



DELIVERABLE 3.4

Training workshops in Jordan

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LIST OF CHANGES

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1. INTRODUCTION

1.1. Scope and Objectives

In the context of IREEDER project, this report describes the training workshops on the subjects of the Internet of Things (IoT), Cyber Security (CS) and Renewable Energy (RE) that held in Jordan. Staff from Jordanian Universities that had trained in EU partners held regular effective workshops at their own institutions as follows:

- IoT training workshop at AHU.
- CS training workshop at TTU
- RE training workshop at MU.

This report aims in describing the basics of each course, the contents of the training workshops and the results of the surveys that followed, regarding the workshops.

1.2. Structure of the Document

The present document is organized as follows:

- The current section describes the scope, objectives and structure of the document
- Section 2 provides a description of the basics of the IoT, CS and RE courses
- Section 3 provides a description of the IoT training workshop and its contents
- Section 4 provides a description of the CS training workshop and its contents
- Section 5 provides a description of the RE training workshop and its contents
- Section 6 provides a description of the questionnaire that was used in the surveys, in order to evaluate and gather feedback on the training workshops
- Section 7 provides an analysis of the results of the survey, for each training workshop
- Section 8 concludes the document and provides some comments on the results



2. THE COURSES

The purpose of the three courses is to present the basic principles on the subjects of IoT, CS and RE, respectively. Moreover, the courses aim at training the Laboratories tutors and providing them the needed knowledge to teach the practical parts of the IREEDER labs.

For the course of IoT, the main technological components of IoT will be presented, examined and evaluated, as well as the most important technological applications. The course aims at teaching how to design, code and build IoT solutions. The students will gain an understanding of the main operating principles and components of IoT systems, as well as knowledge of their architecture and basic technologies and standards. They will be able to use existing platforms in order to design and implement IoT systems. They will be in a position to identify needed security measures and take part in the discussion for future IoT challenges.

The course of CS aims at presenting the fundamental concepts of CS. The course aims at teaching the most important techniques in order to maximize computer and network security and teach the design of secure applications. Students will be able to apply the basic CS concepts and use tools, architectures and security design principles. They will be in a position to identify and use the main security operations and value the impact of new technologies on the subject of cyber security.

The RE course aims at presenting the main principles and architectures of RE systems. The most important technological components of RE systems will be presented and the technological applications will be reviewed. Students will be able to address the main issues regarding RE sources and understand the technologies of RE components and various systems. They will understand the various applications used in energy production, they will gain knowledge on various subjects, like different RE sources, storage systems etc. and they will be able to use equipment in order to model or design an RE system.

Those acquired knowledge have been passed to the trained trainers from different Jordanian partners.

3. IoT TRAINING WORKSHOP

The IoT training workshop took place on 14-15 Feb 2022 and it was coordinated by Dr. Saud Althunibat and Dr. Moath Alsafasfeh, Al-Hussein Bin Talal University, Ma'an, Jordan. In this section, the programme of the IoT training workshop, for each day, will be described in Figure 3-1. The detailed timetable of the training can be seen in the next figures.

Table 3-1 shows the list of the trainees and instructors of the IoT training workshop and their affiliations.

Monday 14th Feb 2022

Time	Topic	Presenter (s)
09:00-9:30	General introduction to the workshop	Dr. Moath Alsafasfeh (AHU)
9:30-10:00	IREEDER project overview	Dr. Saud Althunibat (AHU)
10:00-11:00	Introduction to IoT	Prof. Saleh Alsaraireh (AHU)
11:00-11:30	Coffee Break	
11:30-12:30	IoT Microcontrollers, Sensors for Data Acquisition and Actuators	Prof. Saleh Saraireh (AHU)
12:30-13:30	Revision of Basic Programming and IoT IDE	<i>Dr. Abdullah Alhasanat</i>
13:30-14:30	Lunch Break	
14:30-15:30	Practical Experiments : Arduino Experiments (1)	Eng. Samiha Falahat(AHU) Eng. Eman Sanon (AHU)
15:30- 16:00	Coffee Break	
16:00 – 17:00	Practical Experiments : Arduino Experiments (2)	Eng. Samiha Falahat(AHU) Eng. Eman Sanon (AHU)

Tuesday 15th Feb 2022

Time	Topic	Presenter (s)
9:30-10:30	IoT Connectivity Technologies	Dr. Khaled Matrouk (AHU)
10:30-11:30	IoT Connectivity Protocols	Dr. Khaled Matrouk (AHU)
11:30-12:00	Coffee Break	
12:00-13:00	Data Storage and Cloud Systems in IoT	Dr. Khaled Matrouk (AHU)
13:00-14:00	Lunch Break	
14:00-15:30	Practical Experiments : Raspberry Pi Experiments (1)	Eng. Samiha Falahat(AHU) Eng. Eman Sanon (AHU)
15:30- 16:00	Coffee Break	
16:00 – 17:00	Practical Experiments : Raspberry Pi Experiments (2)	Eng. Samiha Falahat(AHU) Eng. Eman Sanon (AHU)

Figure 3-1: Schedule of the IoT training workshop.

<i>Name of Trainee</i>	<i>Affiliation</i>
Zainab Al-Qaisi	Philadelphia University
Samer Salah	Philadelphia University
Hudefah Al-Kashashenh	Philadelphia University
Yusra Al Sarayrah	Mutah University
Taghred Al Tarawneh	Mutah University
Nabil Abo Amro	Mutah University
Osama Fares	Isra University
Yaser Abadah	Isra University
Malek Hindi	Isra University
Ashraf Alkhreshh	Tafila Technical University
Mohammad Alzyout	Tafila Technical University
Mohammad Alrfou	Tafila Technical University
Amany Farajat	Al-Hussein Bin Talal University
<i>Name of Trainer</i>	<i>Affiliation</i>
Salah Saraireh	Al-Hussein Bin Talal University
Khlaed Matrouk	Al-Hussein Bin Talal University
Abdullah Alhasanat	Al-Hussein Bin Talal University
Samiha Alfalahat	Al-Hussein Bin Talal University
Eman Sanon	Al-Hussein Bin Talal University

Table 3-1: List of participants and instructors in the IoT training workshop.

The agenda of the workshop included 2 days of training, during which the fundamentals on the subject of IoT were presented. During the first day of the training workshop, there was a general introduction to the contents and purpose of the training, followed by an introduction to IoT, which presented the history of IoT along with relevant information on IoT microcontrollers, actuators and sensors for data acquisition. A revision of basic programming and IoT IDE was presented, followed by a presentation and discussion on software development for IoT embedded systems. In the afternoon sessions, practical exercises concerning Arduino experiments were implemented.

The IoT technologies and protocols were presented during the second day of the training workshop. During this part, the main architectures were discussed, along with the major IoT hardware and software. IoT connectivity technologies were presented, with discussions on wireless technologies and sensor networks for IoT and mobile technologies. The IoT connectivity

protocols were presented next, followed by data storage and cloud systems and data analytics and applications. Practical sections were included focusing on Raspberry PI experiments.

4. CS TRAINING WORKSHOP

The CS training workshop took place on 02-03 March 2022 and it was coordinated by Prof. Ahmad Al-Jaafreh, Tafila Technical University, Jordan and Dr. Moath Alsafasfeh, Al-Hussein Bin Talal University, Jordan. In this section, the programme of the CS training workshop, for each day, will be described. The detailed timetable of the training can be seen in Figure 4-1. Table 4-1 shows the list of the trainees and instructors of the CS training workshop and their affiliations.

Wednesday, 2nd Mar 2022

Time	Topic	Presenter (s)
09:00-9:30	General introduction to the workshop	Prof. Ahmad Al-Jaafreh (TTU)
9:30-10:00	IREEDER project overview	Dr. Moath Alsafasfeh (AHU)
10:00-10:30	Secure Design Principles for Networks	Eng. Omar Qawaba(TTU)
10:30-11:30	Cryptography used to Maintain Communication Security	Eng. Omar Qawaba(TTU)
11:30-12:00	Coffee Break	
12:00-13:00	Securing Network Components	Eng. Omar Qawaba(TTU)
13:00-14:00	Lunch Break	
14:00-15:30	Securing Communication Channels	Eng. Omar Qawaba(TTU)
15:30- 16:00	Coffee Break	
16:00 – 17:00	Intrusion Detection & Prevention	Eng. Omar Qawaba(TTU)

Thursday, 3rd Mar 2022

Time	Topic	Presenter (s)
9:30-10:30	Security and Risk Management	Dr. Bilal Alqudah (AHU)
10:30-11:30	Security Engineering , Models, controls, and vulnerabilities	Dr. Bilal Alqudah (AHU)
11:30-12:00	Coffee Break	
12:00-13:00	Cryptography & Key Management	Dr. Bilal Alqudah (AHU)
13:00-14:00	Lunch Break	
14:00-15:30	Cryptography Services	Dr. Bilal Alqudah (AHU)
15:30- 16:00	Coffee Break	
16:00 – 17:00	Recovery & Incident Response	Dr. Bilal Alqudah (AHU)

Figure 4-1: Schedule of the CS training workshop.

Name of Trainee	Affiliation
Walaa Araydah	Philadephia University
Samah Jaradat	Philadephia University
Rasha Al-Fraihat	Philadephia University
Yusra Al-Sarayreh	Mutah University
Taghred Al-Tarawneh	Mutah University
Mohammad Abo Nassar	Mutah University
Neder Salameh	Isra University
Hasan Kanaker	Isra University
Yaser Adabah	Isra University
Bashar Matrouk	Al-Hussein Bin Talal University
Samiha Falahat	Al-Hussein Bin Talal University
Yousef Krashan	Al-Hussein Bin Talal University
Name of Trainer	Affiliation
Bilal Alqudah	Al-Hussein Bin Talal University
Omar Qwabah	Tafila Technical University
Murad Alqtash	Tafila Technical University

Table 4-1: List of participants and instructors in the CS training workshop.

The agenda of the workshop included 2 days of training, during which the fundamentals of CS were presented. During the first day of the training workshop, there was a general introduction to the contents of the workshop, followed by sessions on secure design principles and

cryptography for communication security maintenance. Presentations regarding communications and network security and security network components were included. The operation of hardware and network access control devices were discussed, among other things. The day ended with a session focusing on intrusion detection and prevention. The second day started with sessions on security and risk management. Sessions on security engineering, cryptography and key management, as well as cryptography services, were followed.

5. RE TRAINING WORKSHOP

The RE training workshop took place on 22-23 February 2022 and it was coordinated by Dr. Ziyad Altarawneh and Dr. Ziyad Almajali, Mutah University, Karak, Jordan. In this section, the programme of the RE training workshop, for each day, will be described. The detailed timetable of the training can be seen in Figure 5-1. Table 5-1 shows the list of the trainees, instructors and organizers of the RE training workshop and their affiliations.

Tuesday 22nd Feb 2022

Time	Topic	Presenter (s)
09:00-9:30	General introduction to the workshop	Dr. Ziyad Altarawneh (MU)
9:30-10:00	IREEDER project overview	Dr. Saud Althunibat (AHU)
10:00-11:00	Introduction to RE resources	Dr. Ziyad Almajali (MU)
11:00-11:30	Coffee Break	
11:30-12:30	Solar energy and photovoltaic systems	Dr. Ahmad Salah (AHU)
12:30-13:30	Wind energy fundamentals and operation	Dr. Ziyad Almajali (MU)
13:30-14:30	Lunch Break	
14:30-15:30	Practical Experiments : Solar system (1)	Eng. Firas Adaileh (MU) Eng. Wala Saraieh (MU)
15:30- 16:00	Coffee Break	
16:00 – 17:00	Practical Experiments : Solar system (2)	Eng. Firas Adaileh (MU) Eng. Wala Saraieh (MU)

Wednesday 23rd Feb 2022

Time	Topic	Presenter (s)
9:30-10:30	OFF-grid/ Stand-alone systems	Dr. Ziyad Almajali (MU)
10:30-11:30	Energy storage technologies	Dr. Eyad Maitah (TTU)
11:30-12:00	Coffee Break	
12:00-13:00	Integrating of RE into electrical grid	Dr. Eyad Maitah (TTU)
13:00-14:00	Lunch Break	
14:00-15:30	Practical Experiments : Wind energy system	Eng. Firas Adaileh (MU) Eng. Wala Saraieh (MU)
15:30- 16:00	Coffee Break	
16:00 – 17:00	Practical Experiments : Fuel cell system	Eng. Firas Adaileh (MU) Eng. Wala Saraieh (MU)

Figure 5-1: Schedule of the RE training workshop.

Name of Trainee	Affiliation
Azad Otoum	Philadelphia University
Lina Al-Khateeb	Philadelphia University
Nessreen Alzboom	Philadelphia University
Zaid Al Bdour	Tafila Technical University
Mhmood Al-Hawamdeh	Tafila Technical University
Mohammad Al-Arni	Tafila Technical University
Zakaria Al-Omari	Isra University
Mohanad Al Ghrybah	Isra University
Hasan Thebian	Isra University
Mohammad Alshaari	Al-Hussein Bin Talal University
Mohammad Alsoudi	Al-Hussein Bin Talal University
Sohaib Almasfeh	Al-Hussein Bin Talal University
Name of Trainer	Affiliation
Ziyad Almajali	Mutah University
Fras Adaileh	Mutah University
Wala Sarayrah	Mutah University
Ahmad Salah	Al-Hussein Bin Talal University
Eyad Maitah	Tafila Technical University

Table 5-1: List of participants and instructors in the RE training workshop.



The agenda of the workshop consists of 2 days of training during which the fundamentals on the subject of RE were presented. The first day of the training workshop began with a general introduction to the RE workshop and a brief overview of the IREEDER project. The day continued with two sessions with an introduction and overview of renewable energy resources. An overview of energy use was presented, along with the most important information on RE sources, the types with their characteristics, economic and environmental aspects and RE standards and regulations. A session followed on the topic of photovoltaic systems with a session on the physics of sunlight and photovoltaics, where the basics of energy conversion in photovoltaic solar cells were presented, along with the most important photovoltaic technologies. The wind energy fundamentals and operation are followed next. The day ended with practical exercises about the solar system. The second day of the RE training workshop began with a presentation on off-grid/stand-alone systems and energy storage technologies with principles of their operation and applications. Then, information about the integrations of the renewable energy systems into the electrical grid was followed. The day ended with practical applications to wind energy and energy cell systems.

6. THE SURVEYS

In order to evaluate the training workshops and gather feedback, a survey was prepared and addressed to each participant of each workshop. The following questions were included in the survey.

Your details (name, country, gender, age, position, work field)

What is your motivation to take part in this training workshop?

Organization of the training on behalf of the organizing institution (e.g. registration platform, contact with the organizer, proper communication about training details, ...).

Functionality of conference tool and software used (video, sound, other technical aspects, ...).

Possibility to exchange and interact with tutor(s) and other participants (forums, sessions for discussion, Q&A, ...).

Do you have any suggestions or recommendations for improvements of organizational aspects?



When starting the course, I was well informed about the content of the training workshop.

I find the knowledge and skills I received through the training to be very useful to me.

I think the case studies added high value to the course.

I consider the provided training materials to be useful.

In my opinion the structure of the training was logical and well organized.

The training schedule and time frame were very good.

The training was appropriate for my level of experience.

The training met my expectations.

What did you most like about the training? (e.g. innovative approach, quality of training materials, case-based learning methods, ...)

What can be improved regarding structure, format and material?

The training raised my interest in the topic.

I reached the learning outcomes being specified.

The knowledge and skills I received in this training are valuable to my work/future career.

I missed some background/introductory information.

How satisfied are you with the training workshop?

Have you recognized differences as compared to other trainings?

Please provide an over contribution about the training workshop.

Please list the new concepts/skills/topics you have learned from the training workshop.

Table 6-1: List of questions in the survey for each training workshop.

7. SURVEYS ANALYSIS

7.1. IoT Training Workshop

The analysis of the answers to the questions of the survey, regarding the IoT training workshop, is provided in the following figures. The first questions refer to personal details of each participant. Figure 7-1 to Figure 7-5 present the country (all from Jordan) and age of the participant, along with information regarding their position and field of work.

