DELIVERABLE: D21 - D4.1

First Classroom Courses for Professionals

WP Leader: University of Zagreb, Faculty of Civil Engineering
Authors: University of Zagreb, Faculty of Civil Engineering

Network for Using BIM to Increase the Energy Performance

Grant Agreement Number: 754016
Net-UBIEP H2020

April 2020

This deliverable reflects only the author's view. The Agency is not responsible for any use that may be made of the information it contains.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

Contents

A. Deliverable Details 3
B. Short description 4
1. Learning outcomes and training programme 5
2. Conducted courses 7
2.1 Croatia 7
2.1.1 Course description and results 7
2.1.2 Agenda 13
2.2 Estonia 15
2.2.1 Course description and results 15
2.2.2 Agenda 24
2.3 Italy 29
2.3.1 Course description and results 29
2.3.2 Agenda 35
2.4 Lithuania 36
2.4.1 Course description and results 36
2.4.2 Agenda 44
2.5 Slovakia 46
2.5.1 Course description and results 46
2.5.2 Agenda 56
2.6 Spain 57
2.6.1 Course description and results 57
2.6.2 Agenda 58
2.7 The Netherlands 58
2.7.1 Course description and results 58
2.7.2 Agenda 68

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

A. Deliverable Details	
Document Reference #:	D21 - D4.1
Title:	First Classroom Courses for Professionals
Version Number:	4
Preparation Date:	
Delivery Date:	
Author(s):	University of Zagreb, Faculty of Civil Engineering
Contributors:	All the partners
Work Package	WP 4
Type of deliverable	Other
Format	Report
Dissemination Level:	Public

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

B. Short description

This deliverable is informative to demonstrate the activities performed in each partner's country. It shows the partner's approach to classroom courses (training methodology) and validation results per partner country for this respective course. Statistical data shown for each partner's country could be useful to understand the need of this target.

The goal of this report is to provide an overview of the first classroom courses conducted for **professionals** (**Engineers and Architects**). The target group of **engineers and architects** have a very important role while designing NZEB. They need to use the real data when performing the energy analysis to avoid that the declared values are not the same as built. Nowadays the discrepancy is over the 50% of the EPC provided by the designers and the one verified on the "as built". Besides, it is important to use class detection simulation before construction starts to avoid waste of money and time.

First Classroom Courses for Professionals were conducted in national languages Croatian, Dutch, Estonian, Italian, Latvian, Slovak, Spanish. Validation of training material and assessment for **professionals (Engineers and Architects)** on how to use BIM for the energy performance was conducted during these classroom courses using questionnaires.

Questionnaire tailored for **training participants** were prepared (*D27-D4.7 Survey and or interview among all different Targets*) in order to validate defined competence lists for **professionals** as well as trainee satisfaction with course and instructor (trainer) effectiveness. **Training participants** were asked to judge on their competences **before the training as well as after the training**.

Good quality practices of education are based on these three pillars:

- clear definitions of learning outcomes,
- design and structure of the programme course,
- evaluation and monitoring of the learning outcomes

Two types of questionnaires were used to cover these three pillars of good education and to simultaneously perform a self-assessment of competences gained by the participants during the course.

The purpose of the "**Pre training questionnaire**" was to assess initial level of knowledge, experience and current practices regarding BIM. "**Post training questionnaire**" contains the same or similar questions as a "Pre training questionnaire" which serve to determine in simple ways the progress training participants have made during the courses and efficiency of the courses. Questions about the completeness or redundancy of the foreseen schemes and training courses were also included in the "Post training questionnaires".

The main goal of this report is to provide information for future activities, based on the experience during the Net-UBIEP project. Therefore, this report will present the overview of the conducted classroom curses and will set guidelines for the learning outcomes (also project deliverable *D4.8 Review of the three dimensional matrix*), the evaluation of the courses, and finally will also enable experience exchange between the different training institutions.

The report does not contain sensitive information and the collected data is being treated confidentially following the rules of General Data Protection Regulation 2016/679.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

1. Learning outcomes and training programme

Both learning outcomes and training programme were explored and defined in details in previous project activities. All the partners followed the learning outcomes defined in deliverables *D14 - D3.1 Three-dimensional Matrix* and *D15 - D3.2 Requirement for learning outcomes* as well as the training materials developed as deliverables *D18 - D3.5 Contents for Professionals (Engineers and Architects) on BIM competences* and *D19 - D3.6 Guideline for Professionals on BIM competences*.

Therefore, in this chapter a summary of the main information is presented, as detailed information can be found in the respective Deliverables.
The training materials developed in WP3 were in line with defined learning outcomes, while the courses and seminars were used to transfer the body of knowledge (contained in WP3 training materials) to the trainees. The main objectives of the courses and seminars were to: 1) introduce Professionals, Public administration, Owners/Tenants/Building Administrator and Technicians with the importance of having reliable information when designing and managing a building with special focus to energy efficiency; 2) Help Professionals, Public administration and Owners/Tenants/Building Administrator to define the requirements of BIM model for energy efficiency purposes; 3) Develop a strategy for implementing BIM and energy efficiency with the local stakeholders; 4) to demonstrate the activities performed in each partner's country (show the partner's approach to classroom courses - training methodology) and validate the training materials and the trainings per partner country and for the respective course.
Statistical data shown for each partner's country and the respective group trained was useful to understand the need of each target. Due to the different BIM maturity levels (different levels of maturity with regards to the ability of the construction supply chain to operate and exchange information) in different partner countries and specific competence level of the group to be trained, partners opted for the specific course durations.
The classroom courses followed somewhat different structure in every partner country but as mentioned before have always included all the learning outcomes and training content defined in respective deliverables. Partners who are highly experienced trainers and experts in both BIM and energy efficiency (working at Universities and training institutions) concluded that the same training methodology would not have the same effect in all partner countries (different maturity levels of BIM implementation as well as energy efficiency implementation). Additionally, partners assessed their target audiences for the specific training sessions and thus tailored the training duration to the specific group. Thus in countries with higher BIM maturity level and for groups like professionals who have been working with BIM previously, in depth, hands on, practical training was organized (around the same training material) with more practical explanations was organized. On the other hand, in countries with lower BIM maturity level and for group like owners who don't have any competences on BIM and energy efficiency, more theoretical training sessions were organizing, focusing on basic explanations and showing practical examples and benefits to trainees (but again tailored around the training materials developed in WP3).
Additionally, each respective partner developed their own training aids (i.e. power point presentations,) which then followed their course structure.
In such a situation, partners agreed that relative validation to previous competences was the only feasible way to perform the training material validation. Absolute validation of BIM and energy efficiency competences was not possible in this circumstances because of the different starting points for training participants in partner countries and specific groups. In the opinion of the project partners, each country and

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

group has different starting points in both BIM and energy efficiency and also specific requirements in both topics. Thus partners organized trainings which all followed the developed training materials and had just a slightly different training methodology. Training materials developed within the WP3 aimed to reach the defined learning outcomes.

Validation questionnaires for training participants were prepared in order to validate defined competence lists for all the different targets groups as well as trainee satisfaction with course and instructor (trainer) effectiveness. Training participants, professionals and workers belonging to the different target groups were asked to judge on their competences before the training as well as after the training. The purpose of the "Pre training questionnaire" was to assess initial level of knowledge, experience and current practices regarding BIM. "Post training questionnaire" contains the same or similar questions as a "Pre training questionnaire" which serve to determine in simple ways the progress training participants have made during the courses and efficiency of the courses. Questions about the completeness or redundancy of the foreseen schemes and training courses were also included in the "Post training questionnaires".

Partners used different systems for validation of training courses, but all using the questionnaires developed for this purpose in *D27-D4.7 Survey and or interview among all different Targets*. Some countries used GoogleForms, other partners used free web based voting solution (VoxVote) for interactive presentations and real time feedback from the course participants, BIMSync (CDE) platform was also used to evaluate training, while the fourth option was to use hardcopy questionnaires. The participants filled questionnaires anonymously during classroom courses in order to get their honest opinion and validation.

Table 1 Overview of first classroom courses duration training methodology and number of participants

Partners country	Course date	Classroom course duration	Theoretical (T) / Practical (P)	No. of participants	Voting system
Croatia	20 December 2018	8 hours	T	21	VoxVote
Estonia	9, 10, 24 &25 January 2019	32 hours	T & P	50	Hardcopy
Italy	22 February 2019	4 hours	T	41	GoogleForms
Lithuania	1 March 2019	8 hours	T & P	24	BIMSync
Slovakia	1 April 2019	8 hours	T & P	15	GoogleForms
Spain	25 April 2019	4 hours	T	54	GoogleForms
The Netherlands	12 March 2019	4 hours	T	9	GoogleForms
			Total No. of participants	214	

