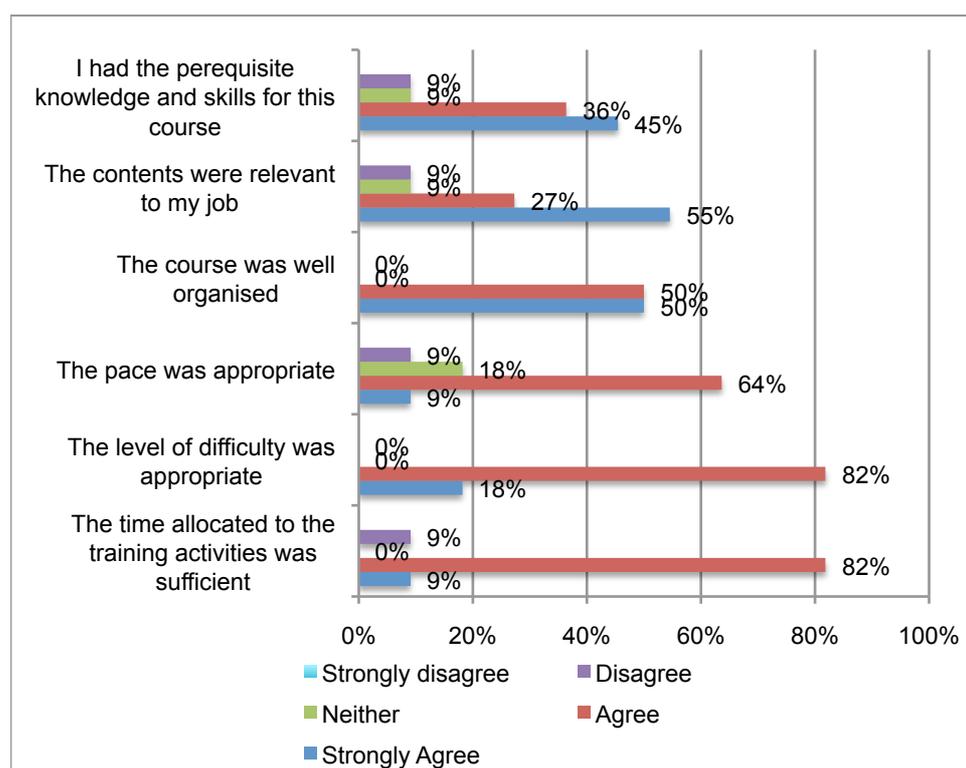


Figure 30. Questionnaire results on general issues

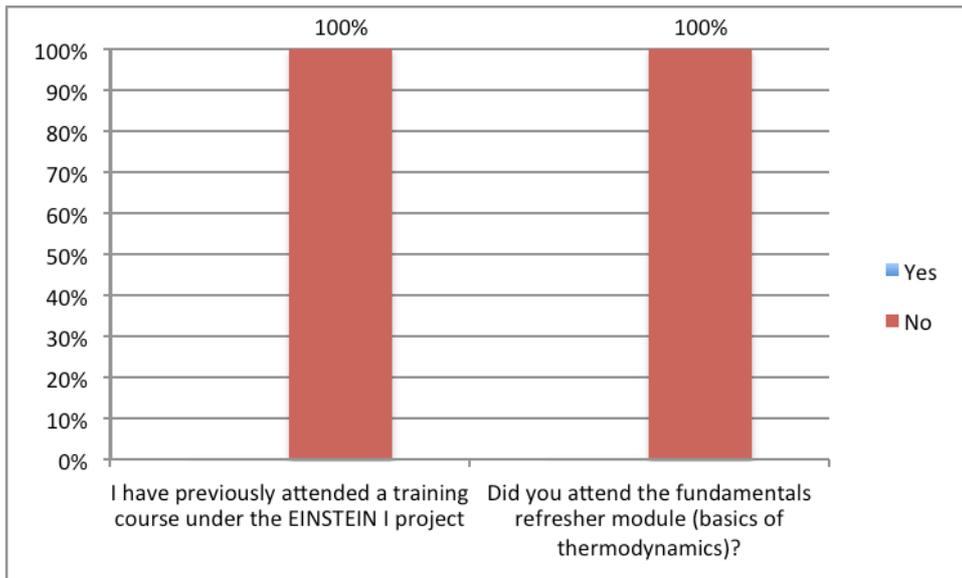


Figure 31. Previous attendance of EINSTEIN course (may be a misinterpreted question).