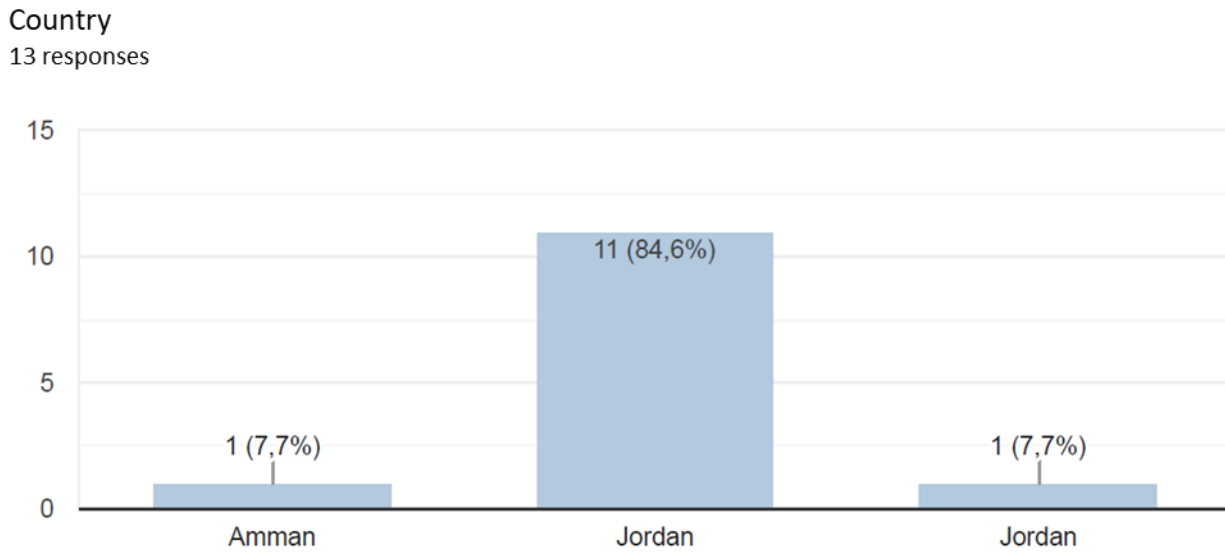


Figure 7-1. Country distribution of the IoT training workshop participants.

Gender
13 responses

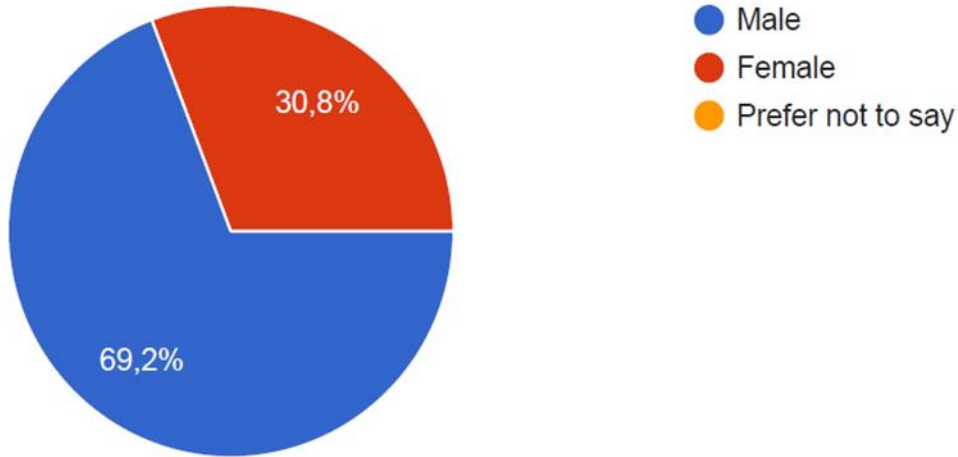


Figure 7-2. Gender distribution of the IoT training workshop participants.

Age
13 responses

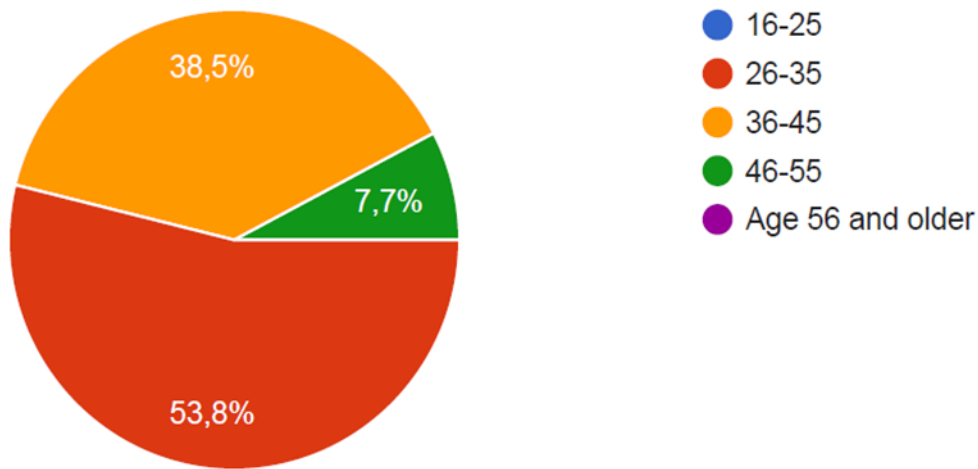


Figure 7-3. Age distribution of the IoT training workshop participants.

Position
13 responses

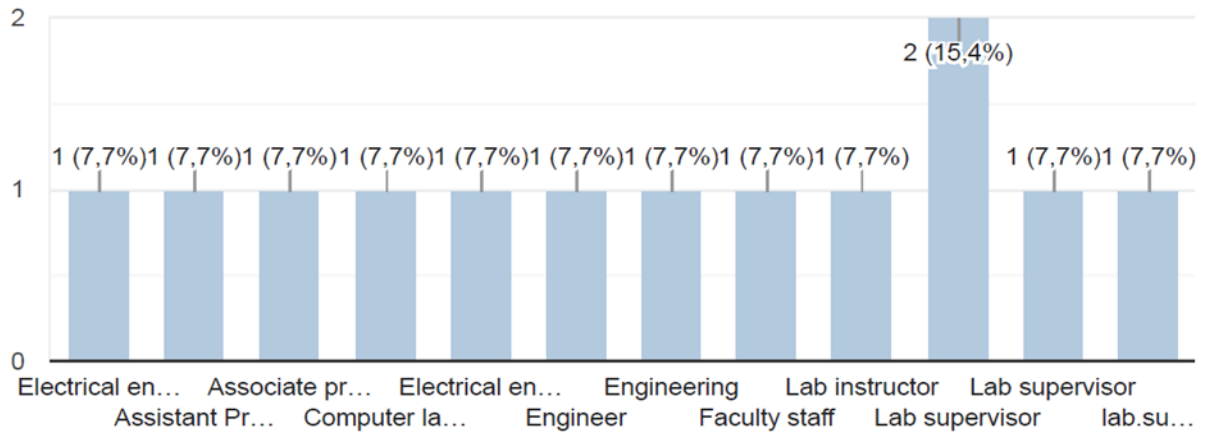


Figure 7-4. Position distribution of the IoT training workshop participants.

Work Field
13 responses

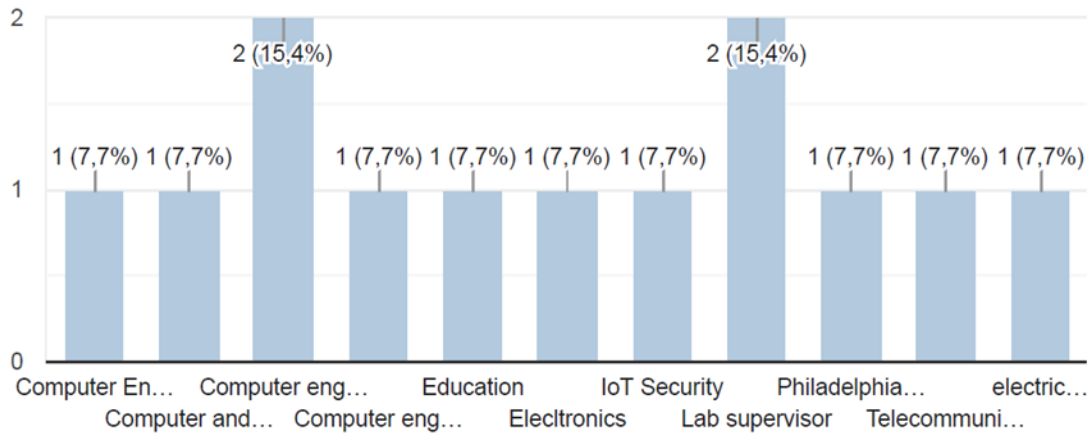


Figure 7-5. Work fields of the IoT training workshop participants.

Figure 7-6 presents the motivation of the participants to take part in the training workshop. The participants are generally interested in learning more on the subject of IoT and the latest technological advances and view it as an important course.

What is your motivation to take part in this training workshop?

13 responses

To improve my skills

to have a better knowledge about Internet of things and knowing the foundations through which we can communicate these concepts to students in a practical way

To enhance my skills in this field

Teaching IoT course

To get familiar with automation and teaching students about systems including sensors , actuators and control them usefully via internet

how to architect the IoT networks and access the microcontroller's data remotely.

Gain knowledge in new trends in electrical engineering

To develop and enhance my information about internet of things

Figure 7-6. Motivation for participation in the IoT training workshop.

The organization of the training workshop, on behalf of the organizing institution, was satisfying, since the majority of the participants (76.9%) gave the highest evaluation, as it can be seen in the chart below (Figure 7-7). The evaluation of the workshop organization takes into consideration the platform for registration, the availability of the organizer to be in contact with the participants, the necessary communication regarding the workshop details, etc.

Organization of the training on behalf of the organizing institution (e.g. registration platform, contact with the organizer, proper communication about training details, ...).

13 responses

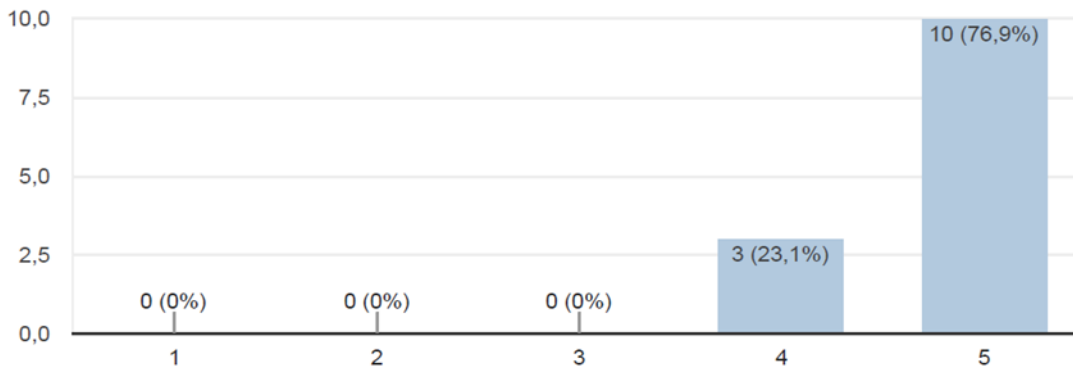


Figure 7-7. Satisfaction scale of the IoT workshop organization by the organizing institution.

Figure 7-8 shows the level of satisfaction regarding the tools and software used in the workshop, like video, sound and other technical aspects. Most of the participants (76.9%) were completely satisfied with the technical aspect of the workshop, 15.4% of the participants (2 out of 13) gave it a high evaluation of 4/5 and only 1 participant evaluated it with 3/5.

Functionality of conference tool and software used (video, sound, other technical aspects, ...).

13 responses

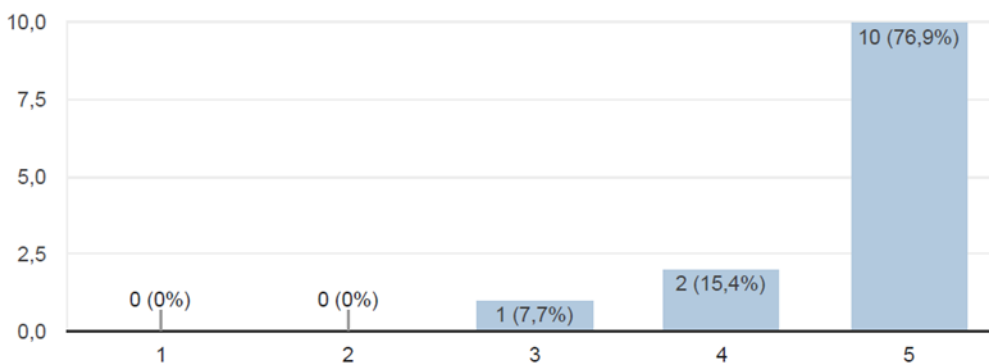


Figure 7-8. Satisfaction scale of the IoT workshop's tools and software used.

Figure 7-9 shows that 100% of the participants gave their highest evaluation to the possibility for exchange and interaction with the tutors and the other participants, during the training workshop. This includes sessions for discussion and Q&A sessions.

Possibility to exchange and interact with tutor(s) and other participants (forums, sessions for discussion, Q&A, ...).

13 responses

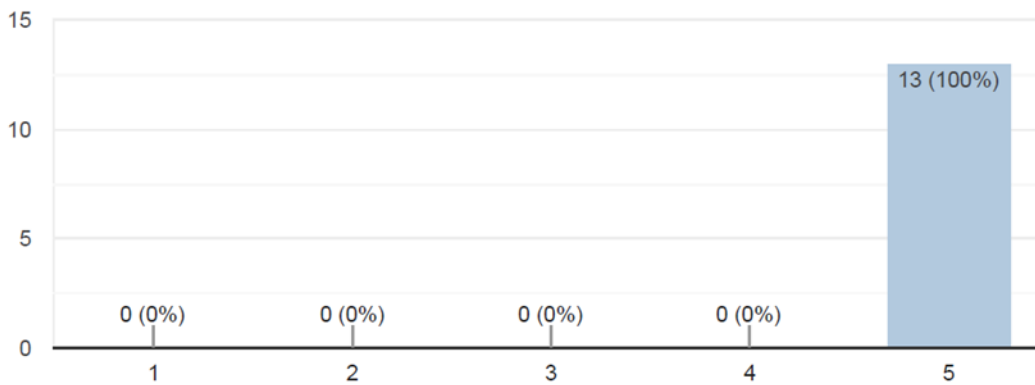


Figure 7-9. Scale of possibility for IoT participants' interaction.

The next question of the survey, asked the participants to provide their own recommendations for improvement of the organizational aspects of the training workshop. The answers are presented in Figure 7-10. Most participants were satisfied with the organization and wouldn't have any changes, while others suggested more time for discussions and more practical assignments based on the topics of the workshop.



Do you have any suggestions or recommendations for improvements of organizational aspects?

13 responses

No

the course was very helpful , with lots of useful information but would have benefitted from being spread over along time period, to give time to absorb all the information properly.

The place

None

No suggestions.. the workshop was organized perfectly

I hoped that more tests would be conducted to address as many essential areas of IoT technology as feasible.

To stick more to the timetable and schedule

Increase the time for practical section for example one day for theoretical part and

Figure 7-10. Suggestions for improvement of IoT workshop organization.

Figure 7-11 shows that 69.2% of the workshop participants found that the information received before the course started, regarding its contents, was satisfying, while only 1 of the participants gave an evaluation of 2/5.

When starting the course, I was well informed about the content of the training workshop.

13 responses

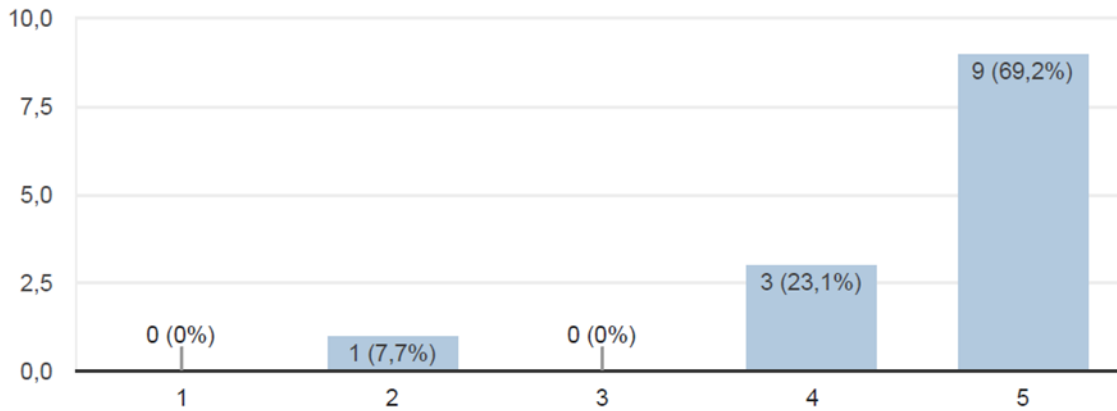


Figure 7-11. Satisfaction scale of the information received regarding the IoT workshop content.

In the next part, the participants were asked to evaluate the usefulness of the information they received during the training workshop. As it can be seen in Figure 7-12, 69.2% of the participants found the skills gained from the workshop to be very useful, while 23.1% gave a high evaluation of 4/5 and 1 participant gave an evaluation of 3/5.

I find the knowledge and skills I received through the training
to be very useful to me.