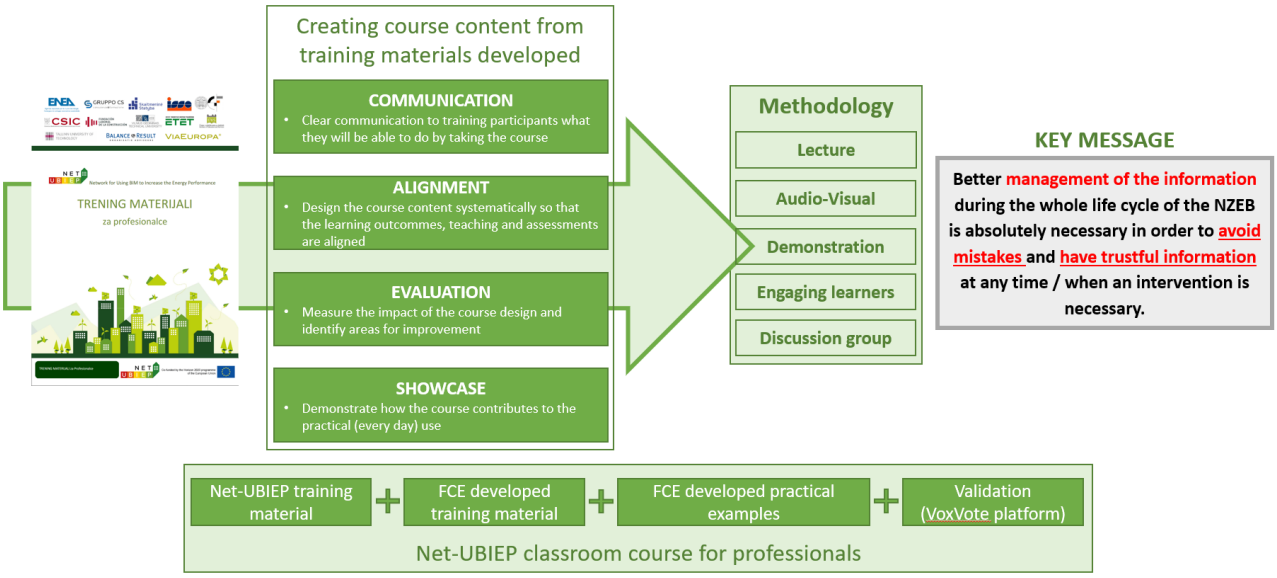
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

2. Conducted courses

2.1 Croatia

2.1.1 Course description and results

First classroom course for professionals was organized on **December 20th 2018** in Varaždin, Croatia.
The course programme consisted of 8 academic hours of theoretical lectures with application examples (case studies) but with no practical tasks.
A group of **21 participants** specialising in architecture and engineering had undertaken the classroom course in Croatia within the framework of the Net-UBIEP project.
The overview of the content development and methodological basis of the classroom courses is shown in the figure below.



Several images from the first classroom course for professionals conducted by the **FCE** can be found bellow.

Pre- and Post-training questionnaires were translated to Croatian language and filled by training participants.
Pre-training questionnaire is available at this link:

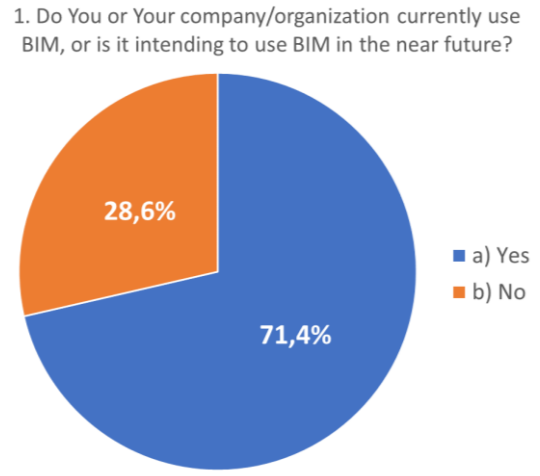
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

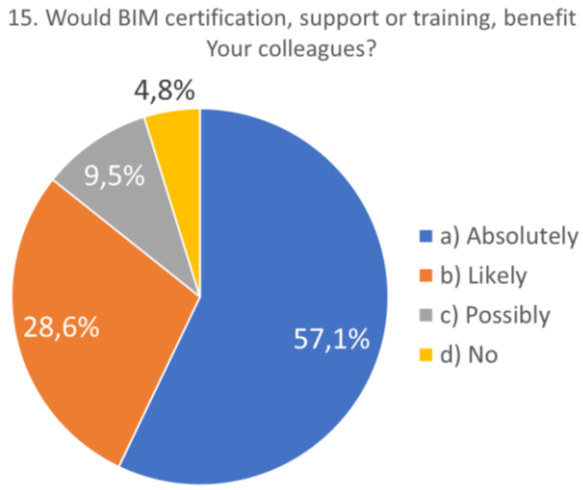
Croatian version	https://docs.google.com/forms/d/e/1FAIpQLSfQYVDL0b-Uic830VIoYTrRaET2YvaGRmp3XeiNnZgwxfe42Q/viewform
English version	https://docs.google.com/forms/d/e/1FAIpQLSduQHwnKBVoeh_hEfGY8lJLDcqlBg-KfTLxsIgxKHOhg5wtVQ/viewform?vc=0&c=0&w=1

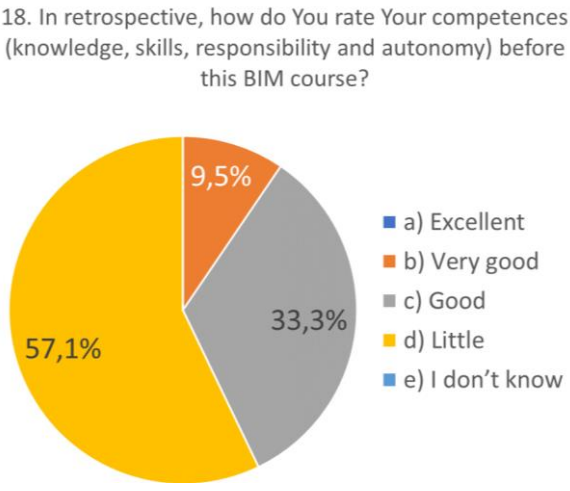
On the other hand, Post-training questionnaire is available at this link:

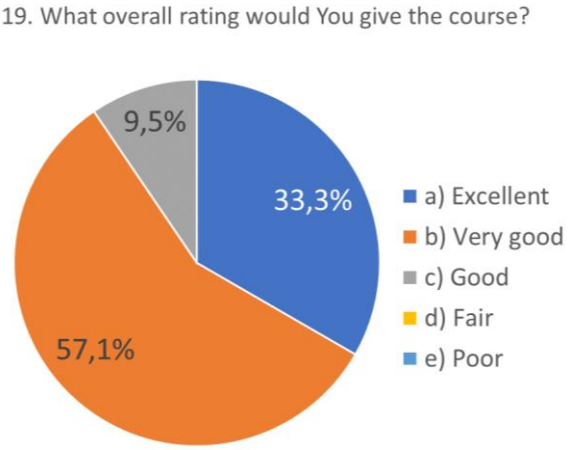
Croatian version	https://docs.google.com/forms/d/e/1FAIpQLSeDbMImztef6JkfdPQRccDasa0pexMC3RPi5foZyTad-UZ6gQ/viewform
English version	https://docs.google.com/forms/d/e/1FAIpQLSfUZIzUpectOF8VuGc71_9GbDWdJG3JvsuDHgJrQ730IeakWg/formResponse

Few general conclusions of the classroom course validation from the participants in Croatia is given below, while the entire questionnaire analysis is performed in deliverable *D27-D4.7 Survey and or interview among all different Targets*. Due to the fact that validation was performed in partners' native language, the analysis below has both English questions and the same questions in native language.