4.3 TRAINING MODULES, MATERIALS AND TRAINERS

This section provides feedback regarding the training materials and the trainers.

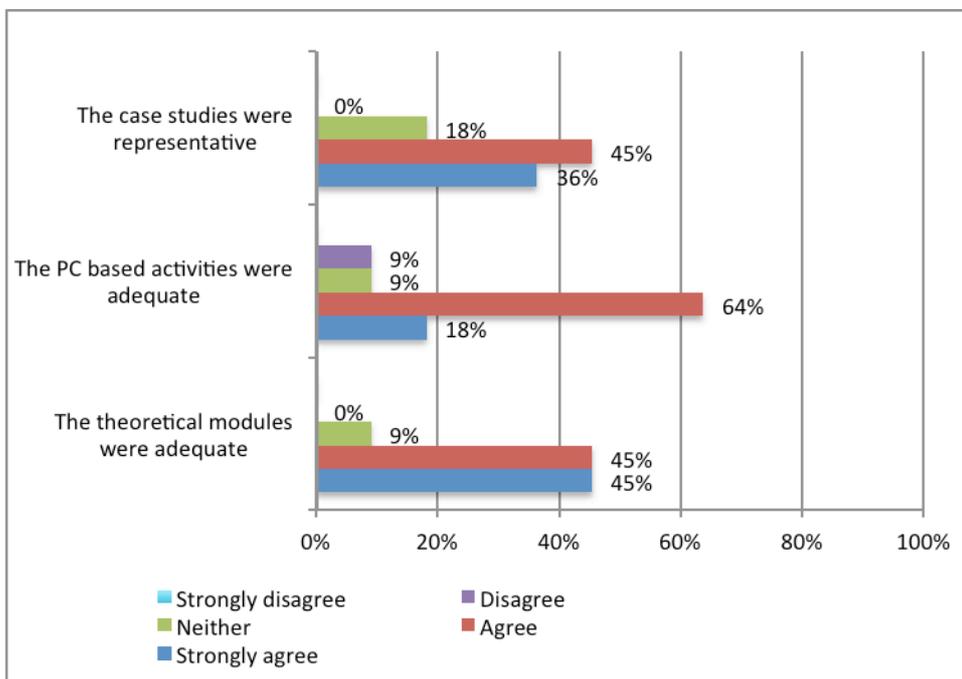


Figure 32. Questionnaire results on training modules, material and trainers

Suggestions for improvement of the course

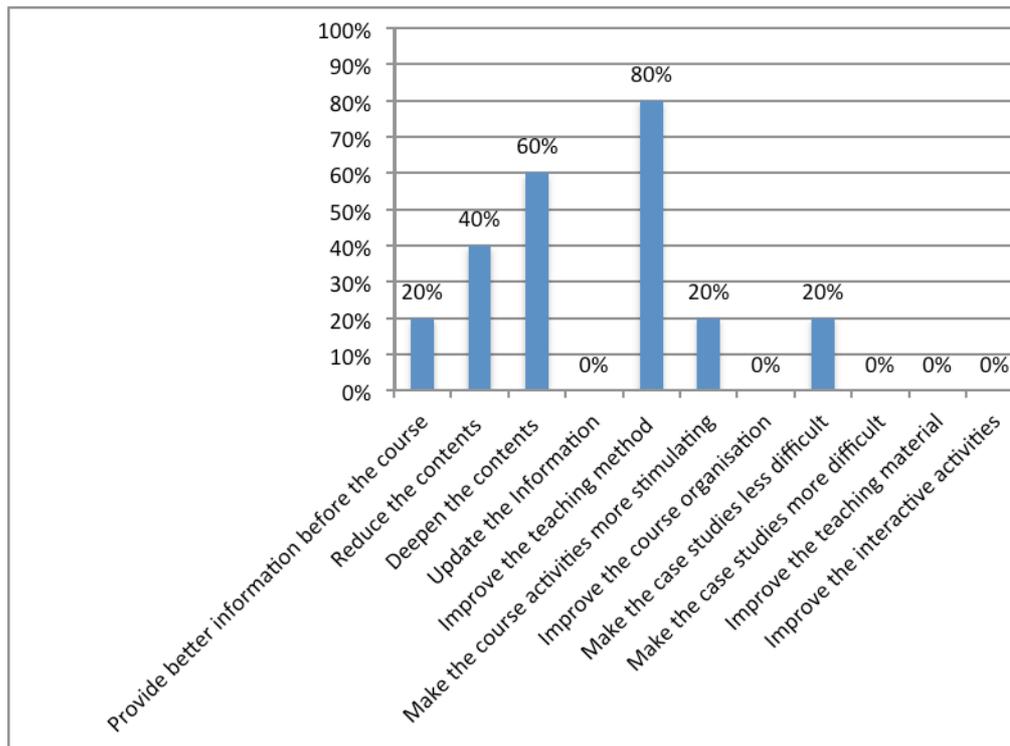


Figure 33. Suggestions for improvement of the course

Table 32. List of comments or suggestions by attendees to improve the course

Comments
Course was very well done. More practice is needed but that differs from person to person, so will have to be after the course.
Less theory required - more practical sessions/experience.
Possible 4 day course to increase breadth and depth of understanding.
More theory and application of the pinch analysis would have been useful.
More practical work would have been useful.

4.4 THE EINSTEIN TOOL

This section deals with feedback on various aspects of the EINSTEIN tool itself.

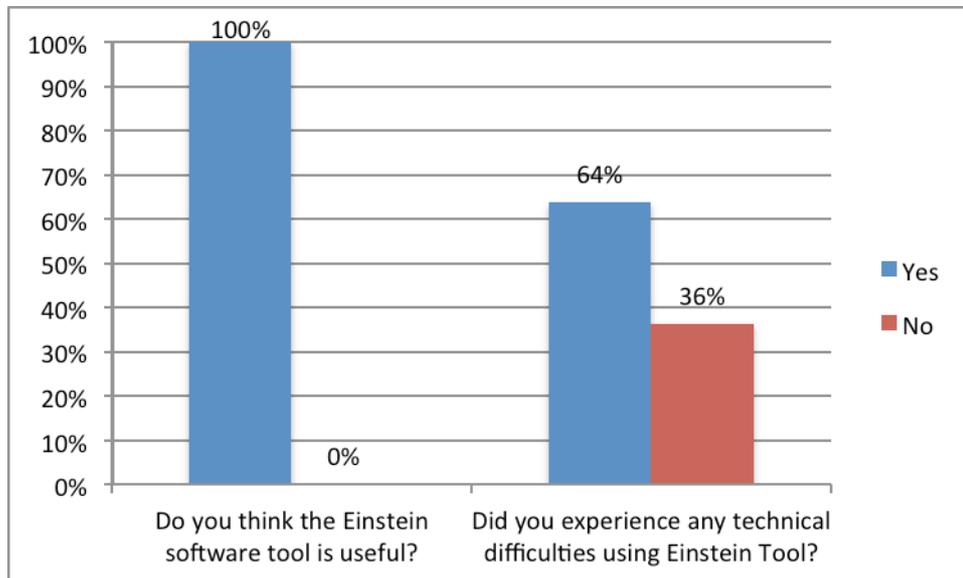


Figure 34. Participants' opinion on the usefulness of the EINSTEIN tool

Table 33. Participants' opinion as to why the EINSTEIN tool is useful

Comments
Structured, simple (well hopefully when I learn it), consistent way of undertaking an audit.
Helps to do calculations and evaluations of a process in an easy way.
It is a good software to do energy auditing simple and straightforward
It saves time when evaluating alternatives. Graphical outputs very useful for reports for clients.
Power and speed at which initial audits can be carried out
It provides a means by which to quickly access energy saving potential
Helpful to analyse appropriate applications[?]
Powerful software tool to assist energy assessments/identify/quantify heat energy waste and solutions
Offers exciting opportunities for optimising energy performance of many industries and sites

Table 34. Comments from the attendees relating to the technical difficulties they encountered while using the EINSTEIN tool

Opinions
Need graphical and visual approach to input the process
Crashed a couple of times but re-started OK.
Linux use on a 1024 x 600 display. "OK" button sometimes disabled - fixed by restart
Not the most intuitive program
Difficult to keep up.
Basically tripped over simple errors in the tool and sometimes struggled to see what I had done wrong
Inconsistencies with air handling flow rates re design capability and the calculated performance i.e. Greater than design capability.