13 responses

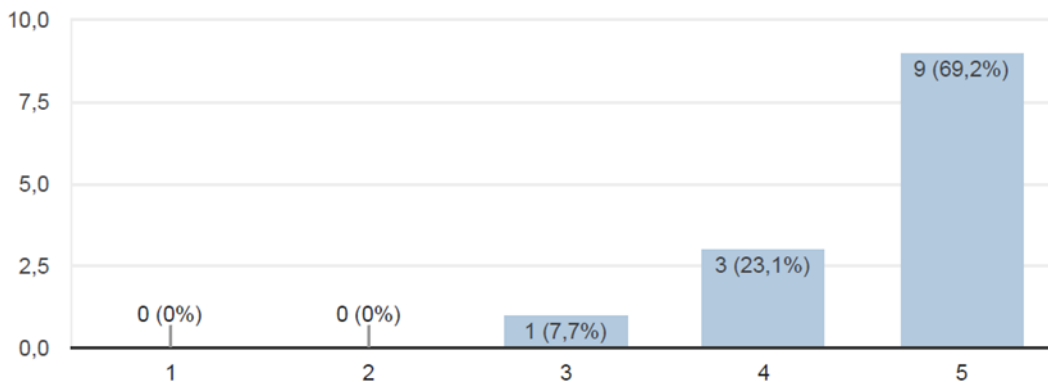


Figure 7-12. Satisfaction scale of the skills gained from the IoT workshop.

In Figure 7-13, it is shown that 46.2% of the participants thought that the case studies gave high value to the course (5/5), while 46.2% gave a high evaluation of 4/5 and 7.7% gave an evaluation of 3/5.

I think the case studies added high value to the course.

13 responses

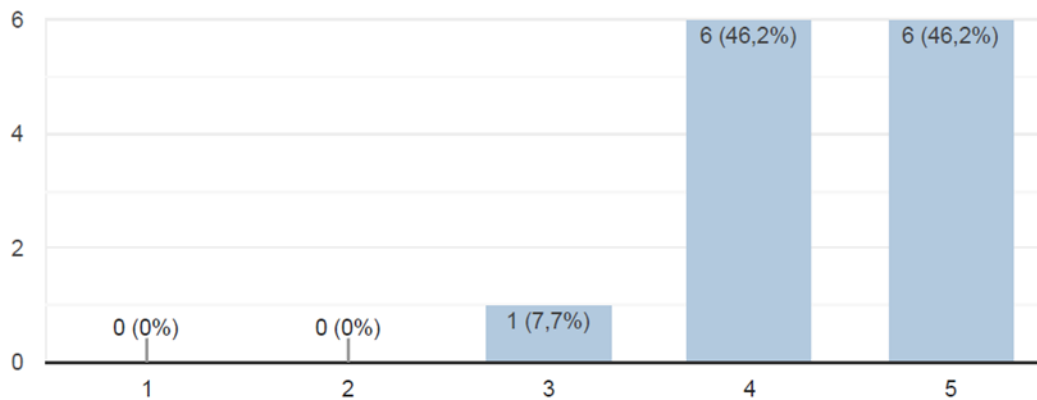


Figure 7-13. Satisfaction scale regarding the value of the IoT case studies.

In the next part, the participants were prompted to evaluate the usefulness of the provided training materials. As it is presented in Figure 7-14, 69.2% of the participants found the material to be very useful, while 23.1% gave it a high evaluation of 4/5 and 1 participant gave an evaluation of 3/5.

I consider the provided training materials to be useful.

13 responses

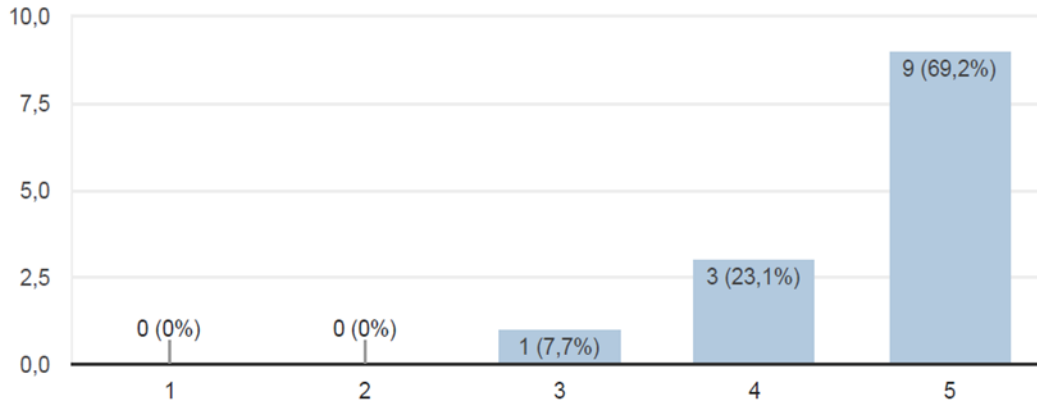


Figure 7-14. Satisfaction scale of the IoT training materials.

Regarding the structure of the training, the results can be seen in the following chart (Figure 7-15). The majority of the participants (76.9%) thought that the structure of the training workshop was very logical and well organized, while 15.4% of the participants gave a high evaluation of 4/5 and only 1 participant gave an evaluation of 2/5.

In my opinion the structure of the training was logical and well organized.

13 responses

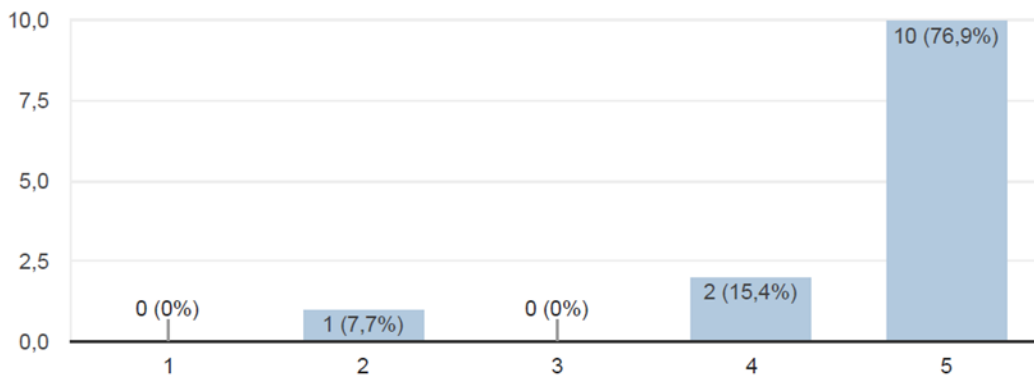


Figure 7-15. Satisfaction scale of the IoT training workshop structure.

Figure 7-16 presents the opinion of the participants regarding the time frame of the training workshop. The majority (46.2%) of the participants gave an evaluation of 4/5, while 38.5% were very satisfied with the time frame. One participant gave an evaluation of 3/5 and one participant was not satisfied with the time frame of the workshop.

The training schedule and time frame were very good.

13 responses

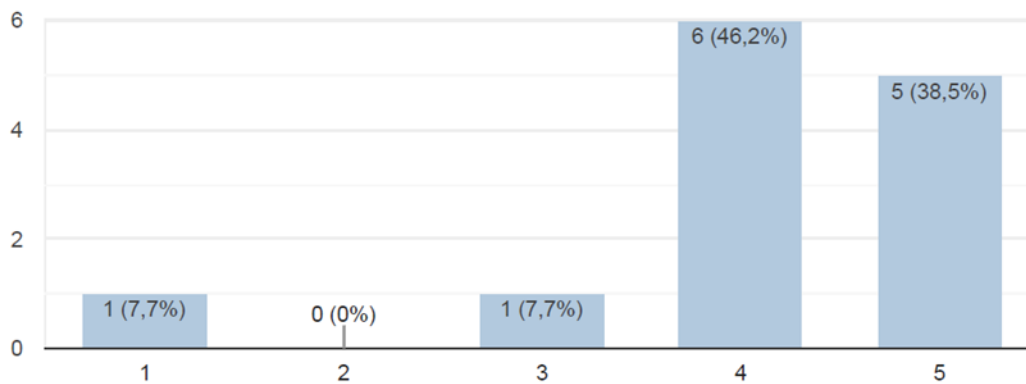


Figure 7-16. Satisfaction scale of the IoT workshop schedule and time frame.

Figure 7-17 presents the participants' opinion regarding the relevance of the training to their level of experience. The majority of the participants found the training to be appropriate for their experience level and gave an evaluation of 4/5 and 5/5, while only 2 participants gave a lower evaluation.

The training was appropriate for my level of experience.

13 responses

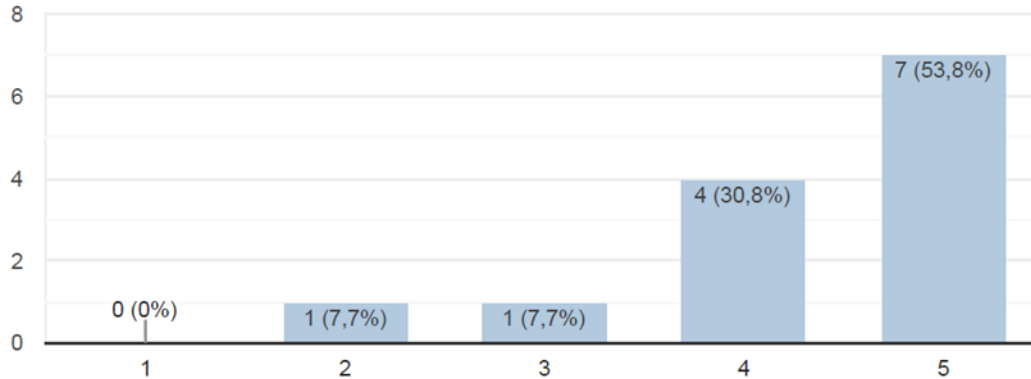


Figure 7-17. Satisfaction scale of the relevance of the IoT workshop to the participant’s level of experience.

The next part asked the participants to evaluate the degree to which the training workshop met their expectations. The majority of the participants (53.8%) gave an excellent evaluation, 5/5, while the rest gave evaluations of 3/5 and 4/5, as it can be seen in Figure 7-18.

The training met my expectations.

13 responses

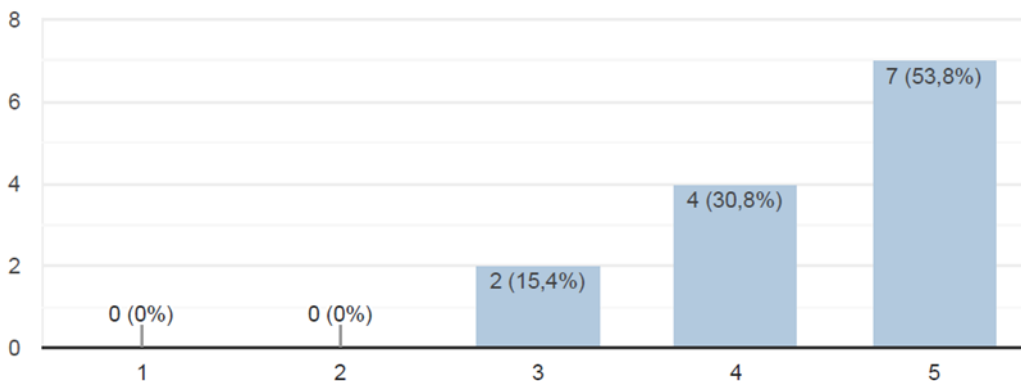


Figure 7-18. Satisfaction scale regarding the IoT participant’s expectations.



In the next part, the participants were asked to mention what they most liked about the training workshop. The answers can be seen in Figure 7-19. The quality of the training materials is something most participants found satisfying, along with the variety of subjects that the workshop covered and the practical examples.

What did you most like about the training? (e.g. innovative approach, quality of training materials, case-based learning methods, ...)

13 responses

all of the above

The case studies

Organization and time management

Innovative approach and compatability of the workshop with recent needs

the practical experimentation.

Case-based

Very useful

The quality of materials

1. Tranies have a good experiance in workshop materials .

2.quality of training .

Figure 7-19. Favorite parts of the IoT training workshop.

Figure 7-20 shows the suggestions that the participants were asked to make, in order to improve the structure, format and material of the training. These suggestions include more practical examples on the subject of IoT, share the material before the workshop and also update the training material.

What can be improved regarding structure, format and material?

13 responses

it was generally good

Sharing the materials before the workshop

Some material needs update and more references need to be included

No such improvement suggestions

it was well presented material

Focusing more on the practical part and not delaying it till the end of the day

Focus on how can connect the microcontroller with local and global network

format

More training in practical side

Figure 7-20. Suggestions for improvement of IoT workshop's structure, format and material.

Figure 7-21 and Figure 7-22 present the satisfaction scale of the participants on whether or not the training raised their interest on the subject and the learning outcomes were reached, respectively. The majority of the participants, in both cases, was fairly satisfied and gave an evaluation of 4/5 and 5/5.

The training raised my interest in the topic.

13 responses

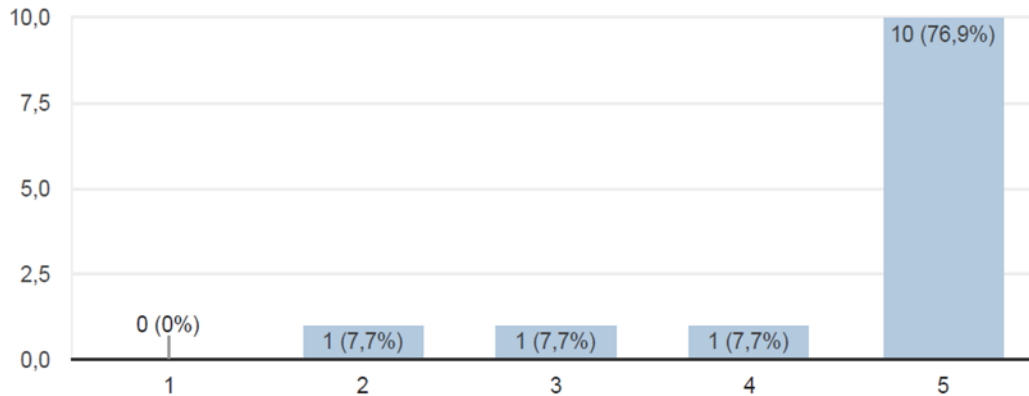


Figure 7-21. Satisfaction scale regarding the participant's interest in the topic of IoT.

I reached the learning outcomes being specified.

13 responses

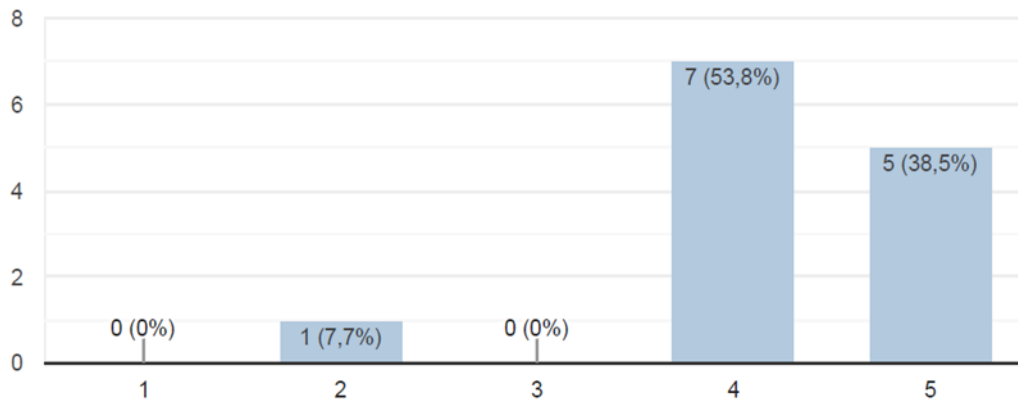


Figure 7-22. Satisfaction scale regarding the learning outcomes on the topic of IoT.

Figure 7-23 shows that most participants found that the knowledge and skills they received from the training workshop will be valuable in their career and future work and gave an evaluation of 5/5 (84.6%).

The knowledge and skills I received in this training are valuable to my work/future career.

13 responses

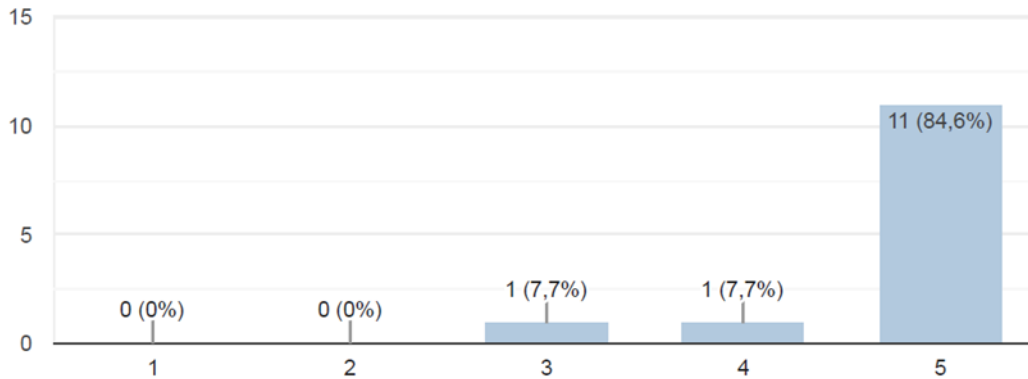


Figure 7-23. Satisfaction scale of the value of IoT skills gained regarding future work.