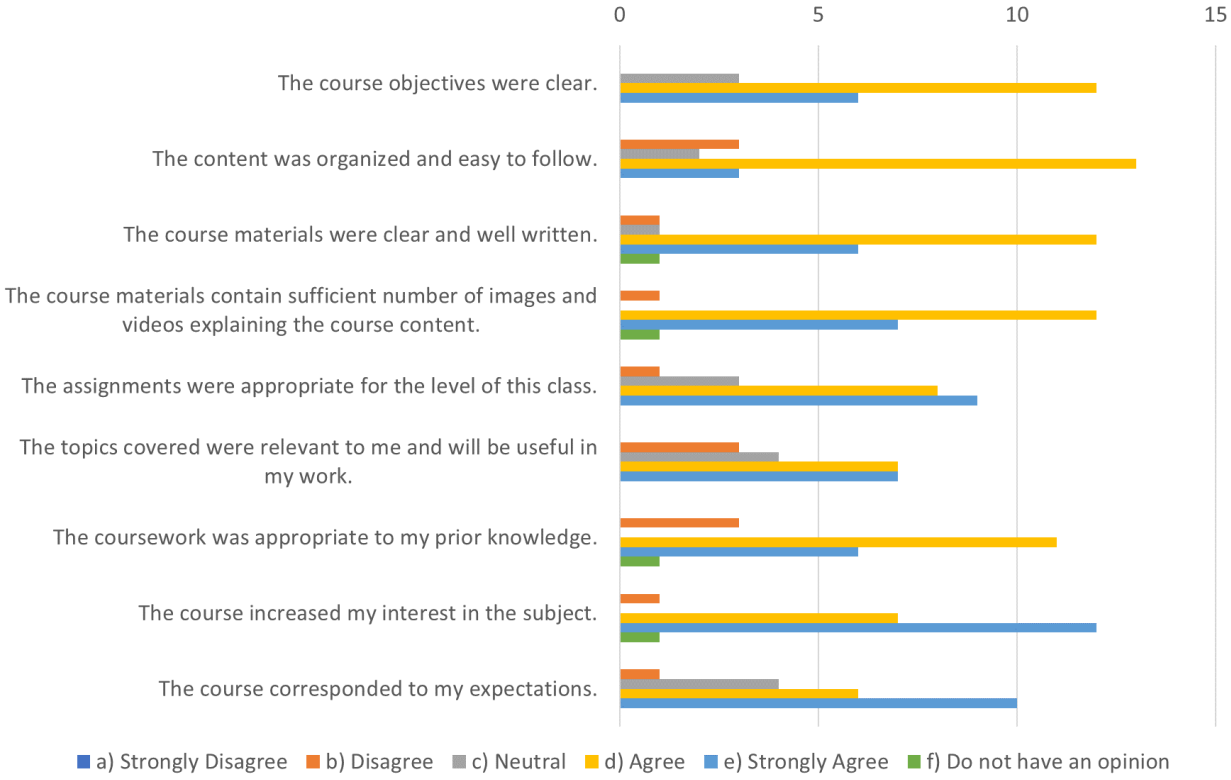




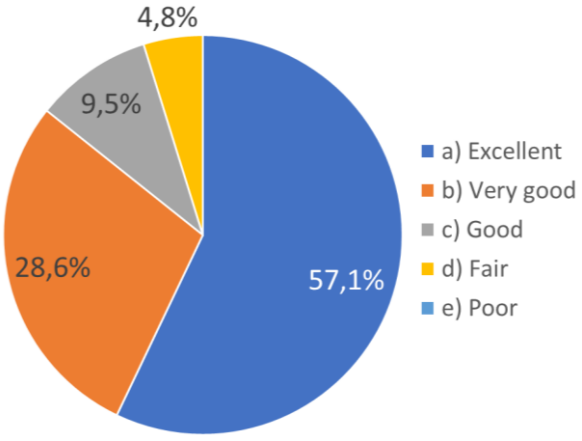


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

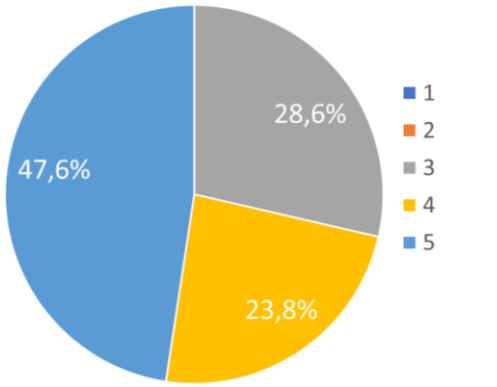
20. Please indicate your level of agreement with the following statements.



21. What overall rating would you give the trainer(s)?

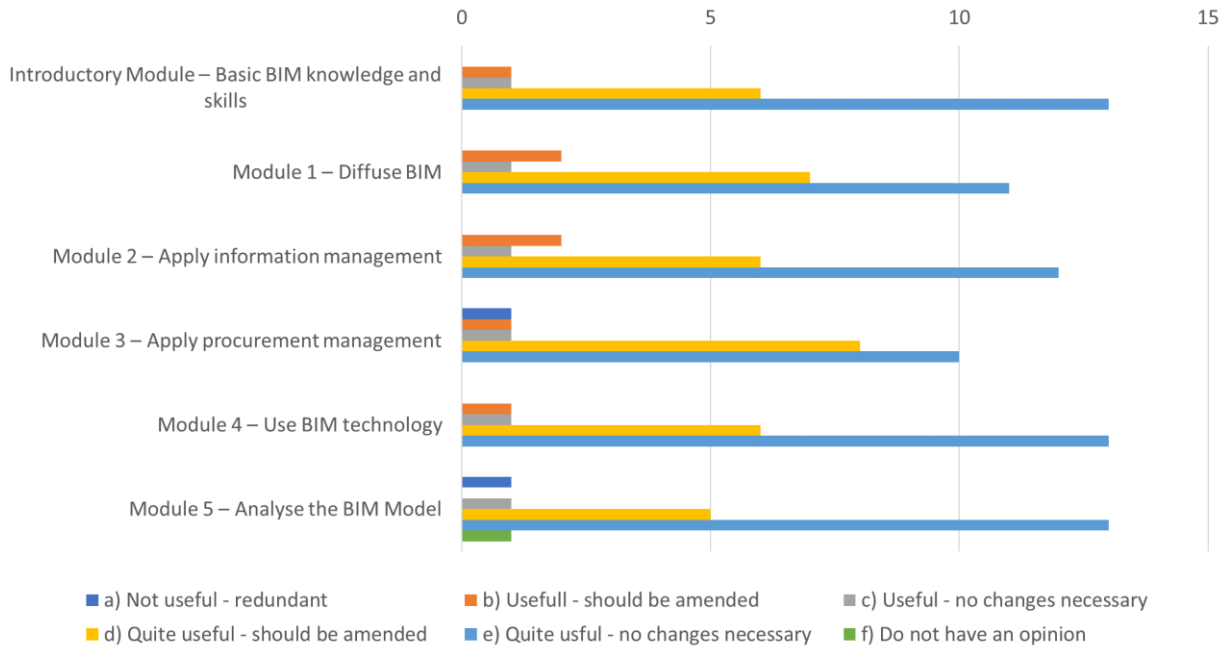


23. How much new information did you receive in the training course?
Rate on the scale: 1 (none) to 5 (a lot of new information)

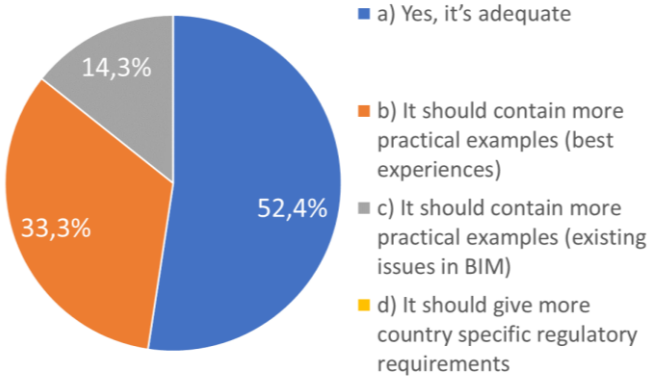


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

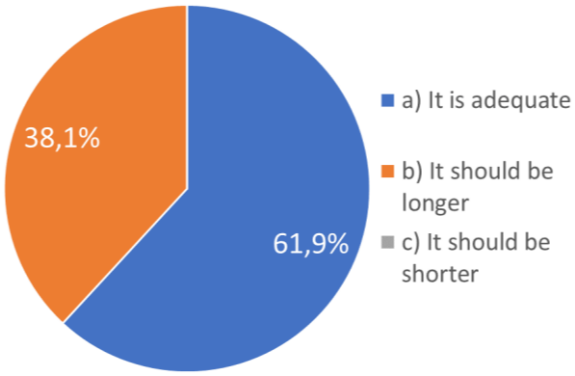
25. Please rate the following BIM course modules based on how they are useful and interesting to you



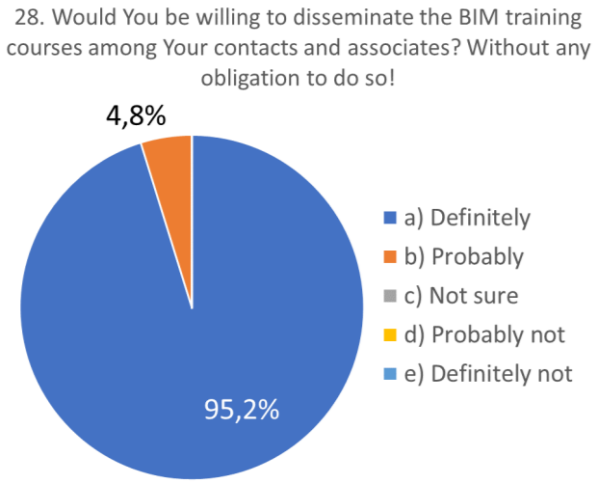
26. What do You feel, is the training material comprehensive enough?

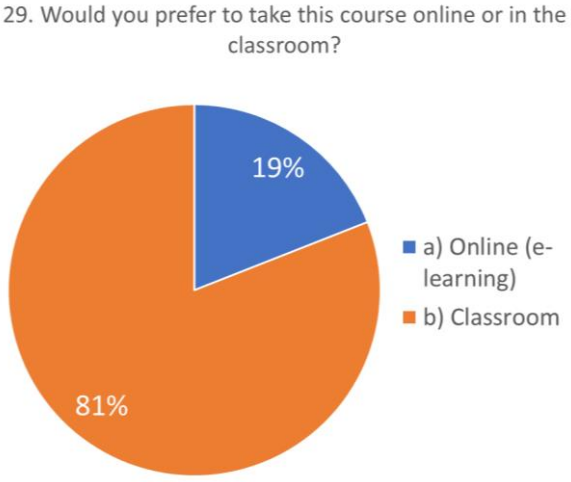


27. What do You feel about the duration of the training?



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016





It is evident from the training validation results that 85.7 % of participants feel BIM certification, support or training would absolutely (57.1 %) or likely (28.6 %) be beneficial to their colleagues which is a good indication of their view about the necessity of certification courses. Additionally, after the course, training participants were asked to evaluate their competences prior to the classroom course on BIM. The intention was to get the information what is their initial knowledge on BIM as well as to see whether the course was an "eye opener" and comprehensive enough. The participants replied that they feel they had little (57.1 %) or good (33.3 %) and very good (9.5 %) competences. Since 71.4 % of course participants are already using BIM (or intends to use it in near future) the overall rating of the course as good (9.5 %), very good (57.1 %) and excellent (33.3 %) is very encouraging and positive for the developed training materials and courses held in Croatia. Trainers received positive overall rating of very good (28.6 %) and excellent (57.1 %).

The majority of course participants agree or strongly agree with the statements that the course objectives were clear with organized and easy to follow content. They mainly agree that course materials were clear and well written and contain sufficient number of images and videos explaining the course content. The positive validation of the Croatian course is also evident from the fact the majority of participants agree that assignments were appropriate for the level of this class (appropriate to their prior knowledge) and the topics covered are relevant and will be useful in their future work as they received new information (71.4% of participants feel they got significant amount of new information). The course also increased their interest in the subject and corresponded to their expectations.

When getting more in depth and looking for their opinion on each of the training modules, participants feel that Introductory module is useful and requires no changes, while 5 modules developed are useful but significant number of course participants also feel that these modules should be amended with additional content to make it better. Specifically, approximately half of course participants (52.4 %) feel the training material is adequate and comprehensive enough, while remaining participants think that training materials should contain more practical examples (best experiences and existing issues in BIM), 33.3 % and 14.3 % respectively which is a significant number and should be respected. Regarding the duration of training, 61.9 % of training participants said that 8-hour training course is adequate, while 38.1 % think it should be longer. It has to be enhanced that 81.0 % of course participants prefer to take this course in the classroom while only 19.0 % of people would prefer to take it on-line.