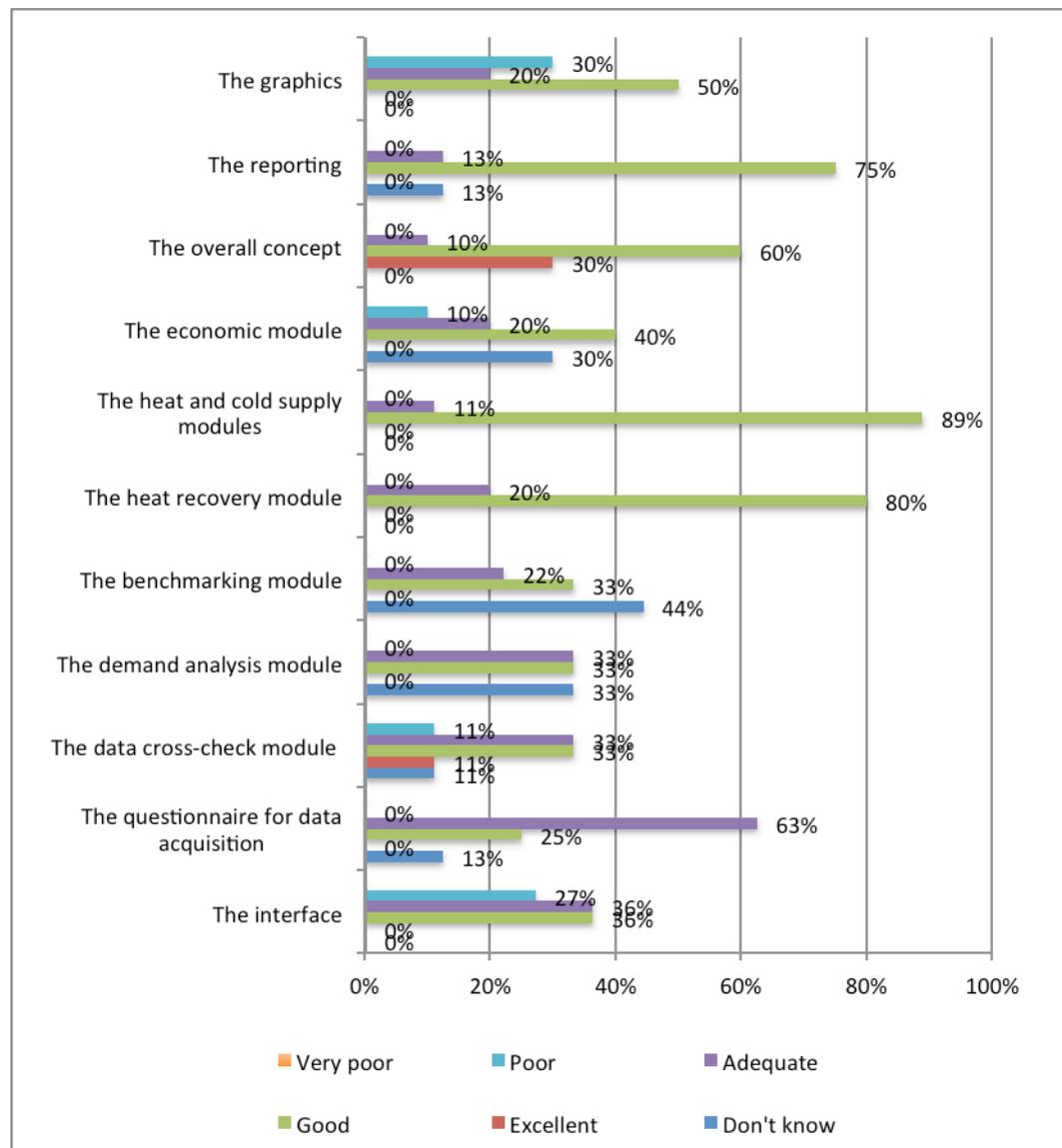


Figure 35. Participants' ratings of parts of the EINSTEIN tool

Table 35. Suggestions for improvement of the EINSTEIN tool

Comments
I don't spend a lot of time modeling so I would have preferred an easier interface
It will be better to improve the visual/graphical approach
Data cross check errors are impossible to understand. More visuals please.
Some UI issues with tab order and action of enter key
It's not always obvious how to get what you want and the error messages are obscure.
A process flow diagram/network of the system will be helpful/useful
Graphics - more of them please, interactive graphics/links would help use of system
Not enough time to fully evaluate

Table 36. 'Which important feature and/or functions are missing?'