In the next part, the participants were asked to evaluate the background/introductory information, as it can be seen in Figure 7-24. The majority of them (46.2%) gave a low evaluation of 2/5 and feel that they missed some background information regarding the items of the training workshop. The same number of participants were generally satisfied with the background information providing evaluations from 3/5 to 5/5. This issue can be further addressed to meet the needs of the rest of the group.

I missed some background/introductory information.

13 responses

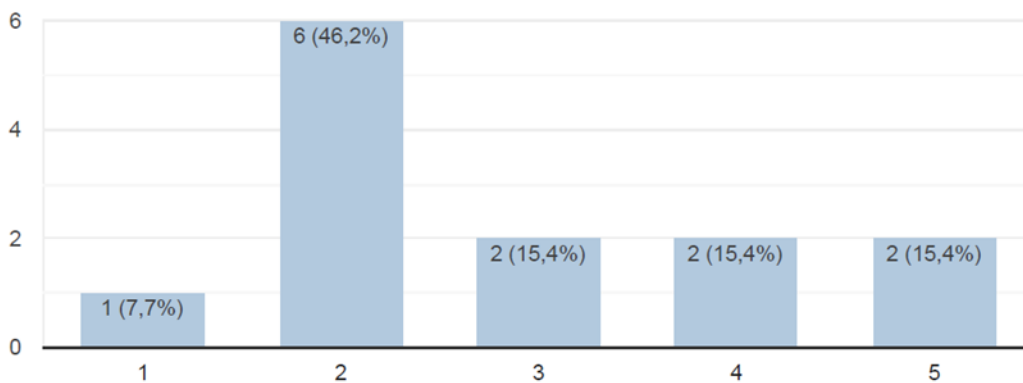


Figure 7-24. Scale of IoT background information that was missed.

Figure 7-25 presents the overall satisfaction of the participants regarding the training workshop. A high percentage of 92.3% gave high evaluations of 4/5 and 5/5, while only one participant gave an evaluation of 3/5. As a result, the training workshop seems to have met its objectives and pleased the participants.

How satisfied are you with the training workshop?

13 responses

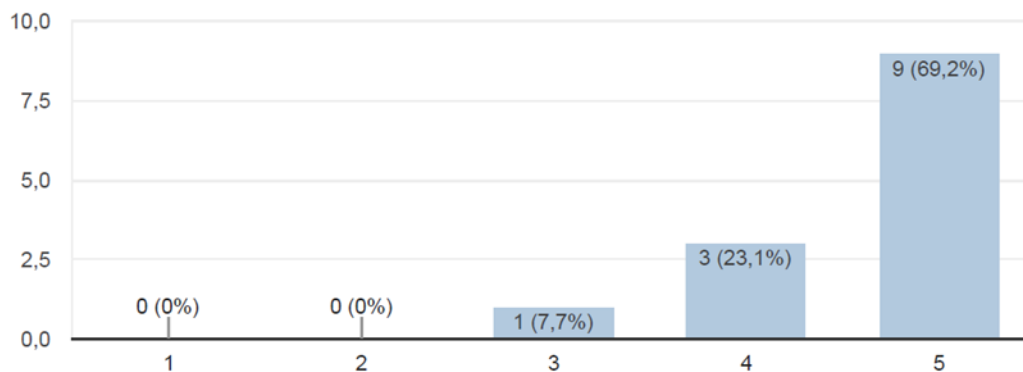


Figure 7-25. Overall satisfaction scale of the IoT training workshop.

In Figure 7-26, 23.1% of the participants said that they didn't recognize any major differences between the IoT workshop and other training workshops.

Have you recognized differences as compared to other trainings?

13 responses

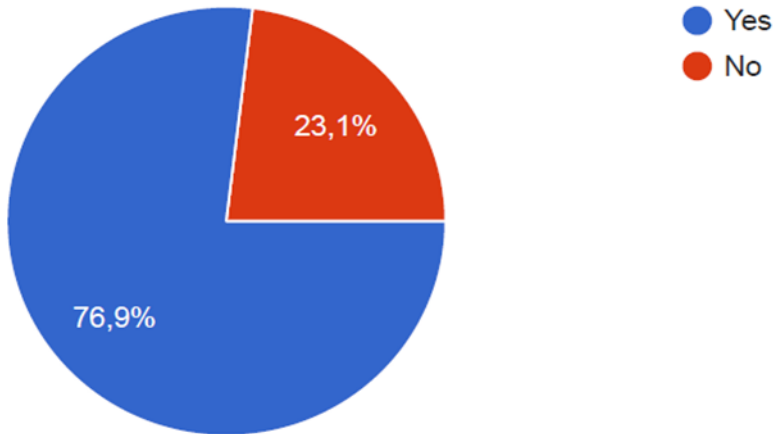


Figure 7-26. Differences between the IoT workshop and other trainings.

In the next part, as can be seen in Figure 7-27, most of the participants concluded that the training workshop was well organized and presented and it included useful material and subjects.



Please provide an over contribution about the training workshop.

13 responses

I don't have any suggestions

Practical skills

IoT security issues and challenges need did not receive sufficient attention

Working together in the IOT lab is available at any time either in King hussain university or Isra university

The contribution, in my perspective, is in figuring out how to connect microcontroller systems to the Internet, as well as the mechanisms for communicating with, controlling, and even programming them remotely.

Became familiar with iot software and websites

A

No

Figure 7-27. Over contributions about the IoT training workshop.



Please list the new concepts/skills/topics you have learned from the training workshop.

13 responses

It was my first time to use the Arduino and Raspberry pi and to know how to programmed it ,use it and to control things through it.
I also learnt more about the internet networks and the protocols related to it.

Wireless communication and protocols

concepts pertaining to wireless communication such as transmission modes

Cloud connection , actuator control , python programming, wireless technologies

how to deal with AWS.IDE and other IDEs.
how to deal with raspberry pi under IoT protocols.

IoT softwares and websites, and how to create accounts

Deal with rasparypi

arduino

Figure 7-28. New skills learned from the IoT training workshop.

The skills gained by the participants are mentioned in Figure 7-28. Most of the participants gained knowledge regarding the IoT fundamentals and concepts, while they learned about the IoT architecture, technological advances, protocols sensors and programming, among other things.

7.2. CS Training Workshop

The analysis of the answers to the questions of the survey, regarding the CS training workshop, is provided in the following figures. The first questions, depicted in Figure 7-29 to Figure 7-33, refer to the participants' personal details.

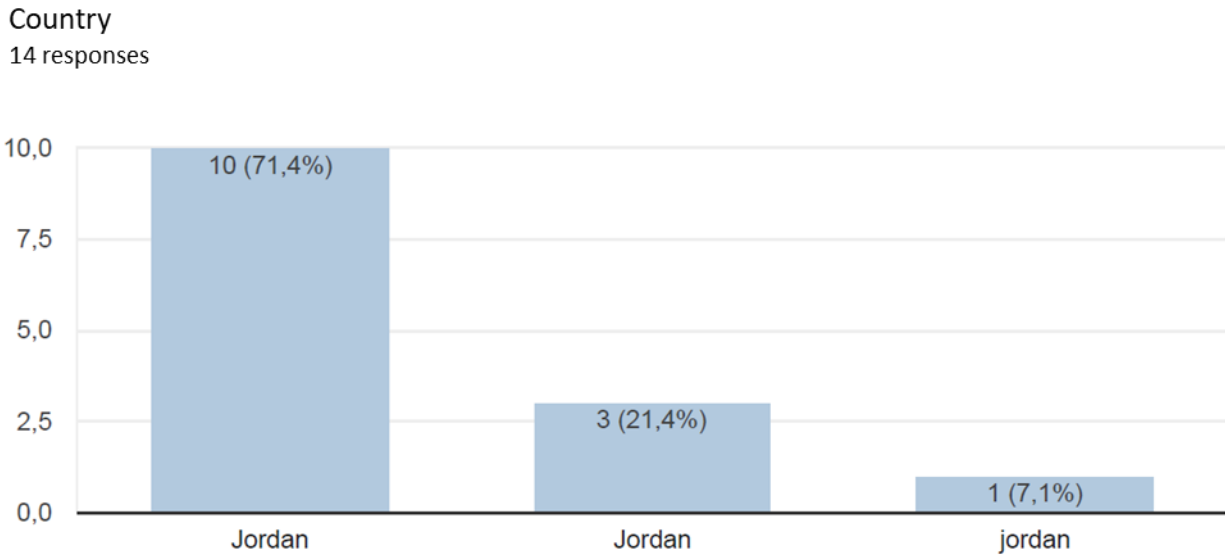


Figure 7-29: Country distribution of the CS training workshop participants.

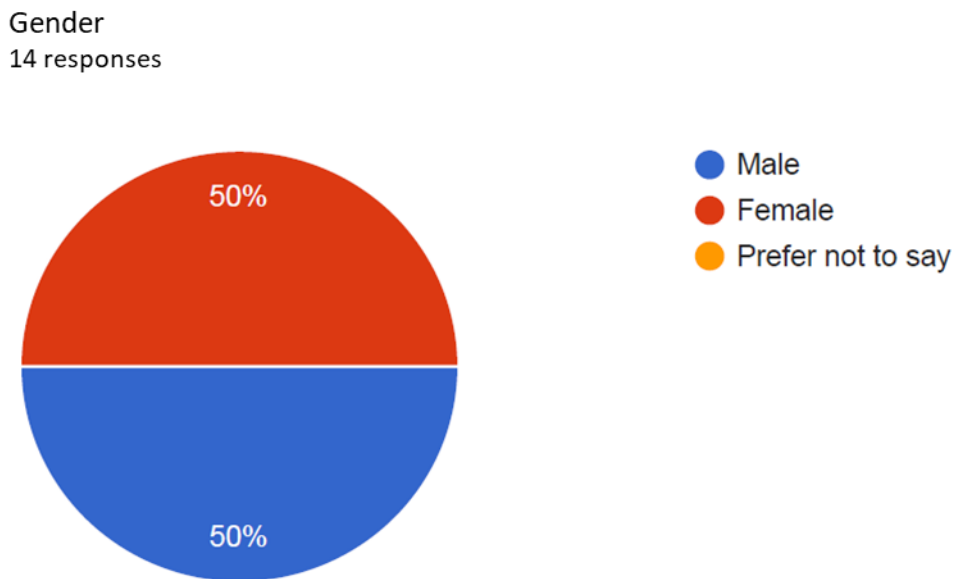


Figure 7-30: Gender distribution of the CS training workshop participants.

Age

14 responses

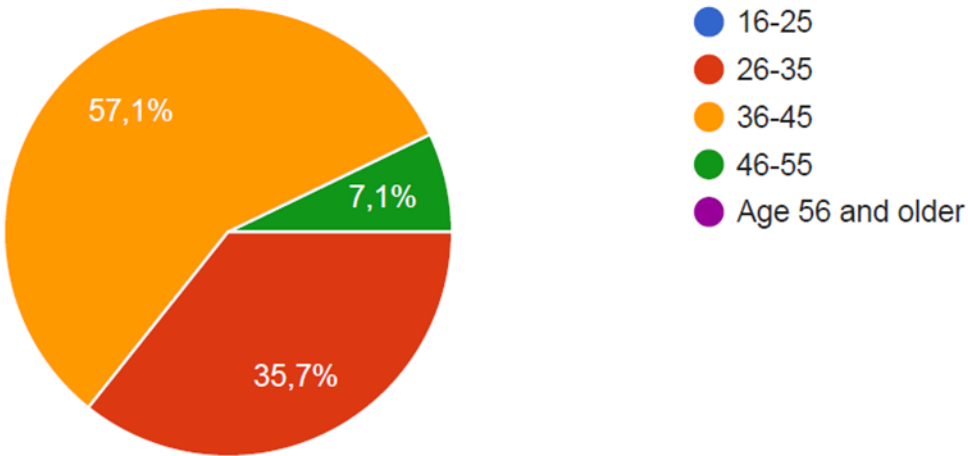


Figure 7-31: Age distribution of the CS training workshop participants.

Position

14 responses

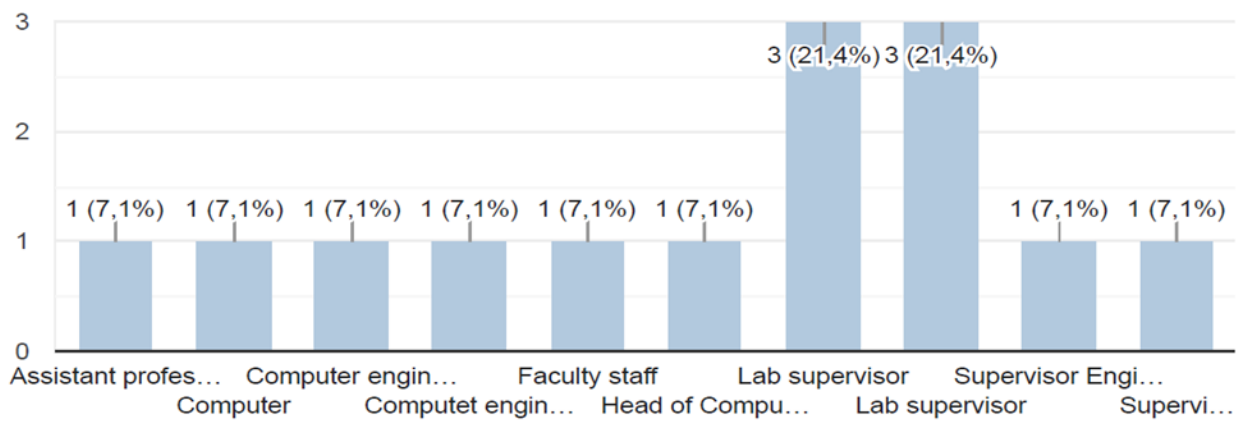


Figure 7-32: Position distribution of the CS training workshop participants.



Work Field

14 responses

computer engineer

Education

Network computer/microprocessor /cyber security

Communication engineer

Mechatronics Engineering

Computer engineering

Computer engineering

Engineering

Communication lab engineer

Figure 7-33: Work fields of the CS training workshop participants.

Figure 7-34 presents the participants' motivation for taking part in the CS training workshop. Many participants were interested in learning more about cyber security because they are involved in teaching relevant courses. All participants in general found the subject intriguing and were interested in broadening their knowledge on it.



Work Field

14 responses

Cyber security

Skills improvement

Learning Cyber security

Learning, training and improvement

Because the cyber security is useful methods to make a strong privacy on our information.

To improve security and data protection over the cyber

To improve myself and my job

Like to learn in this topics

The rise of this concept nowadays, the importance of keeping the data, knowing the

Figure 7-34: Motivation for participation in the CS training workshop.

Figure 7-35 presents the satisfaction scale of the participants, regarding the organization of the training by the organizing institution. The participants were satisfied with the organization of the training action giving evaluations of 4/5 and 5/5.

Organization of the training on behalf of the organizing institution (e.g. registration platform, contact with the organizer, proper communication about training details, ...).

14 responses

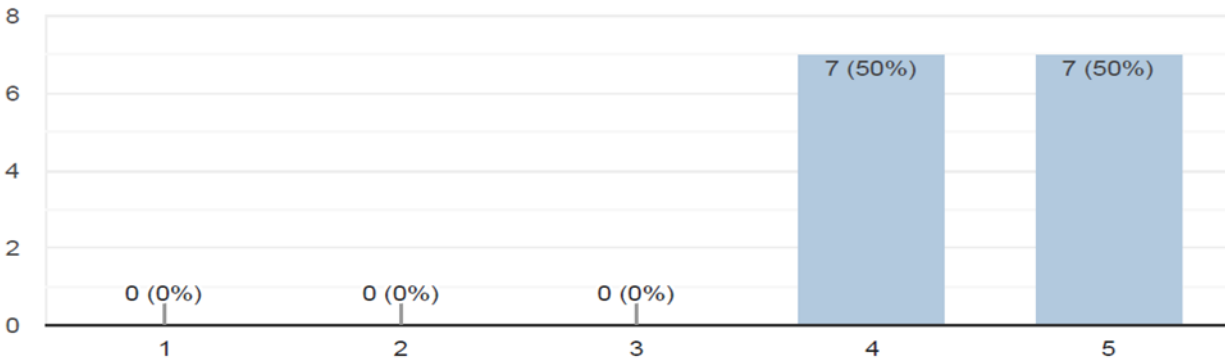


Figure 7-35: Satisfaction scale of the CS workshop organization by the organizing institution.

Regarding the functionality of the conference tools and software that were used, the majority of the participants were very satisfied and gave high evaluations of 4/5 and 5/5 (Figure 7-36) while only two participants gave evaluations of 2/5. These tools include video, sound and other technical aspects.

Functionality of conference tool and software used (video, sound, other technical aspects, ...).