The quality of the course is best rated if training participants disseminated and recommend the course to their colleagues, friends and associates, and in the case of Croatian 1st classroom course for professionals,

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

95.2 % of participants declared they would definitely be willing to disseminate the BIM training courses among their contacts.

Analysis of the training results, problems and solutions together with lessons learned during the courses are as follows:

- A model of trainings for BIM has been developed, combining theoretical part with application examples (case studies).
- The duration of trainings – 8 hours. Participants of the trainings have confirmed that duration is appropriate but significant number of participants asked for longer training duration.
- The practical work is deemed by the trainers as necessary for other two classroom courses for professionals.

Comments and suggestions of the training participants could be summarised in the following few lines:

- The classroom course participants seek for more practical lessons and tasks, more examples of good practice.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

2.1.2 Agenda

NET-UBIEP | Network for Use BIM to
Increase Energy Performance

BIM for professionals (engineers and architects)

Free workshop

Date: 20.12.2018.

Venue: University North, 104. brigade, UNIN 1, Varaždin, Hall 36

Contact person:

- Mergim Gaši, Faculty of Civil Engineering, University of Zagreb,
- Tel: +385 1 4639 121
- mgasi@grad.hr

Registration form: http://www.net-ubiep.eu/hr/registracija-2/

Hour	Topic	Lecturer
9.00 – 9.30	Introduction on the Net-UBIEP project Why using BIM can increase energy efficiency of the buildings	Bojan Milovanović
9.30 – 9.45	Discussion – pre-training questionnaires	Bojan Milovanović
09.45 – 10.30	Introductory Module – Basic BIM knowledge and skills • Introduction: what is BIM? • BIM Dictionary – basic terms • Advantages and the costs of using BIM for different purposes • Return on Investment (ROI) • Standards which support BIM process • Discussion	Kristijan Robert Prebanić
10.30 - 10.45	Break	
10.45 – 11.30	Module 1 – Diffuse BIM • Open BIM tools and standard format • BIM roles and responsibilities • BIM dimensions ○ 4D, 5D, 6D, 7D • Discussion	Ivana Burcar Dunović
11.30 – 12.15	Module 2 – Apply information management • Principles of dana management in Common data environment	Mergim Gaši

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

www.net-ubiep.eu - netubiep.project@net-ubiep.eu.it

NET-UBIEP | Network for Use BIM to
Increase Energy Performance

	• Non-graphical information in BIM model of the building • Building maintenance plan and energy service agreement • BIM as built Model for increasing energy efficiency of buildings • Discussion	
12.15 – 13.00	Lunch	
13.00 – 13.45	Module 3 – Apply procurement management • BIM and contracting • BIM in public procurement • BEP (BIM Execution Plan) • BIM maturity index • Collaboration among project participants • Discussion	Ivana Burcar Dunović
13.45 – 14.45	Module 4 – Use of BIM technology Module 5 – Analyse of the BIM Model • Sustainable construction sector o Energy efficiency o Green building • Automated model control o Compliance with the regulations o Clash detection • BIM for quality management • BIM for project takeover, commissioning and facility management (as built model) • Discussion	Bojan Milovanović
14.45 – 15.00	Break	
15.00 – 16.00	Demonstration work using OpenBIM tools: • Work on BIM models, clash control; • BIM model during building exploitation (energy efficiency, building maintenance) • Control and the approval of the model change by the different project participants • Discussion	Sanjin Gumbarević
16.00 – 16.15	Discussion – post-training questionnaires - Validation of developed training materials	Bojan Milovanović

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

www.net-ubiep.eu - netubiep.project@net-ubiep.eu.it

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

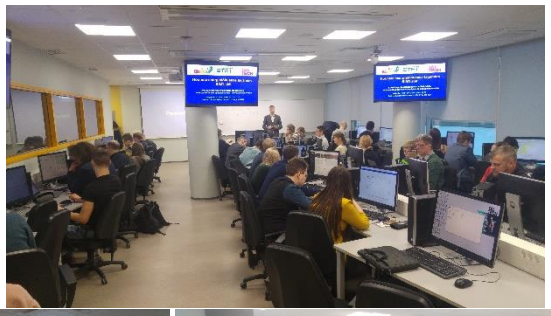
2.2 Estonia

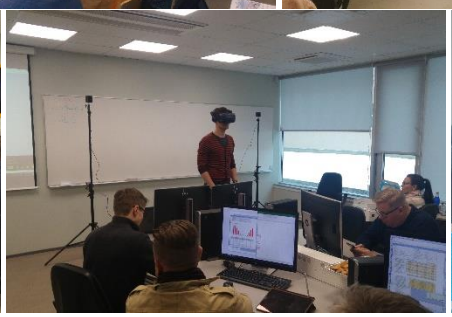
2.2.1 Course description and results

First classroom course for professionals was organized on **January 9th** (8 hours), **January 10th** (8 hours) **2019** and **January 24th** (8 hours) **and 25th 2019** (8 hours) in Tallinn, Estonia.
The course programme consisted of 32 academic hours of theoretical lectures with application examples (case studies) and practical work.
A group of **50 participants** architects, energy efficiency specialists and construction engineers had undertaken the classroom course in Estonia within the framework of the Net-UBIEP project.
The duration of 32 hours of the classroom course was divided into 4 days of theoretical and practical training with each day focusing on the following topics:

- Introduction to the topic (energy efficiency and BIM)
- Calculation of building heat loss using BIM
- BIM, energy efficiency and engineering systems
- BIM procurement, strategy, requirements and building cost effectiveness

Several images from the first classroom course for professionals conducted by the **TUT** can be found bellow.



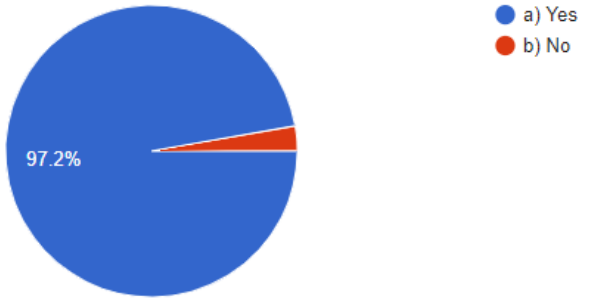


Pre- and Post-training questionnaires were translated to Estonian language and filled by training participants. Estonian partners used hardcopy questionnaires for the course validation.

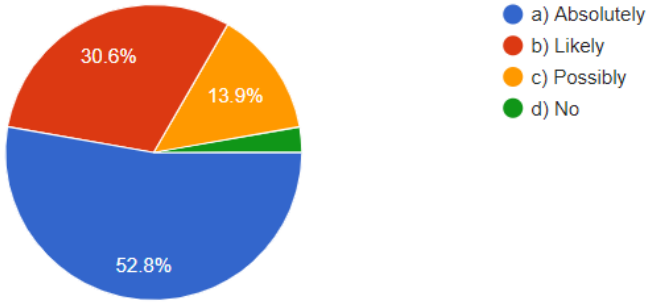
Few general conclusions of the classroom course validation from the participants in Lithuania is given below, while the entire questionnaire analysis is performed in deliverable *D27-D4.7 Survey and or interview among all different Targets*. Due to the fact that validation was performed in partners' native language, the analysis below has both English questions and the same questions in native language.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

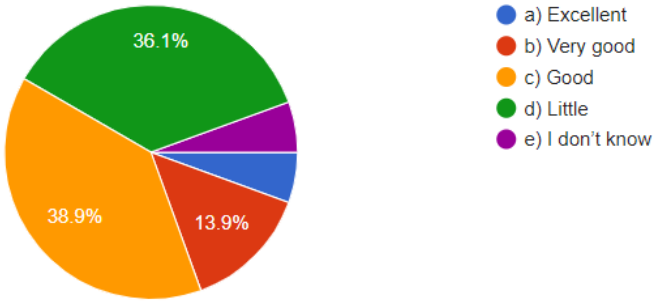
1. Do You or Your company/organization currently use BIM, or is it intending to use BIM in the near future?
   a) Yes
   b) No



15. Would BIM certification, support or training, benefit Your colleagues?
   a) Absolutely
   b) Likely
   c) Possibly
   d) No

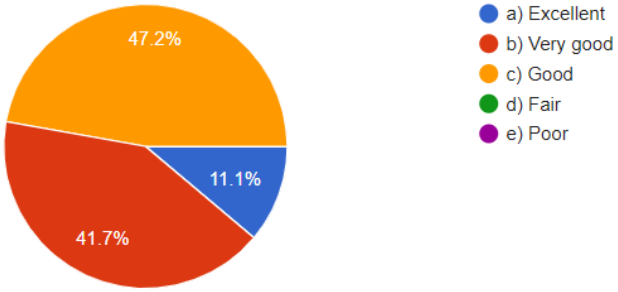


18. In retrospective, how do You rate Your competences (knowledge, skills, responsibility and autonomy) before this BIM course?
   a) Excellent
   b) Very good
   c) Good
   d) Little
   e) I don't know