Comments
A way to identify where you are in the process if you get lost! Simpler error messages!
Only visuals e.g. H/E. Network diagram
Would be helpful if items selected on lists on first tabs were visible across the tabs. "Process Data" in "Process List" only visible on first "Process Data" tab.
A graphical interface.

4.5 TRAINING RESULTS

This section deals with the outcome of the training for the individual trainees.

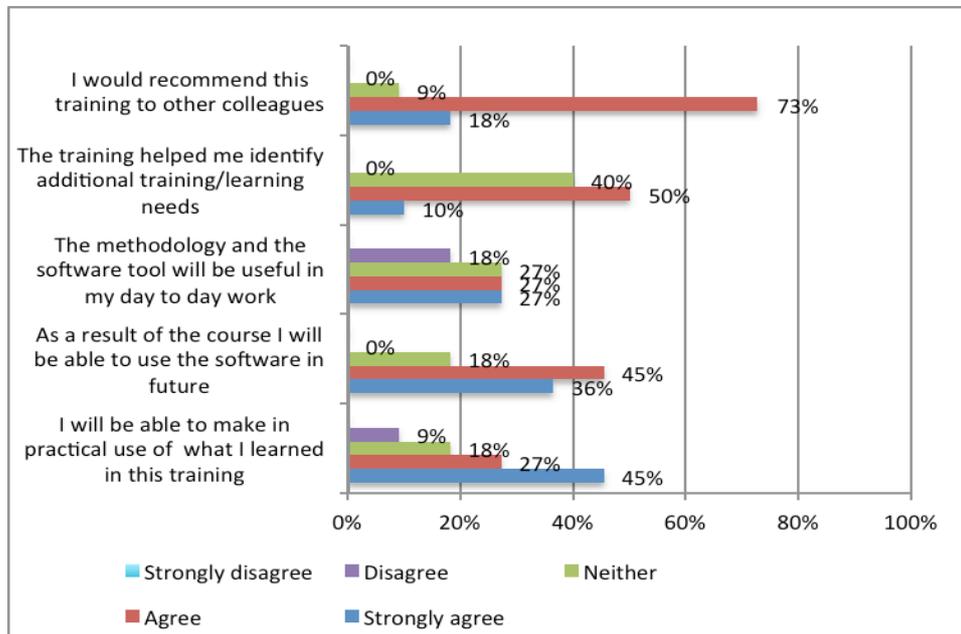


Figure 36. Results of EINSTEIN training course

Table 37. 'What was least valuable about this training?'

Comments
To much theoretical on the first day
Theory modules
Very lengthy presentations/delivered at pace, too many powerpoint slides with little depth to info

Table 38. 'What was most valuable about this training?'

Comments
All 3 days! Gave me great ideas for student projects.
Assistance from Juergen (thanks for patience)
Juergen was affable and patient
I want to learn more about Energy Management now. Not really in my field but may be in the future.
Quick evaluation for improvements
Hands on practice and discussion with course tutor.
Excellent start to using EINSTEIN

Table 39. Other comments

Comments
Juergen must be the most patient person on the planet.
Could you please make a video tutorial about this software, so if I have students then I can ask them to learn it without having to attend the course.
Teacher (Juergen) was very good.
Thank you
Thank you for support during course
Very well done to Juergen F., very good tutor, very patient, very clear and knowledgeable.

4.6 FEEDBACK FROM TRAINING ORGANISERS AND TRAINERS

Table 40. Comments from the course trainers (feedback to trainers from trainees)

Error messages should be clearer
Visualisation should include heat exchangers
Working in processes/equipments/buildings/distributions (not the first sheet) should include information on which processes we are working in
In the connection sheet naming of UPH, USH
Double click in system connection leads to the process/equipment/distribution