14 responses

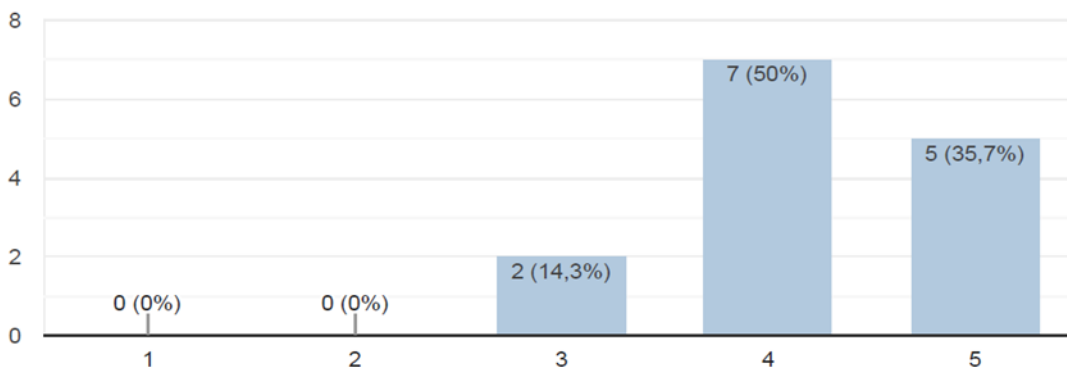


Figure 7-36: Satisfaction scale of the CS workshop's tools and software used.

In Figure 7-37, the majority of participants found the possibility to exchange and interact with the tutors and the other participants, to be quite satisfying, while one participant gave an evaluation of 3/5 on this subject.

Possibility to exchange and interact with tutor(s) and other participants (forums, sessions for discussion, Q&A, ...).

14 responses

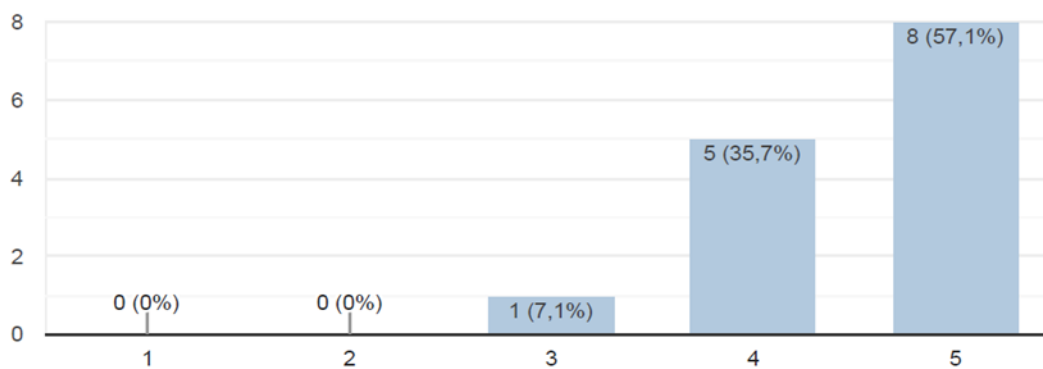


Figure 7-37: Scale of possibility for CS participants' interaction.

Figure 7-38 shows the suggestions and recommendations made by the workshop participants, in order to improve the organizational aspects of the training. Some of the suggestions include more practical examples on the subject of cyber security.



Do you have any suggestions or recommendations for improvements of organizational aspects?

14 responses

No

Intensive training if possible

No comment

Cyber security have a full of information, I suggest to increase the period of this workshop

Make another workshop

More focusing on practical parts

Record the sessions

No suggestions,,,

- The duration of the workshop was insufficient to cover the topic comprehensively

Figure 7-38: Suggestions for improvement of CS workshop organization.

In Figure 7-39, the majority of the participants answered that they were well informed about the training workshop content, while only one participant gave a low evaluation of 3/5.

When starting the course, I was well informed about the content of the training workshop.

14 responses

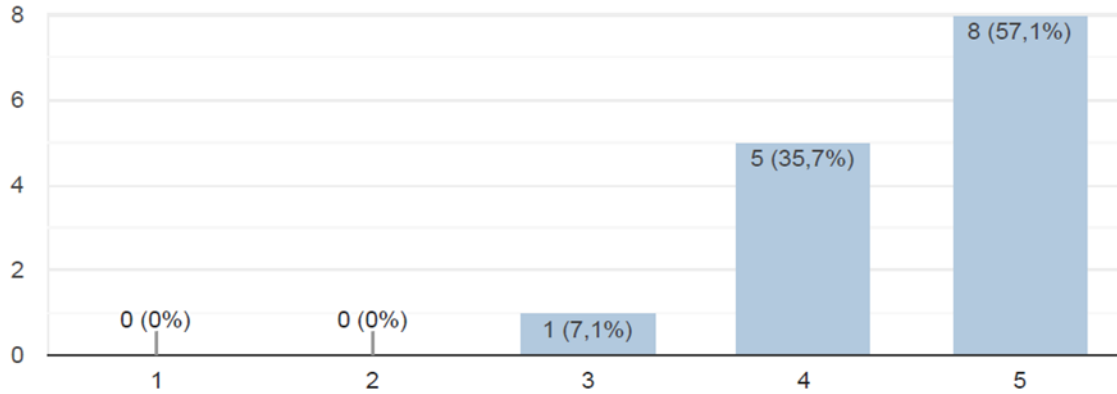


Figure 7-39: Satisfaction scale of the information received regarding the CS workshop content.

Figure 7-40 presents the satisfaction scale, regarding the knowledge and skills received through the training. Around 93% of the participants found that the skills gained through the training workshop will be very useful to them.

I find the knowledge and skills I received through the training
 to be very useful to me.

14 responses

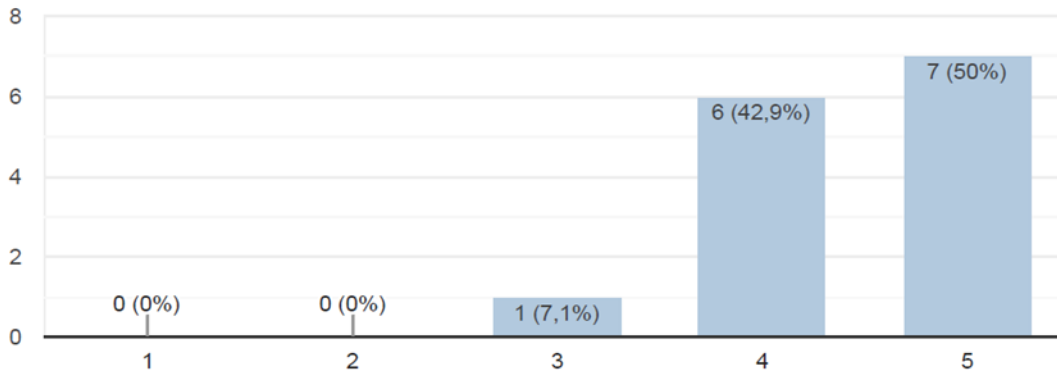


Figure 7-40: Satisfaction scale of the skills gained from the CS workshop.

In Figure 7-41, 15 participants found that the case studies added high value to the course, while 1 of them gave an evaluation of 3/5.

I think the case studies added high value to the course.

14 responses

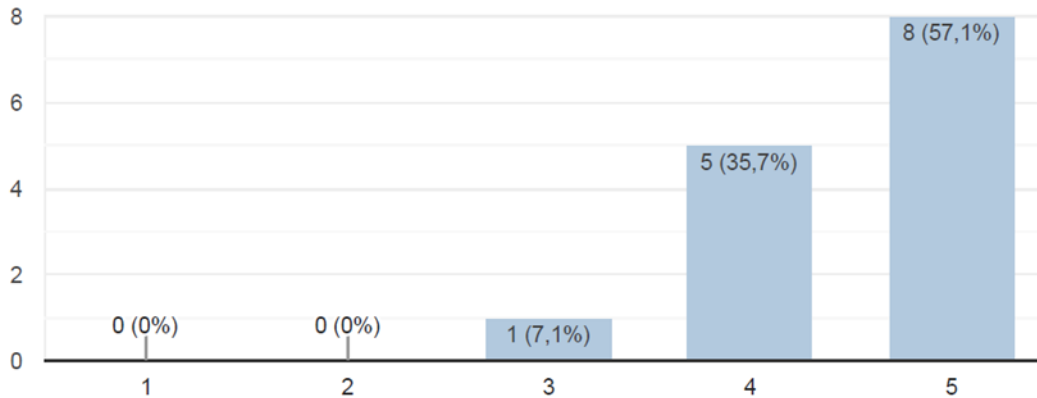


Figure 7-41: Satisfaction scale regarding the value of the CS case studies.

The majority of the participants found the training materials to be very useful and they found the structure of the training logical and well organized (Figure 7-42 and Figure 7-43, respectively).

I consider the provided training materials to be useful.

14 responses

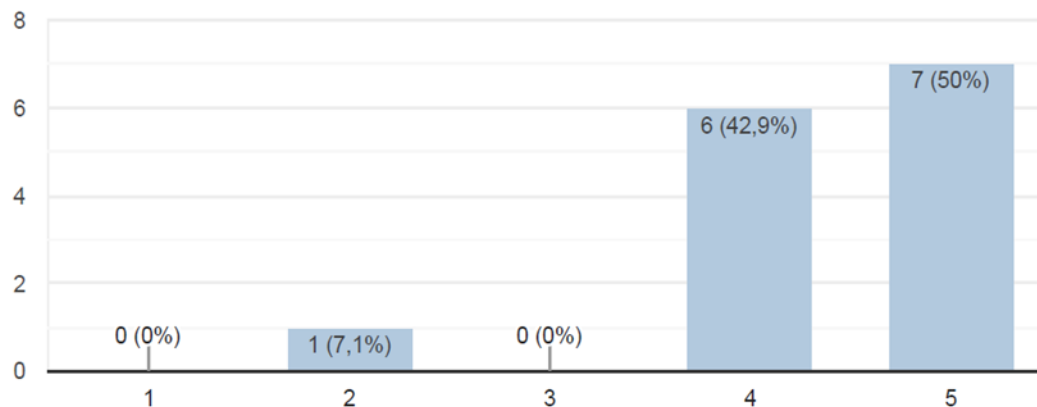


Figure 7-42: Satisfaction scale of the CS training materials.

In my opinion the structure of the training was logical and well organized.

14 responses

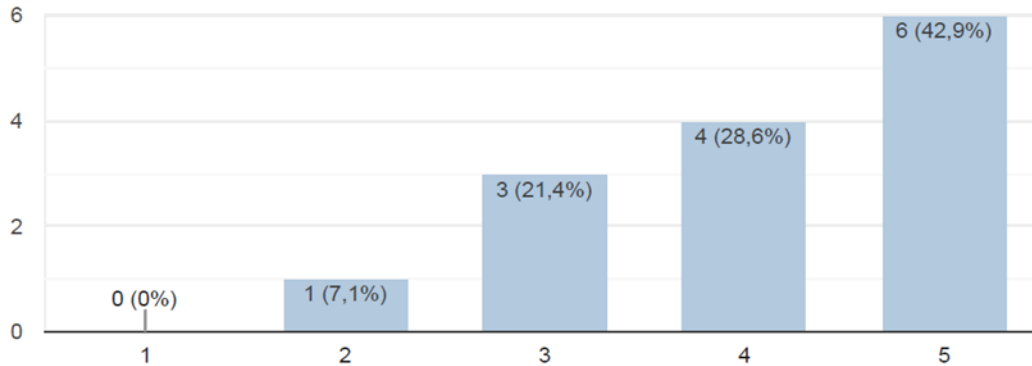


Figure 7-43: Satisfaction scale of the CS training workshop structure.

In Figure 7-44, the majority of the participants were satisfied with the schedule of the training and the time frame, while 4 participants gave a lower evaluation of 2/5 and 3/5.

The training schedule and time frame were very good.

14 responses

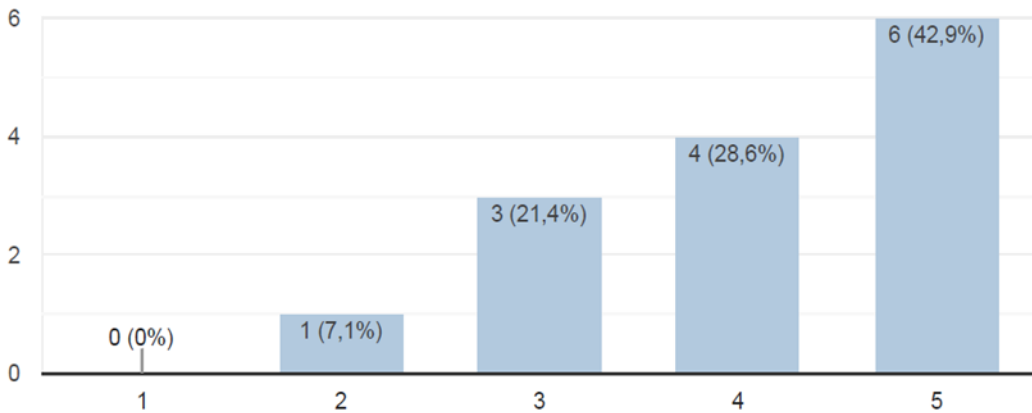


Figure 7-44: Satisfaction scale of the CS workshop schedule and time frame.

Figure 7-45 shows that 13 out of the 14 participants found that the training was appropriate for their level of experience.

The training was appropriate for my level of experience.

14 responses

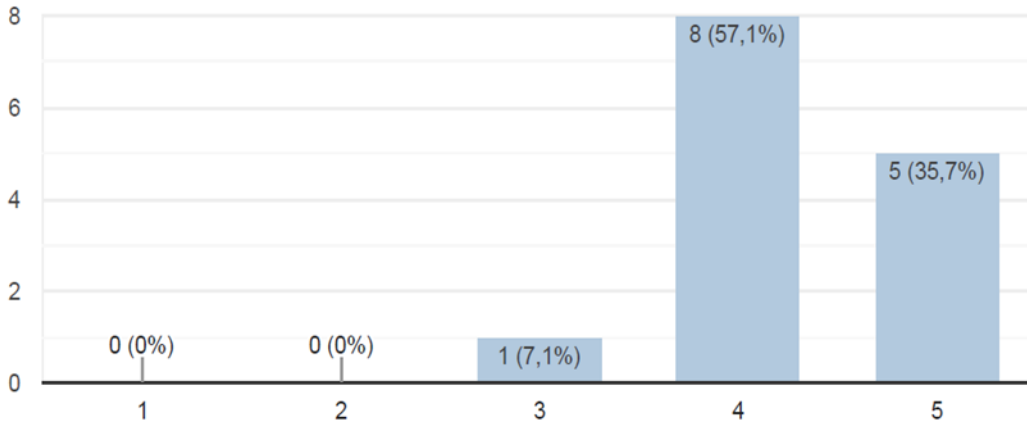


Figure 7-45: Satisfaction scale of the relevance of the CS workshop to the participant’s level of experience.

Figure 7-46 shows the satisfaction scale regarding the expectations of the participants. The majority gave a high evaluation of 4/5 and 5/5, suggesting that the training met their expectations, while 5 participants gave lower evaluations of 2/5 and 3/5.

The training met my expectations.

14 responses

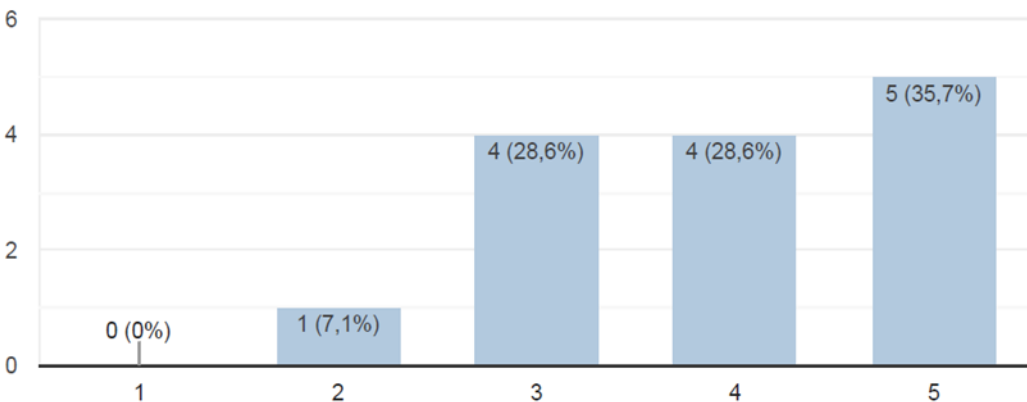


Figure 7-46: Satisfaction scale regarding the CS participant’s expectations.

In the next question of the survey, the participants were asked to mention the parts of the training that they liked best and the answers are presented in Figure 7-47. The quality of the training materials was highly appreciated by the majority of the participants, while the organization and the content of the training workshop were also among their favorite parts.

What did you most like about the training? (e.g. innovative approach, quality of training materials, case-based learning methods, ...)