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

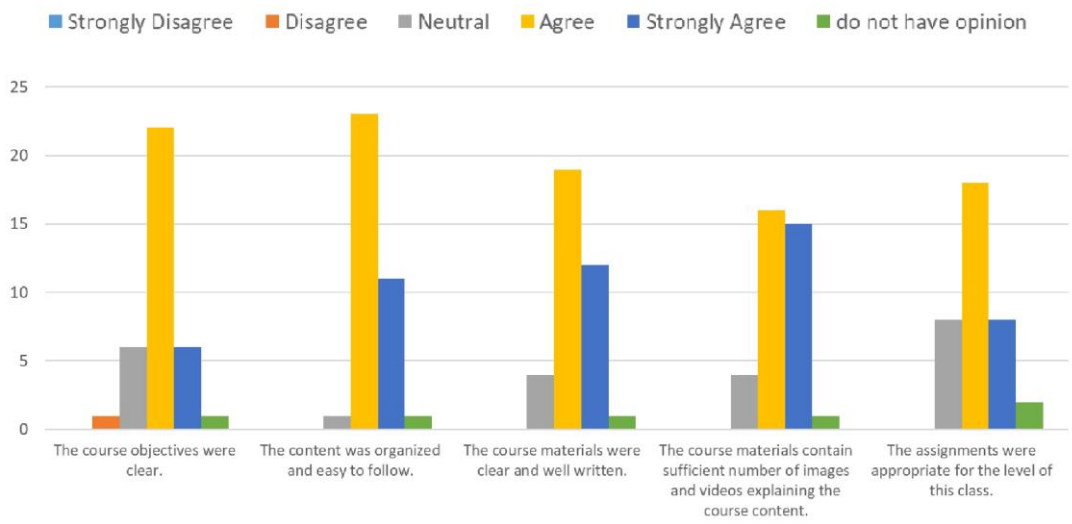
19. What overall rating would You give the course?	a) Excellent b) Very good c) Good d) Fair e) Poor

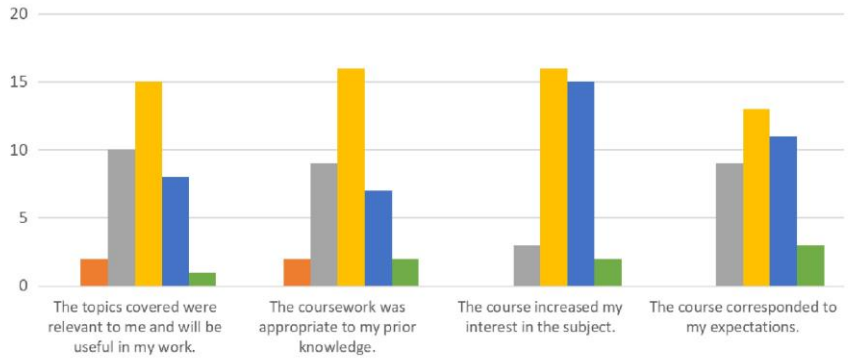


20. Please indicate your level of agreement with the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	do not have opinion
The course objectives were clear.						
The content was organized and easy to follow.						
The course materials were clear and well written.						
The course materials contain sufficient number of images and videos explaining the course content.						
The assignments were appropriate for the level of this class.						
The topics covered were relevant to me and will be useful in my work.						
The coursework was appropriate to my prior knowledge.						
The course increased my interest in the subject.						
The course corresponded to my expectations.						

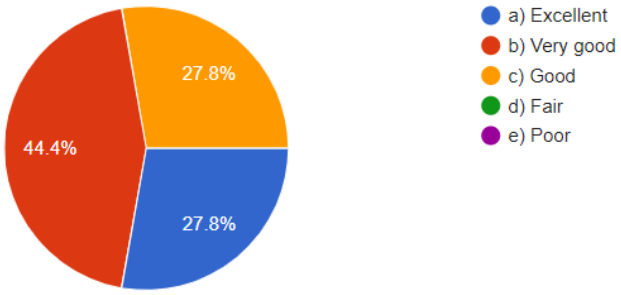
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016





21. What overall rating would you give the trainer(s)?

a) Excellent
b) Very good
c) Good
d) Fair
e) Poor

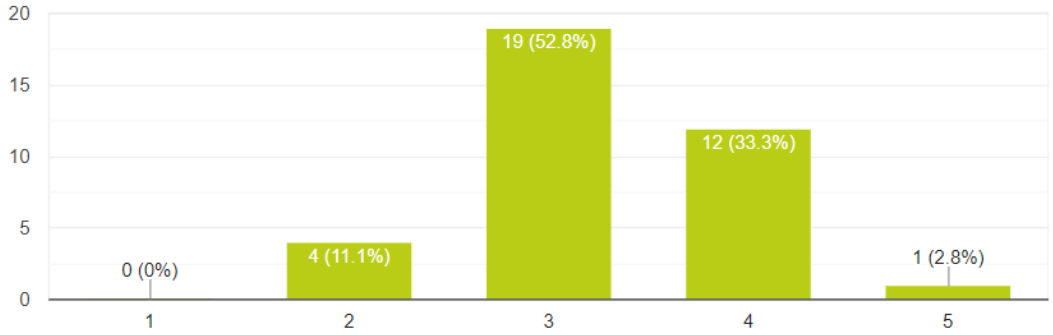


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

23. How much new information did you receive in the training course?

Rate on the scale from: 1 (none) to 5 (a lot of new information)

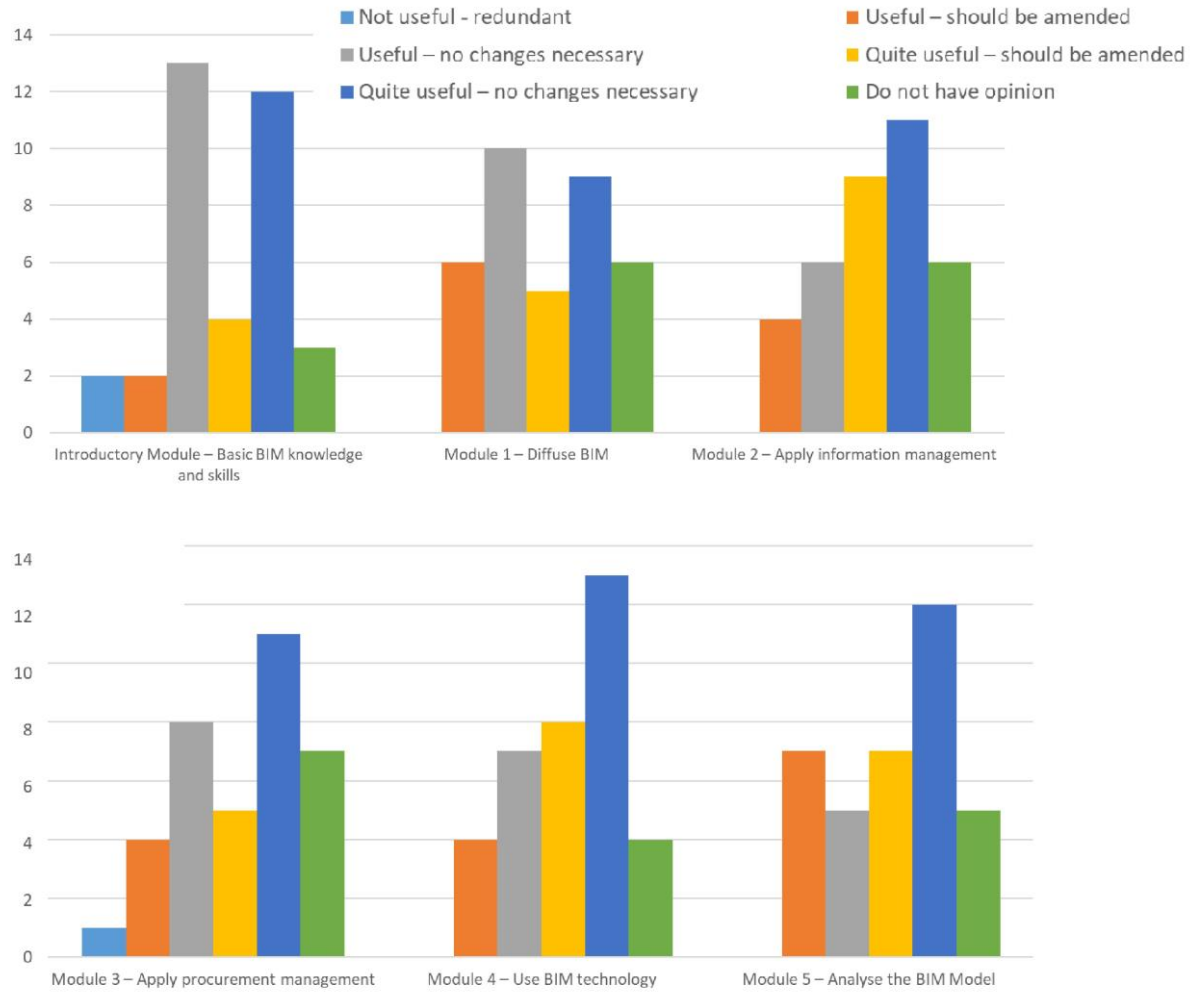
a) 1
b) 2
c) 3
d) 4
e) 5



25. Please rate the following BIM course modules based on how they are useful and interesting to You.

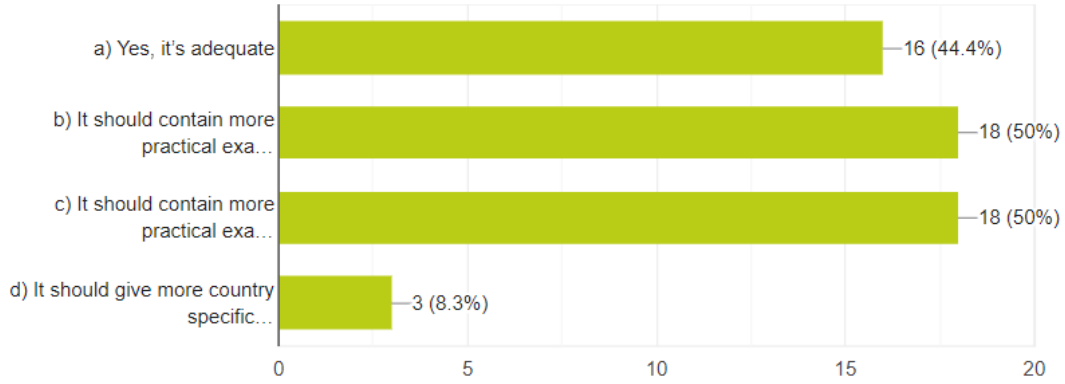
	Not useful - redundant	Useful – should be amended	Useful – no changes necessary	Quite useful – should be amended	Quite useful – no changes necessary	Do not have opinion
Introductory Module – Basic BIM knowledge and skills						
Module 1 – Diffuse BIM						
Module 2 – Apply information management						
Module 3 – Apply procurement management						
Module 4 – Use BIM technology						
Module 5 – Analyse the BIM Model						