14 responses

Innovative approach

Material

Case -based learning

quality of training materials

Subjects that involved in the workshop

Quality of training materials

Case-based learning methods

Quality of training materials

The course material and the trainers experience in this topic

Figure 7-47: Favorite parts of the CS training workshop.

Figure 7-48 presents the suggestions, made by the participants, for improvement of the workshop's structure, formal and material. Some participants believe that the material could be reduced a little, while others suggest that more practical examples were added for better understanding of the material.



What can be improved regarding structure, format and material?

14 responses

Structure

format and material

Add more practical topics

More details

NA

Material

Improve the structure

Upload all materials and software used to the server, so it will be available to use later.

Sharing the main (instructor) screen to the audience via there PCs

Figure 7-48: Suggestions for improvement of CS workshop's structure, format and material.

Figure 7-49 and Figure 7-50 show that the majority of the participants found that the training raised their interest in the topic and they reached the learning outcomes that were specified, respectively.

The training raised my interest in the topic.

14 responses

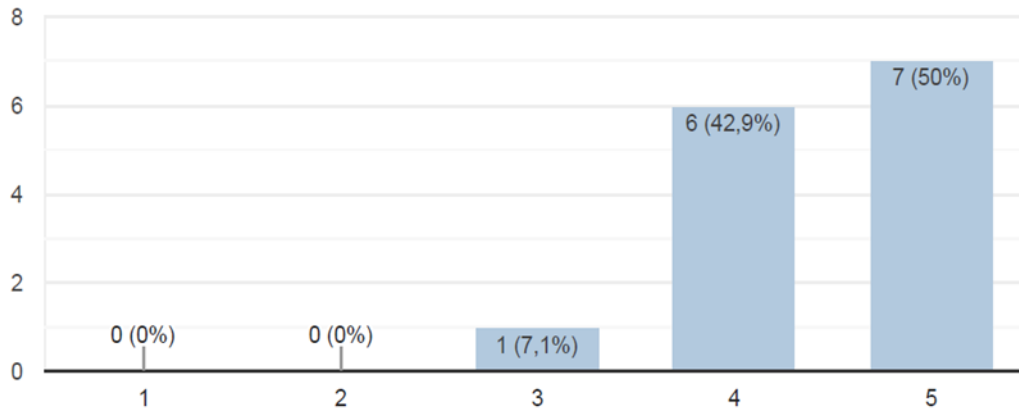


Figure 7-49: Satisfaction scale regarding the participant's interest in the topic of CS.

I reached the learning outcomes being specified.

14 responses

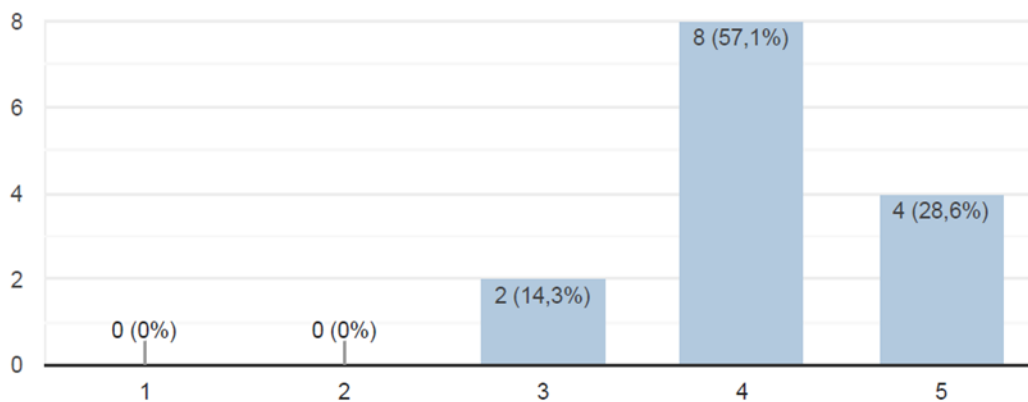


Figure 7-50: Satisfaction scale regarding the learning outcomes on the topic of CS.

In Figure 7-51, it can be observed that most of the participants believe that the knowledge and skill, gained in the training, will be valuable in their future work.

The knowledge and skills I received in this training are valuable to my work/future career.

14 responses

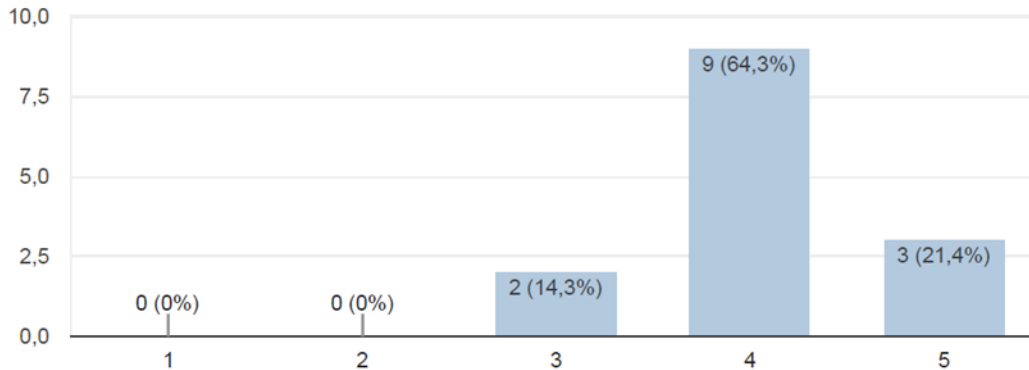


Figure 7-51: Satisfaction scale of the value of CS skills gained regarding future work.

Figure 7-52 shows that around 35.7% of the participants thought they missed some background information regarding the content of the training workshop giving evaluations lower than 3/5. The 35.7% of the participants were very satisfied with the introductory information, however, this issue could be further addressed to cover the needs of the rest of the participants.

I missed some background/introductory information.

14 responses

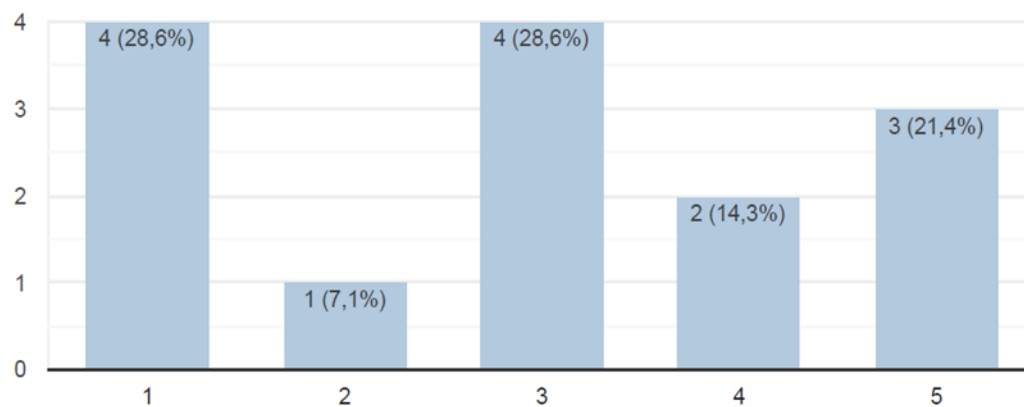


Figure 7-52: Scale of CS background information that was missed.

Almost all participants were very satisfied with the training (Figure 7-53), while around 64.3% of them recognized differences when compared to other trainings (Figure 7-54).

How satisfied are you with the training workshop?

14 responses

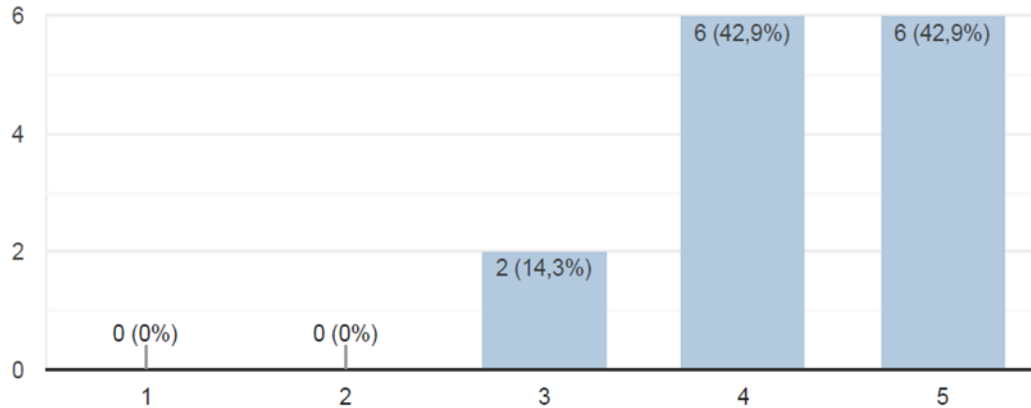


Figure 7-53: Overall satisfaction scale of the CS training workshop.

Have you recognized differences as compared to other trainings?

14 responses

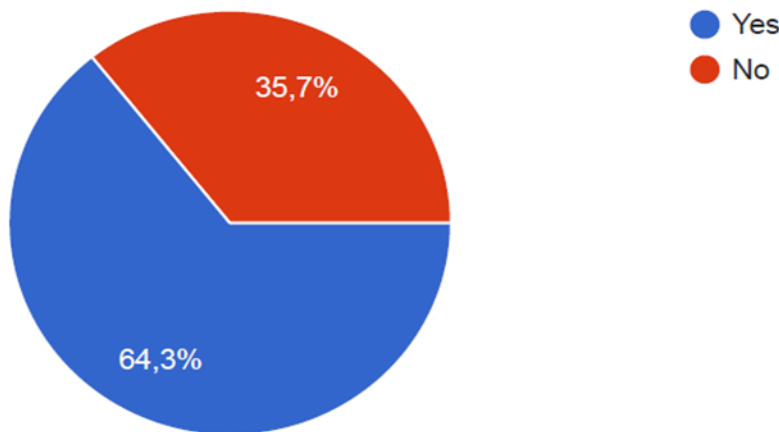


Figure 7-54: Differences between the CS workshop and other trainings.

Most participants found the training to be very interesting and informative on the subject of cyber security, while they felt the need for more practical applications (Figure 7-55).



Please provide an over contribution about the training workshop.

14 responses

Give me more information about cyber security

Learn university students the security skills

Me need more order about details

NA

Knowing about the military security

I will share the information and skills with my students

Share this informations with my students

More practice sessions

Allocate more time to focus on the details more.

Figure 7-55: Over contributions about the CS training workshop.

They skills that they have learned through the training include infrastructure on cyber security, networking fundamentals, cryptography principles, security protocols and many more (Figure 7-56).



Please list the new concepts/skills/topics you have learned from the training workshop.

14 responses

Give me more information about cyber security

Password cracking

More security topics

Securing Network Components

Securing Communication Channels

1. How to know if the website is strong or not

2. How to access and know the password of secured computers

I learned about data protection and vm

Intrusion detection and prevention

More practical examples to the skills and tools

Figure 7-56: New skills learned from the CS training workshop.

7.3. RE Training Workshop

The analysis of the answers to the survey, provided by the participants of the RE training workshop, are presented in the following figures.

Figure 7-57 to Figure 7-61 present the personal details of the training's participants.

Country
 12 responses

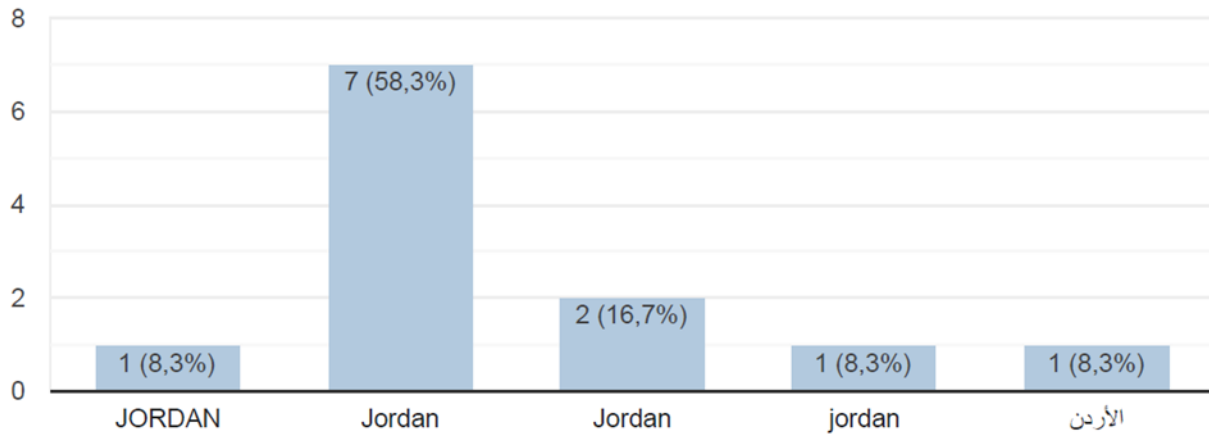


Figure 7-57: Country distribution of the RE training workshop participants.

Gender
 12 responses

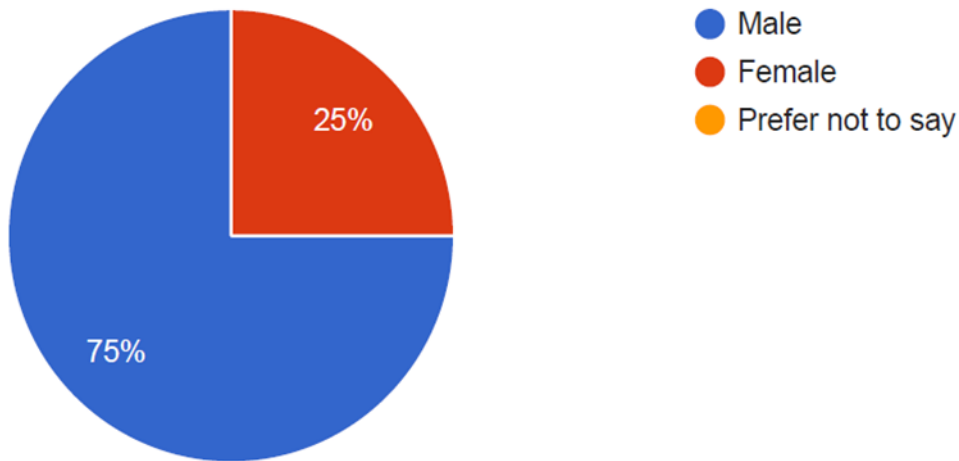


Figure 7-58: Gender distribution of the RE training workshop participants.

Age
12 responses

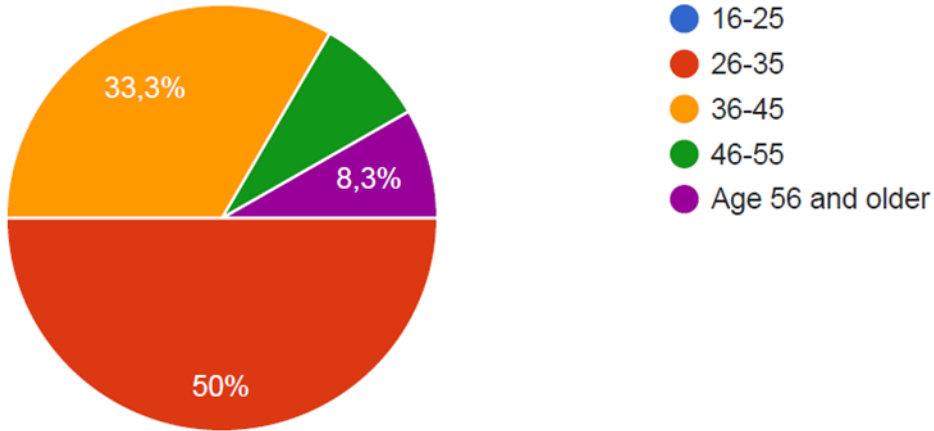


Figure 7-59: Age distribution of the RE training workshop participants.

Position
12 responses

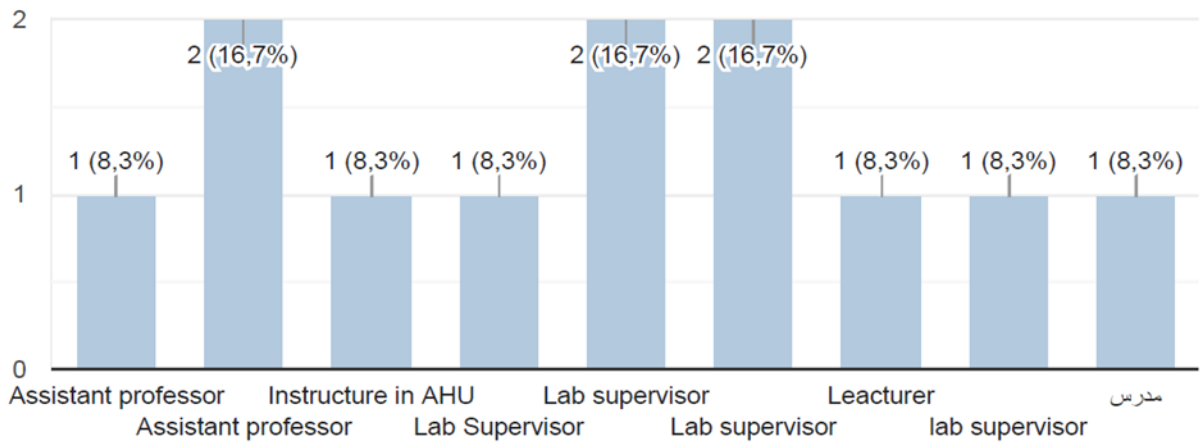


Figure 7-60: Position distribution of the RE training workshop participants.