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016



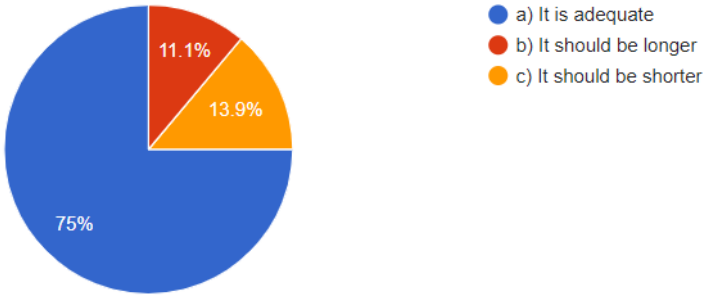
26. What do You feel, is the training material comprehensive enough? (Please mark all that apply)	a) Yes, it's adequate b) It should contain more practical examples (best experiences) c) It should contain more practical examples (existing issues in BIM) d) It should give more country specific regulatory requirements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*



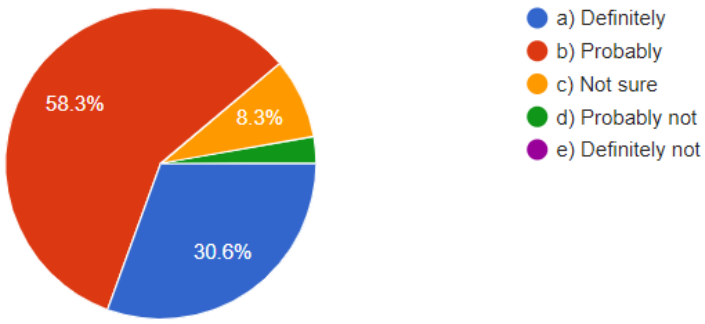
27. What do You feel about the duration of the training?

a) It is adequate
b) It should be longer
c) It should be shorter



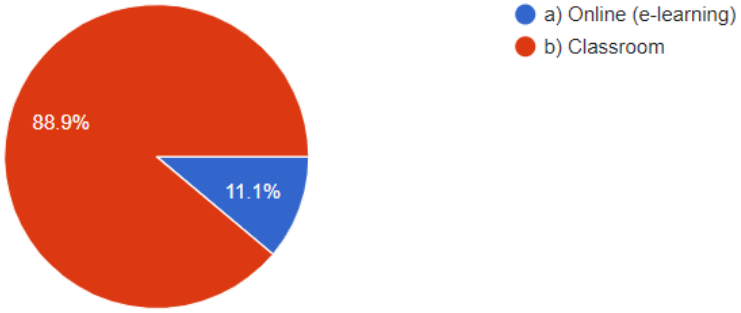
28. Would You be willing to disseminate the BIM training courses among Your contacts and associates?
Without any obligation to do so!

a) Definitely
b) Probably
c) Not sure
d) Probably not
e) Definitely not



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

29. Would you prefer to take this course online or in the classroom?	a) Online (e-learning) b) Classroom



It is evident from the training validation results that 83.4 % of participants feel BIM certification, support or training would absolutely (52.8 %) or likely (30.6 %) be beneficial to their colleagues which is a good indication of their view about the necessity of certification courses. Additionally, after the course, training participants were asked to evaluate their competences prior to the classroom course on BIM. The intention was to get the information what is their initial knowledge on BIM as well as to see whether the course was an "eye opener" and comprehensive enough. The participants replied that they feel they had little (36.1 %) or good (38.9 %) and very good (13.9 %) competences. Since 97.2 % of course participants are already using BIM (or intends to use it in near future) the overall rating of the course as good (47.2 %), very good (41.7 %) and excellent (11.1 %) is very encouraging and positive for the developed training materials and courses held in Estonia. Trainers received positive overall rating of very good (44.4 %) and excellent (27.8 %).

The majority of course participants agree to the statements that the course objectives were clear with organized and easy to follow content. They mainly agree and strongly agree that course materials were clear and well written and contain sufficient number of images and videos explaining the course content. The positive validation of the Estonian course is also evident from the fact the majority of participants agree that assignments were appropriate for the level of this class (appropriate to their prior knowledge) and the topics covered are relevant and will be useful in their future work as they received new information (88.9% of participants feel they got fair amount of new information). The course also increased their interest in the subject and corresponded to their expectations.

When getting more in depth and looking for their opinion on each of the training modules, participants have opinion that Introductory module is useful or quite useful and requires no changes, while 5 modules developed are deemed useful by majority of course participants but there is significant number of those that feel they should be amended with additional content to make it better. Specifically, the general opinion is that training materials contain more practical examples (best experiences and existing issues in BIM), 50.0 % and 50.0 % respectively. Regarding the length of training, 75.0 % of training participants said that 32-hour training course is adequate, while 11.1 % think it should be longer and 13.9 % think the course should be shorter. It has to be enhanced that 88.9 % of course participants prefer to take this course in the classroom while only 11.1 % of people would prefer to take it on-line.

The quality of the course is best rated if training participants disseminated and recommend the course to their colleagues, friends and associates, and in the case of Estonian classroom course for professionals, participants declared they would definitely (30.6 %) and probably (58.3 %) be willing to disseminate the BIM training courses among their contacts.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

Analysis of the training results, problems and solutions together with lessons learned during the courses are as follows:

- A model of trainings for energy efficiency and BIM has been developed, combining theoretical part with application examples (case studies) and practical tasks.

Comments and suggestions of the training participants could be summarised in the following few lines:

- More practical examples, otherwise too generic and theoretical. Without better practices, one cannot reach the objective. BIM should be present in every presentation.
- Better manage the time during the course since sometimes the discussion got a bit too long and time was spent to install and learn software (Trimble Connect) which was not then further used during the course.
- Instead of 2 days in a row, it would be better to have the course a day at the time. It is difficult to miss work for two days in a row.
- 4th day was the most interesting. More practical examples needed. More practical work with software in the computer lab. The 3rd day lectures on ventilation and heating were too basic. But this could be because I am building services engineer.
- The training should be separated for different specialists. More practical examples and work; e.g., how an architect could design and test different massing strategies in the early stages of design.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

2.2.2 Agenda

Ensuring the energy performance of buildings through using BIM- training for architects, energy efficiency specialists and civil engineers

Registration: https://www.ttu.ee/taiendusoppijale/koolituskalender/algavad-koolitused/algavad-koolitused-2/?id=26999&koolitus=15961&registreeru.

Time schedule:

Introduction to the topic		
Date: 9.01.2019,10:00 - 17:30 **Location:** Tallinn University of Technology		
Aeg	Koolitaja	Teema
10:00-11:30	Targo Kalamees	**Introduction to energy performance of buildings** • H / A, ETA, KEK • What does the future hold? • Energy efficiency assessment at the stage of applying for a building permit and a permit for use • Energy efficiency planning in building design • Impact of construction design and construction quality on energy efficiency
11:30-11:45		**Pause**
11:45-13:15	Anti Hamburg	**Designed and measured energy consumption** • What is an energy label • How to read the label? • New buildings • Renovation of buildings How to check the order of magnitude of energy efficiency based on BIM model and energy label information? • Heat losses ~ ratio of heating energy consumption • Thermal permeability (thermally homogeneous, thermally homogeneous)
13:15-14:15		**Lunch**
14:15-15:45	Raido Puust	**Introduction to BIM** • Terms, principles, process description • BIM versus CAD • Different stages and details of the models • BIM versus traditional design
15:45 – 16:00		**Pause**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

16:00-17:30	Raido Puust	**Application of BIM models in issuing building permits and permits for use:** • Software, file formats, transfer of information from one BIM to another • Working with models, • Navigating models, • Reading model construction information and deriving new construction information from the model (areas, • Window area, area of fencing structures • Properties of building parts: thermal permeability, thicknesses of material layers, material properties

Heat loss of buildin enevelope by BIM		
Date: 10.01.2019; 10:00 - 17:30 **Location:** Tallinn University of Technology ICT-121 ja ICT-122		
Time	Lecturer	Title
10:00-11:30	Targo Kalamees Anti Hamburg Raido Puust Targo Kalamees	**Thermal transmittance of the structure in contact with air (roof, external wall) U, W / (m2□K)** • Thermal conductivity of the material • Thermally homogeneous barrier structure • Thermally inhomogeneous barrier structure • Areas (incl. Connecting rooms into one zone) • Where is this information and how is it presented in the BIM software? How to present correctly? • Where is this information and how is it presented in the energy efficiency software? How to present correctly? • Transfer data to spreadsheet software
11:30-11:45		**Pause**
11:45-13:15	Targo Kalamees Anti Hamburg Raido Puust Targo Kalamees	**Thermal transmittance of the structure in contact with the ground (floor, basement wall) U, W / (m2□K)** • Floor on the ground • Bottom ventilated floor • Heated basement wall • Heated basement floor • Floor above the unheated basement • Where is this information and how is it presented in the BIM software? How to present correctly? • Where is this information and how is it presented in the energy efficiency software? How to present correctly? • Transfer data to spreadsheet software
13:15-14:15		**Lunch**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