Work Field

12 responses

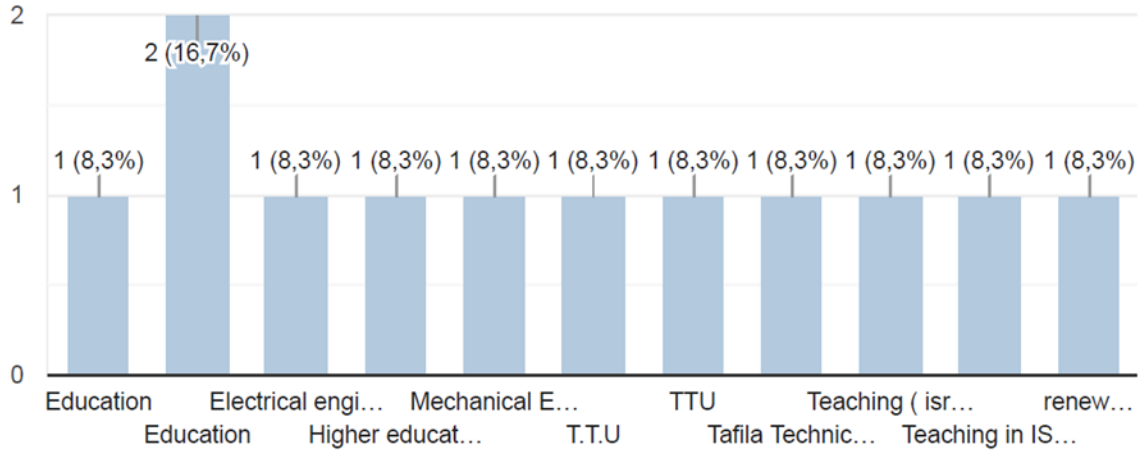


Figure 7-61: Work fields of the RE training workshop participants.

Figure 7-62 shows the different motivating reasons for taking part in the RE training workshop. Most participants were interested in increasing their knowledge on renewable energy sources and applications, while others are involved in teaching RE courses and found the training helpful and informative.



What is your motivation to take part in this training workshop?

12 responses

To learn new knowledge and practical skills

Training on Renewable energy

Learning more about RE

learning more about renewable energy

for learning

To learn more about RE and to improve the educational process in this field

الخلايا الشمسية
تورباين الرياح

Interested in RE training and increased in my experience

Interested in RE. Improving my experts in the field

Figure 7-62: Motivation for participation in the RE training workshop.

All participants were satisfied with the organization of the training on behalf of the organizing institution and gave high evaluations of 4/5 and 5/5, as it can be observed in Figure 7-63.

Organization of the training on behalf of the organizing institution (e.g. registration platform, contact with the organizer, proper communication about training details, ...).

12 responses

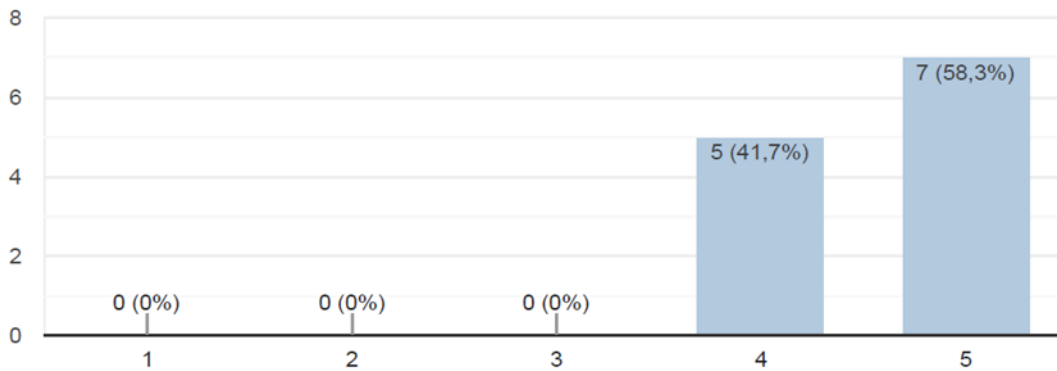


Figure 7-63: Satisfaction scale of the RE workshop organization by the organizing institution.

The majority of the participants also gave high evaluations, regarding the functionality of the conference tools and software that was used (Figure 7-64).

Functionality of conference tool and software used (video, sound, other technical aspects, ...).

12 responses

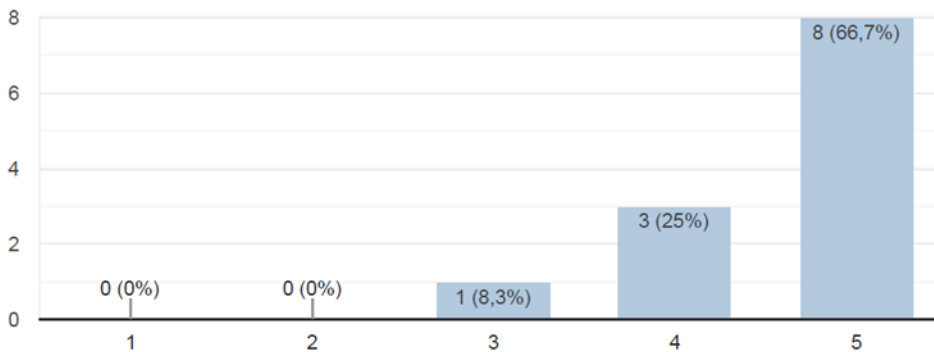


Figure 7-64: Satisfaction scale of the RE workshop's tools and software used.

In Figure 7-65, it can be observed that all participants gave high evaluations (4/5 and 5/5) regarding the possibility to interact with the tutors and other participants, in the form of forums or sessions for discussion during the training.

Possibility to exchange and interact with tutor(s) and other participants (forums, sessions for discussion, Q&A, ...).

12 responses

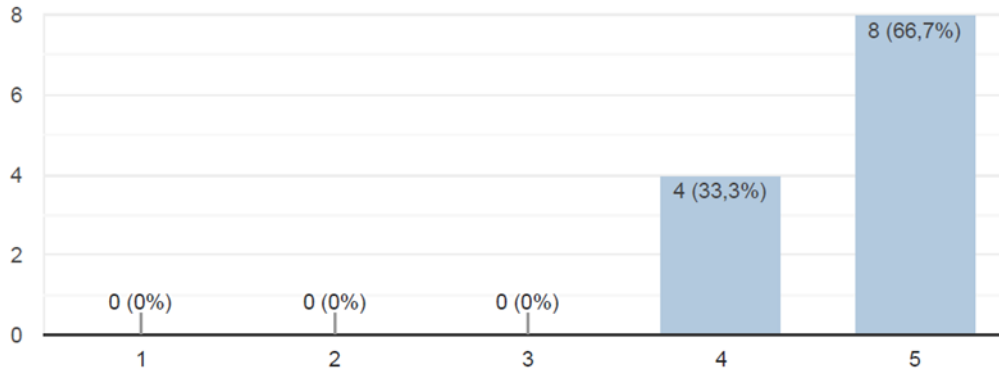


Figure 7-65: Scale of possibility for RE participants' interaction.

In the next question of the survey, the participants were asked to make suggestions in order to improve the organizational aspects of the training. The answers can be seen in Figure 7-66. Most of them were very satisfied with the training and didn't have anything to add regarding the organization, while others the training to be extended to more days including invitations to more speakers.



Do you have any suggestions or recommendations for improvements of organizational aspects?

12 responses

No

Nothing

increase the period of workshop

The workshop needs more days

γ

I hope taken more time in next training

/

Extend the workshop to three days and invite other speakers

Figure 7-66: Suggestions for improvement of RE workshop organization.

Most of the participants were satisfied with the information they had received about the content of the workshop, prior to the beginning of the training (Figure 7-67).

When starting the course, I was well informed about the content of the training workshop.

12 responses

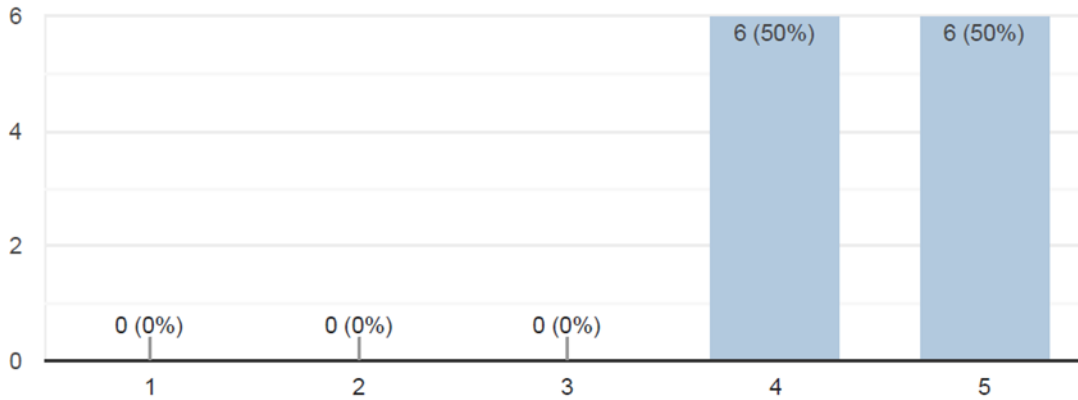


Figure 7-67: Satisfaction scale of the information received regarding the RE workshop content.

A high majority of the participant gave high evaluations (4/5 and 5/5) regarding the knowledge and skills they received through the training and their usefulness while only one participant gave an evaluation of 3/5 (Figure 7-68).

I find the knowledge and skills I received through the training
to be very useful to me.

12 responses

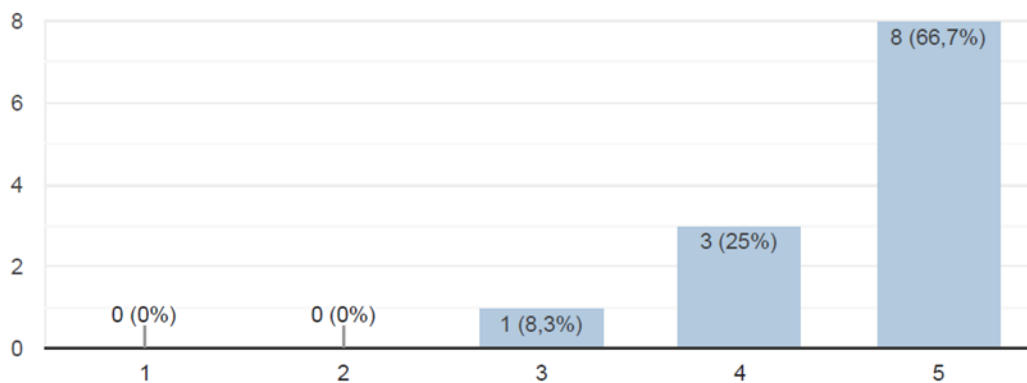


Figure 7-68: Satisfaction scale of the skills gained from the RE workshop.

Almost all participants found the case studies to add high value to the training. Only one participant gave an evaluation of 3/5 (Figure 7-69).

I think the case studies added high value to the course.

12 responses

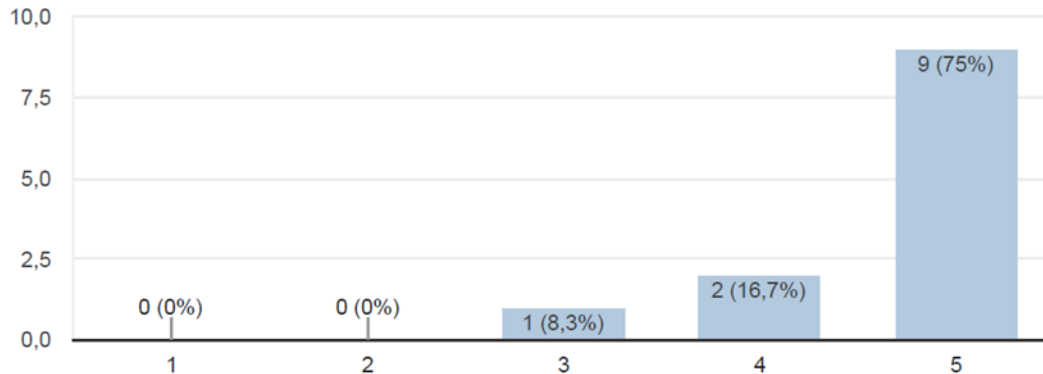


Figure 7-69: Satisfaction scale regarding the value of the RE case studies.

Regarding the usefulness of the materials that were provided in the training, the majority of the participants were very satisfied and gave high evaluations, as it can be observed in Figure 7-70.

I consider the provided training materials to be useful.

12 responses

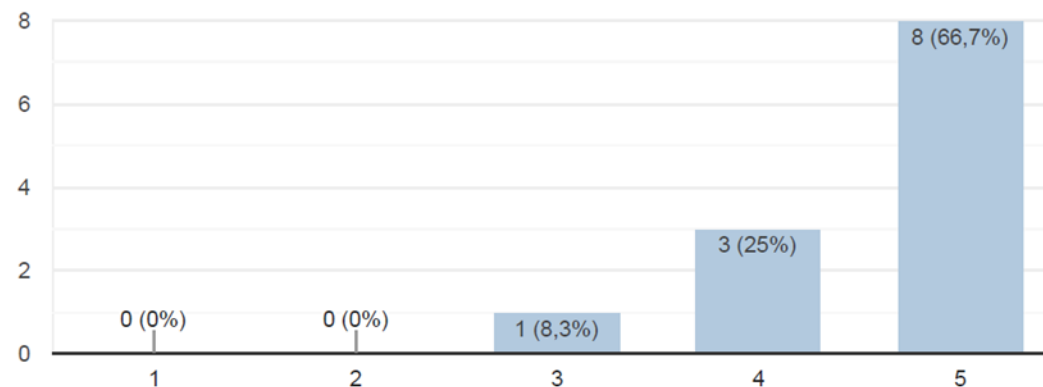


Figure 7-70: Satisfaction scale of the RE training materials.

Figure 7-71 and Figure 7-72 show the satisfaction scale of the participants, regarding the structure of the training and its schedule and time frame, respectively. The participants were satisfied in regards to all these aspects and 3 participants gave an evaluation of 3/5, when the time frame of the training was concerned.

In my opinion the structure of the training was logical and well organized.

12 responses

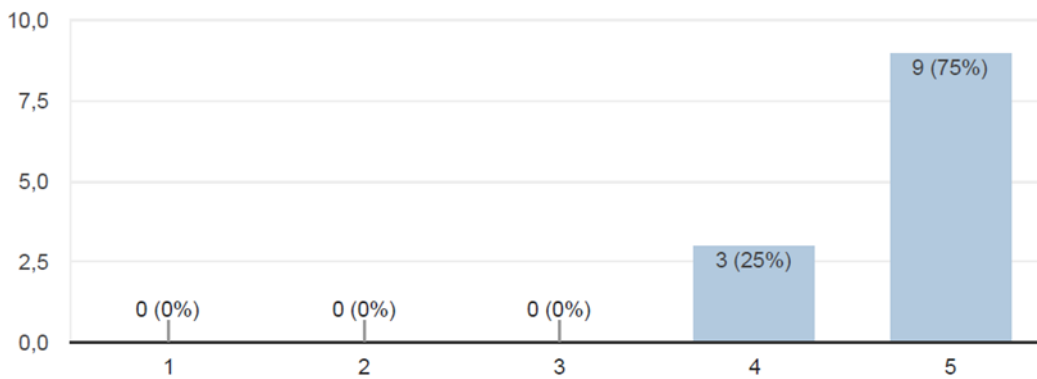


Figure 7-71: Satisfaction scale of the RE training workshop structure.

The training schedule and time frame were very good.