14:15-15:45	Targo Kalamees Anti Hamburg Raido Puust Targo Kalamees	**Linear thermal transmittance, W / (m□K) and point thermal transmittance □, W / (K) of structures** • Calculation principles • Table values Air leaks in barrier structures, air leakage rate q50, m3 / (h□m2) • Calculation principles • Table values • Is there and where is this information and how is it presented in the BIM software? • Where is this information and how is it presented in the energy efficiency software? How to present correctly? • Transfer data to spreadsheet software
15:45 – 16:00		**Pause**
16:00-17:30	Targo Kalamees Anti Hamburg Raido Puust Targo Kalamees	**Window's thermal transmittance U, W / (m2□K)** • Glass • Frame • Glass package edge • Orientation effects • Is there and where is this information and how is it presented in the BIM software? • Where is this information and how is it presented in the energy efficiency software? How to present correctly? • Transfer data to spreadsheet software

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

BIM, Energy performance and service systems		
Date: Neljapäev 24.01.2019,10:00 - 17:30 **Location:** Tallinn University of Technology ICT-121 ja ICT-122		
Time	Lecturer	Title
10:00-11:30	Anti Hamburg Ergo Pikas	**Transfer of information from BIM to energy efficiency software**
11:30-11:45		**Pause**
11:45-13:15	Martin Thalfeldt Anti Hamburg Martin Thalfeldt Ergo Pikas	**Service systems and their impact on energy efficiency: Ventilation** • Zoning • Equipment parameters (airflows, SFP, noise) • Transition air • Is there and where is this information and how is it presented in the BIM software? • Where is this information and how is it presented in the energy efficiency software? How to present correctly? • • Transfer data to spreadsheet software
13:15-14:15		**Lunch**
14:15-15:45	Martin Thalfeldt Anti Hamburg Martin Thalfeldt Ergo Pikas	**Service systems and their impact on energy efficiency: Heating** • Heat sources (heat pumps, district heating, etc.) • Radiators • Floor heating • Is there and where is this information and how is it presented in the BIM software? • Where is this information and how is it presented in the energy efficiency software? How to present correctly? Data entry into spreadsheet software
15:45 – 16:00		**Pause**
16:00-17:30	Martin Thalfeldt Anti Hamburg Martin Thalfeldt Ergo Pikas	**Renewable energy sources and their impact on energy efficiency** • Solar panels; Productivity and factors affecting it • Installation conditions. Taking shadows into account. • Is there and where is this information and how is it presented in the BIM software? • Where is this information and how is it presented in the energy efficiency software? How to present correctly? • Transfer data to spreadsheet software

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

BIM procurement, strategy, requirements and building cost-effectiveness		
Date: 25.01.2019 kell 10:00 - 17:30 **Location:** Tallinn University of Technology SOC 311		
Time	Lecturer	Title
10:00-11:30	Targo Kalamees	**BIM and energy performance in design and construction procurement** • Procurement evaluation criteria • Requirements for procurement modeling, final result • Requirements for competent persons (invitations) • Model inspection and delivery
	Ergo Pikas	**BIM Strategy:** • Objectives and uses of the BIM design, • Implementation of BIM in the design and organization, • Principles of open BIM interoperability, • BIM standards and guidelines
11:30-11:45		**Pause**
11:45-13:15	Ergo Pikas	**BIM requirements and practice at different stages:** • Pre-design activities (eg architectural competitions, initial sketches, needs description, concept development, etc.) • Design, Construction, Supervision • Use, • Demolition • Examples of best / worst theory and best / worst practice **Energy performance design at the concept stage** • Simple tools and their comparison • Comparison of building options
13:15-14:15		**Lunch**
14:15-15:45	Martin Thalfeldt Ergo Pikas	**BIM 5D: Budget forecasting**
15:45 – 16:00		**Pause**
16:00-17:30	Martin Thalfeldt Ergo Pikas	**BIM 5D: Cost-optimal solutions**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

2.3 Italy

2.3.1 Course description and results

First classroom course for professionals was organized on **February 22nd 2019** in Terni, Italy.
The course programme consisted of 4 academic hours of theoretical lectures.
A group of **41 participants** specialising in architecture and engineering had undertaken the classroom course in Italy within the framework of the Net-UBIEP project.
The overview of lectures held at the 1st classroom courses is shown below.

- Start of work by answering online questionnaires http://www.net-ubiep.eu/it/self-assessments-5
- Introduction: building information modelling as a tool for the sustainability of our cities
- The Data Sharing Environment (ACDat) for managing the information flow of the BIM process
- Application of BIM in energy performance and property management contracts to reduce consumption and produce energy from renewable sources integrated into the building.
- Designing plants for improving energy performance using BIM: An application to ENEA's energy school.
- BIM applied to cultural heritage: HBIM
- BIM objects and vouchers for the construction of "regional catalogues"
- Administration of the final questionnaire to be completed online http://www.net-ubiep.eu/it/assessments-5
- Final Debate

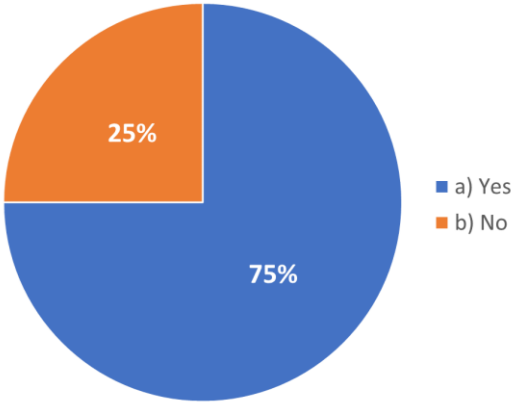
Several images from the first classroom course for professionals conducted by **ENEA** can be found bellow.

Pre- and Post-training questionnaires were translated to Italian language and filled by training participants.

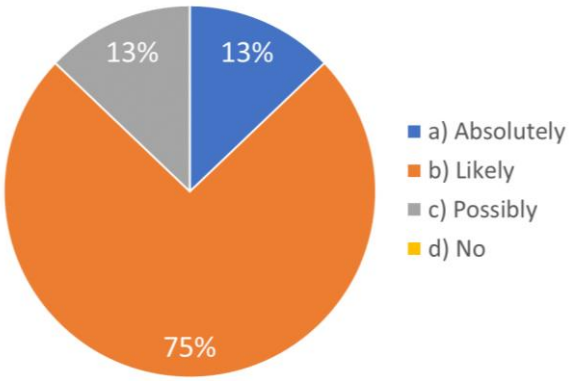
Few general conclusions of the classroom course validation from the participants in Italy is given below, while the entire questionnaire analysis is performed in deliverable *D27-D4.7 Survey and or interview among all different Targets*. Due to the fact that validation was performed in partners' native language, the analysis below has both English questions and the same questions in native language.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

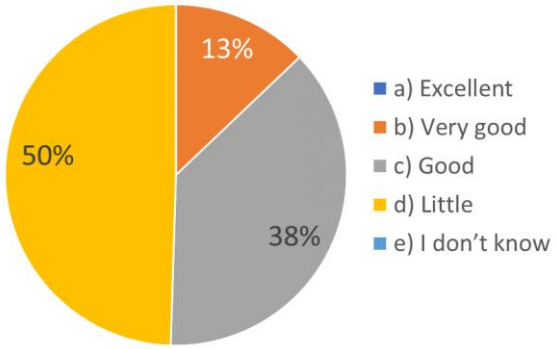
1. Do You or Your company/organization currently use BIM, or is it intending to use BIM in the near future?



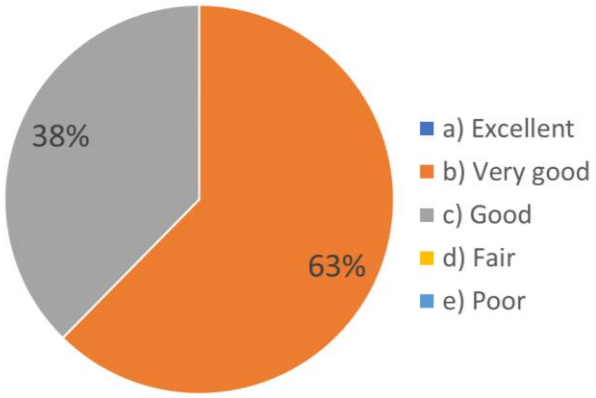
15. Would BIM certification, support or training, benefit Your colleagues?



18. In retrospective, how do You rate Your competences (knowledge, skills, responsibility and autonomy) before this BIM course?