12 responses

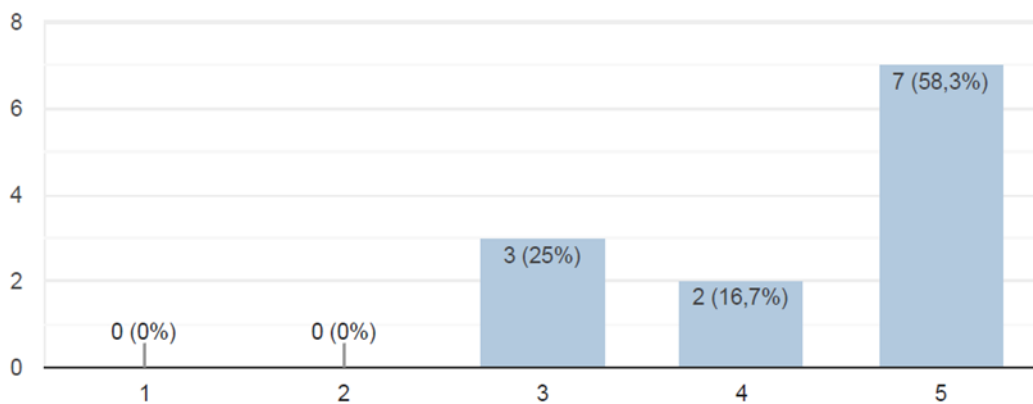


Figure 7-72: Satisfaction scale of the RE workshop schedule and time frame.

Most of the participants though that the training was appropriate to their level of expertise and gave evaluations of 4/5 and 5/5 while 2 participants gave an evaluation of 3/5 (Figure 7-73).

The training was appropriate for my level of experience.

12 responses

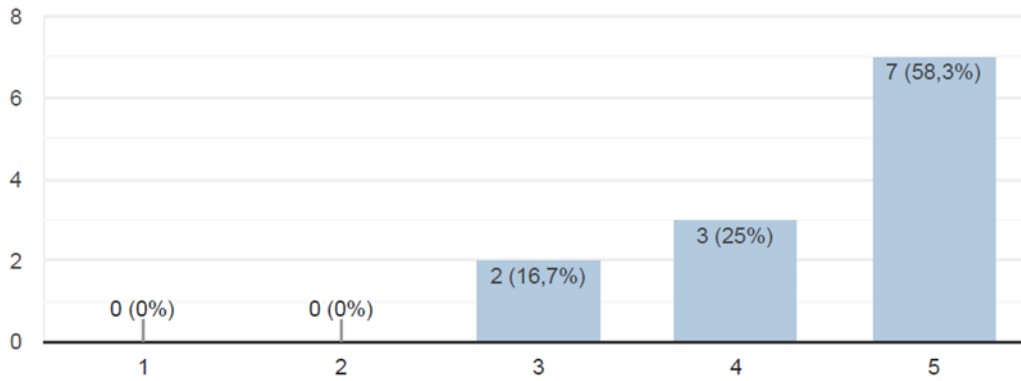


Figure 7-73: Satisfaction scale of the relevance of the RE workshop to the participant's level of experience.

The majority of them also stated that the training met their expectations with 4 participants giving an evaluation of 3/5 (Figure 7-74).

The training met my expectations.

12 responses

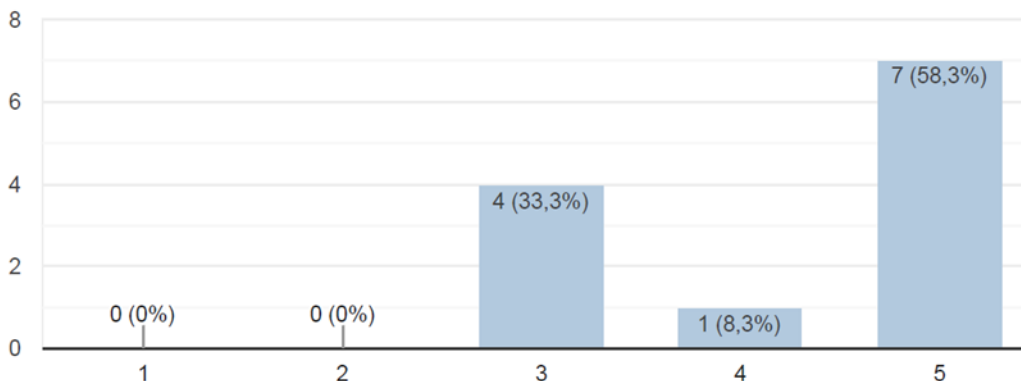


Figure 7-74: Satisfaction scale regarding the RE participant's expectations.

Figure 7-75 lists the parts of the training workshop that the participants liked best. The quality of the training materials, the experience of the training's speakers and the innovative approaches are among the participants' favorite parts.

What did you most like about the training? (e.g. innovative approach, quality of training materials, case-based learning methods, ...)

12 responses

Case-based learning methods

Organization and topics and speakers

Quality of training

all of them

Threads

Trainers ability and aquality of training materials.

تَقْرِيْبًا

Learning methods

The training material specially the courses slides

Figure 7-75: Favorite parts of the RE training workshop.

The suggestions made by the participants in order to improve the training's structure, format, quality and material, include more practical exercises and more invitations of RE experts (Figure 7-76).

What can be improved regarding structure, format and material?

12 responses

- More practical experiment
- Format
- All of This was very good
- .
- altaeamuq fi baed alamur alati takhusu altaaqat almutajadida
- Some topics need more time to clear such as integrating of RE into electrical grid. And some subject must be added such as redox flow battery.
- تقرينا
- Invite expert
- Can invite expirt reviewer

Figure 7-76: Suggestions for improvement of RE workshop’s structure, format and material.

The majority of the participants found that the training raised their interest in the topic of RE and gave high evaluations, as it can be observed in Figure 7-77.

The training raised my interest in the topic.

12 responses

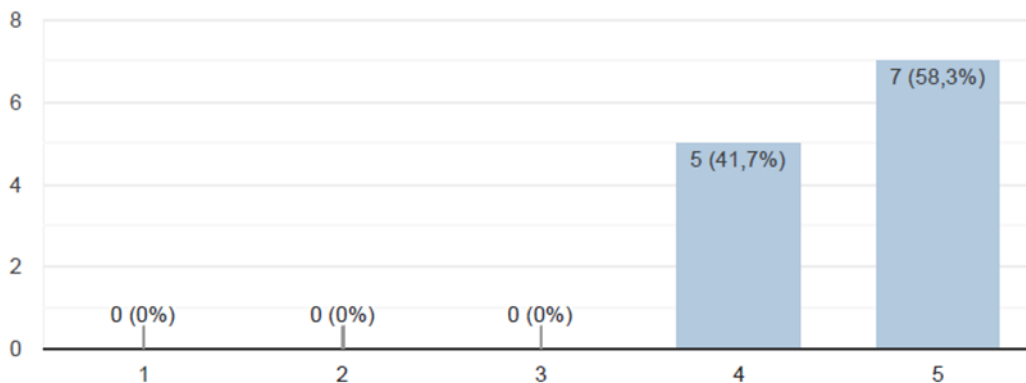


Figure 7-77: Satisfaction scale regarding the participant’s interest in the topic of RE.

All of them answered with high evaluations in regards to reaching the learning outcomes that were specified in the training (Figure 7-78).

I reached the learning outcomes being specified.

12 responses

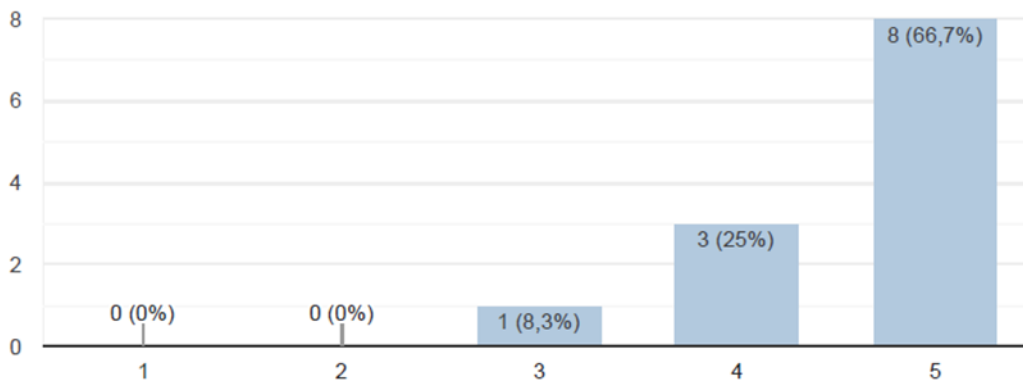


Figure 7-78: Satisfaction scale regarding the learning outcomes on the topic of RE.

Over 92% of the participants believe that the skills they received in the RE training will be valuable in their future work giving high evaluations of 4/5 and 5/5 (Figure 7-79).

The knowledge and skills I received in this training are valuable
to my work/future career.

12 responses

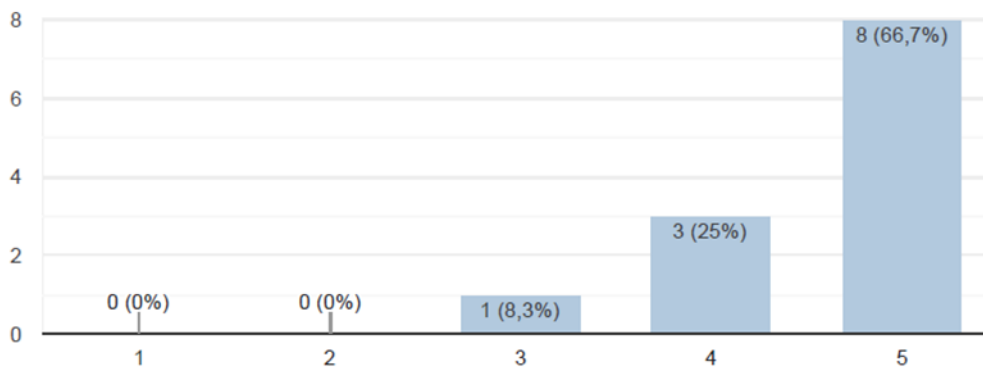


Figure 7-79: Satisfaction scale of the value of RE skills gained regarding future work.

When questioned about the background information they received (Figure 7-80), the majority of the participants thought that they missed some introductory information, so maybe this issue can be further assessed and addressed, in order to satisfy the participants' needs.

I missed some background/introductory information.

12 responses

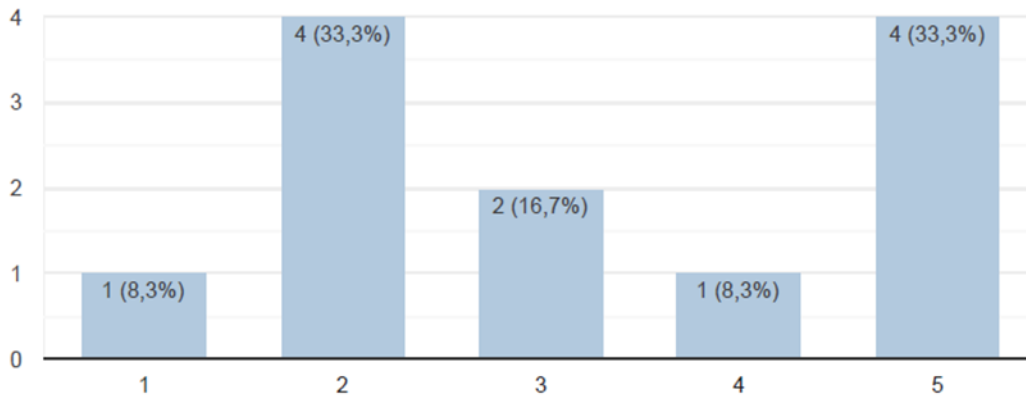


Figure 7-80: Scale of RE background information that was missed.

In overall, the participants were very satisfied with the training workshop and this can be observed in Figure 7-81, as they all gave high evaluations of 4/5 and 5/5.

How satisfied are you with the training workshop?

12 responses

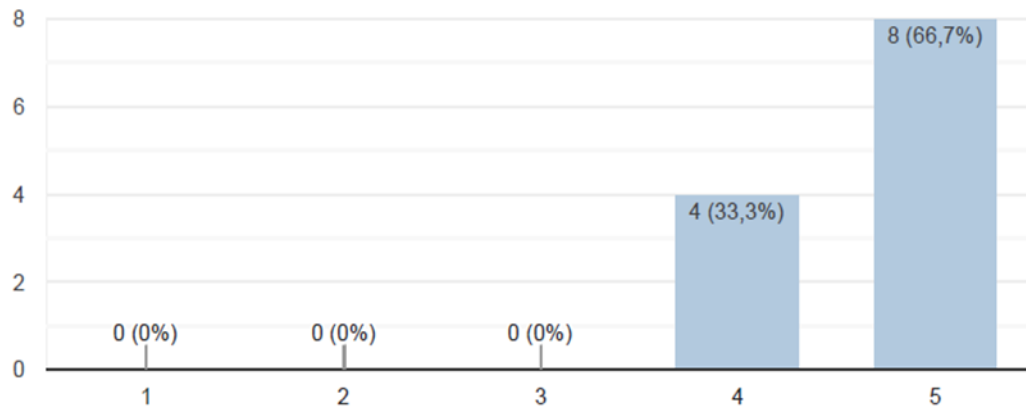


Figure 7-81: Overall satisfaction scale of the RE training workshop.

Figure 7-82 shows that around 75% of the participants recognized differences between the RE training and other training workshops.

Have you recognized differences as compared to other trainings?

12 responses

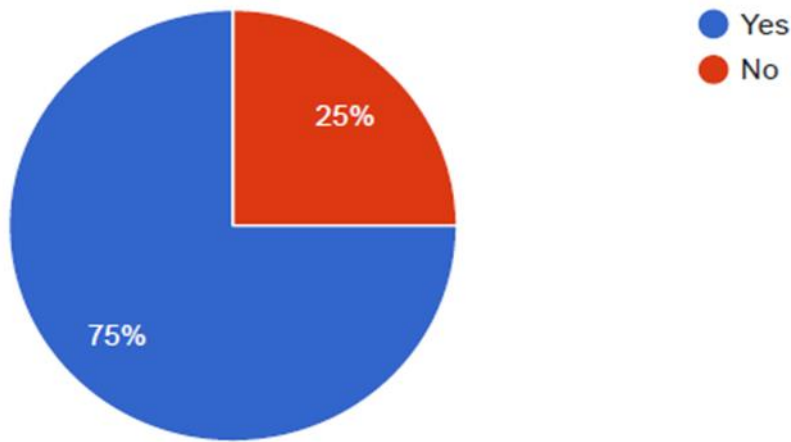


Figure 7-82: Differences between the RE workshop and other trainings.

The participants were next asked to provide an overall contribution regarding the training workshop and the results can be seen in Figure 7-83. Most of them were very satisfied with the training and believe it was a good introduction on the subject of RE. The participants liked the selection of the topics and the experience of the trainers. Some of them would like more practical applications. The discussion sessions were also among the parts that the participants appreciated.



Please provide an over contribution about the training workshop.

12 responses

Perfect

I don't have

Very very good

Yes

It was a good workshop

نعم

*

Excellent training

Figure 7-83: Over contributions about the RE training workshop.



Please list the new concepts/skills/topics you have learned from the training workshop.

12 responses

Off grid connections and energy storage and wind turbine

I don't have

Battery and storage system in RE

.

Planning skills
interactive skills

I learn how to present the RE educational materials to my students, Stand-alone RE System, types of storage devices, conditions of integrating of RE into electrical grid.

نعم

*

Figure 7-84: New skills learned from the RE training workshop.

The new skills that the participants gained from the training workshop are listed in Figure 7-84. The participants learned more about RE systems, PV materials, energy storage applications and more. They widened their knowledge on the different types of RE sources and they had the chance to exchange views and information with other colleagues, also experienced on the subject.

8. CONCLUSIONS

This deliverable aimed at describing the training workshops on the subjects of IoT, CS and RE that took place in the context of the IREEDER project.



The basics of each course were first presented, followed by a description of the contents of each training workshop. The participants of the workshops were asked to complete a survey in order to provide feedback and comments on the training workshops. The full content of the survey was presented in this report, along with analysis of the results.

Based on the analysis of the survey, the participants were interested in learning more on the subjects of IoT, CS and RE and their technological advances, which is why they took part in the training workshops. The majority of the participants were satisfied with the organizational aspects of each workshop, the functionality of the tools and software that were used as well as the level of interaction with the workshop's tutors and the other participants. Suggestions for improving the organizational aspects included more practical applications on each subset, more training days and more invitations to speakers and experts.

Most of the participants found the training workshops useful, as they gained knowledge and skills, and appreciated the structure of each workshop. Regarding the schedule and time frame, there was a small percentage who was not satisfied with it.

The majority of the workshops' participants found the trainings appropriate for their own level of experience and believed that they met their expectations. The aspects of the trainings that most participants liked were the quality of the training materials, the variety of topics that each workshop covered and the innovative approaches that were used. Some suggested more practical examples in order to improve the structure and format of each workshop but, in overall, the participants commented that the trainings succeeded in raising their interest in the topics.

Most of the trainings' participants believed that the skills they received from the workshops will be valuable for them in terms of future work. Most of the participants commented that they missed some background and introductory information on the subjects but, in overall, the majority of them were very satisfied with the projects. Significant differences compared to other workshops are pointed out by the participants. Concluding, the training workshops on the subjects of IoT, CS and RE managed to provide the participants with new knowledge on each topic and raised their interest on these subjects.