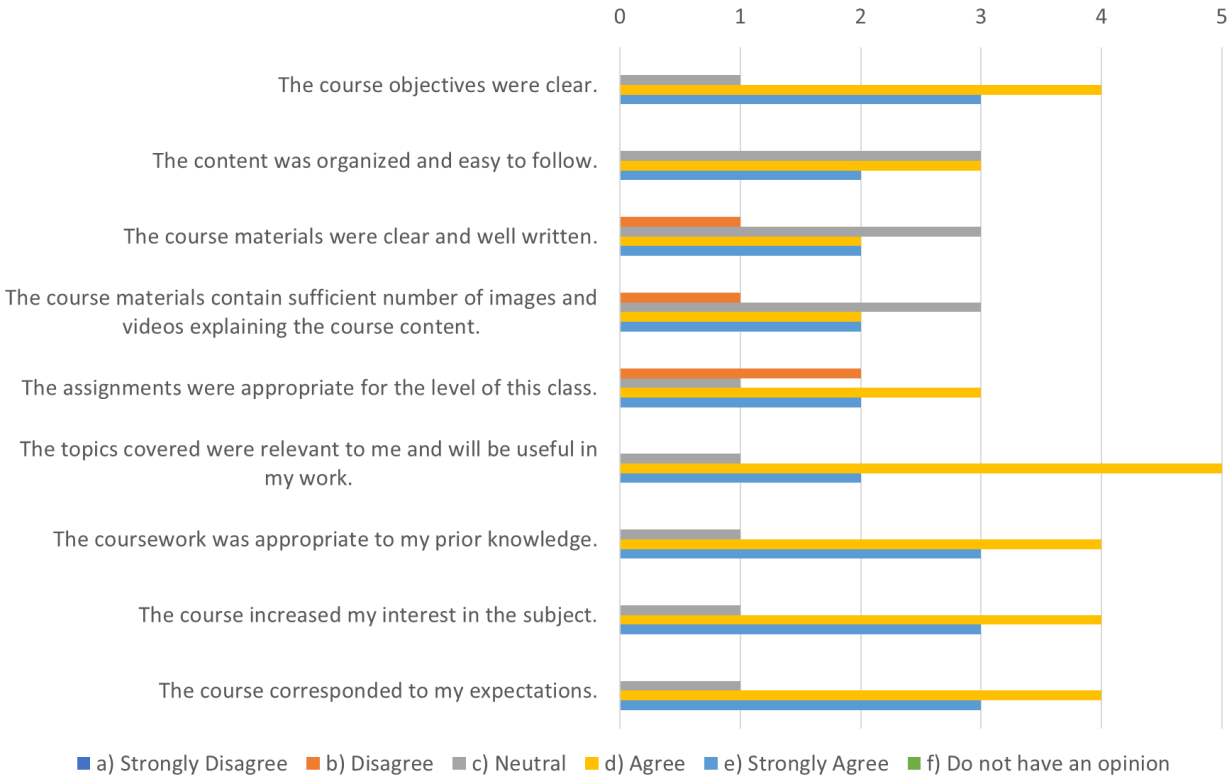


19. What overall rating would You give the course?

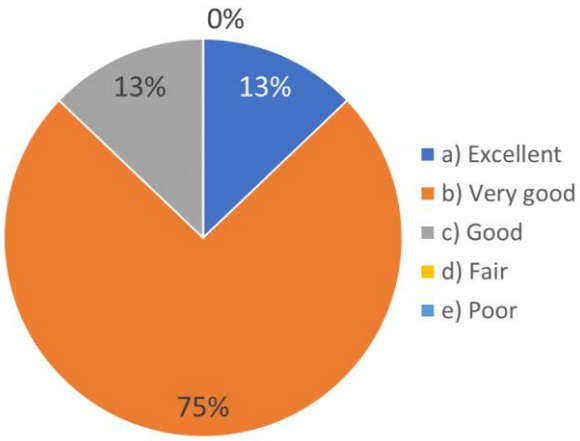


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

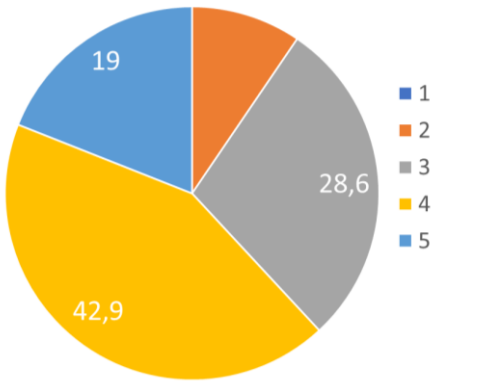
20. Please indicate your level of agreement with the following statements.



21. What overall rating would you give the trainer(s)?

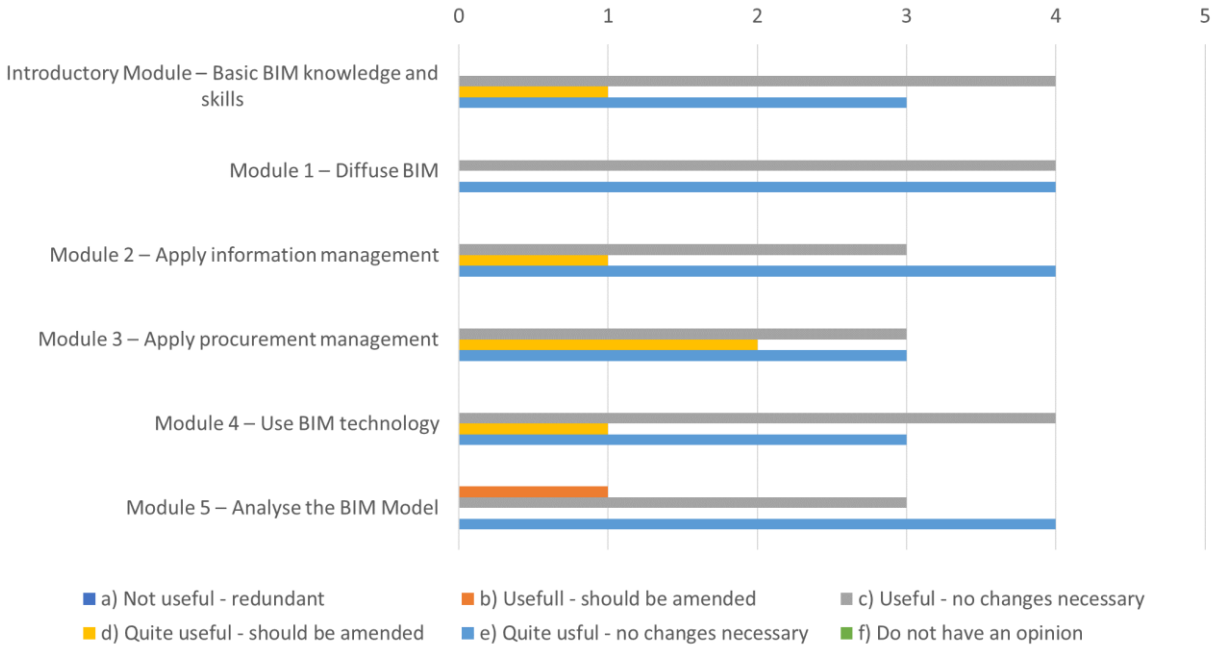


23. How much new information did you receive in the training course?
Rate on the scale: 1 (none) to 5 (a lot of new information)

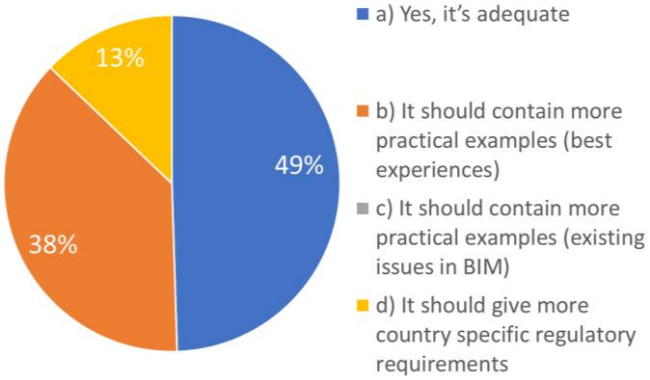


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

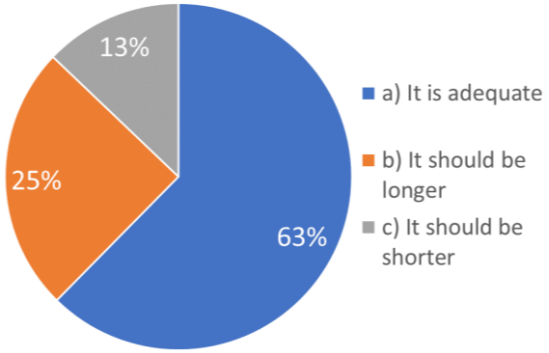
25. Please rate the following BIM course modules based on how they are useful and interesting to you



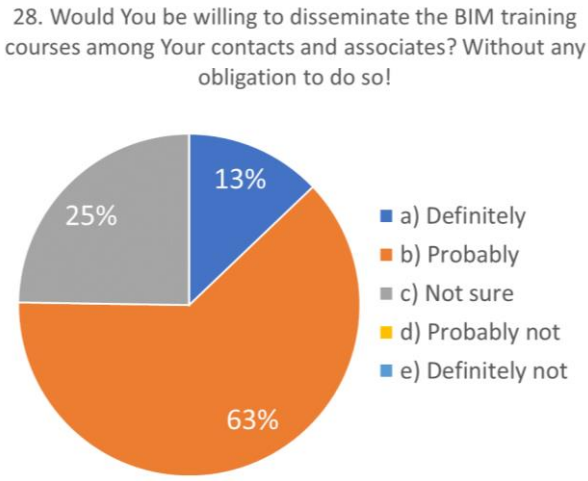
26. What do You feel, is the training material comprehensive enough?

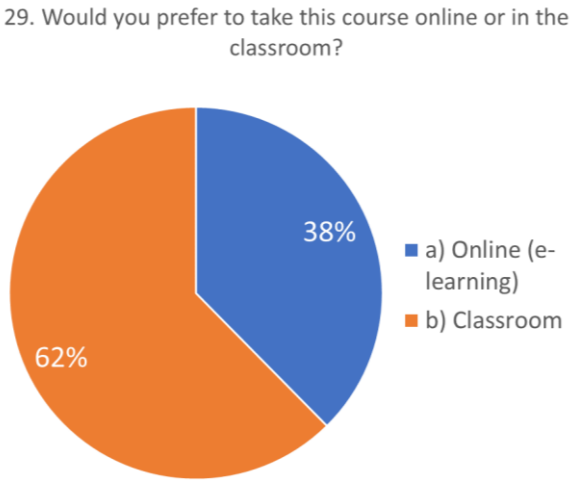


27. What do You feel about the duration of the training?



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016





It is evident from the training validation results that 88 % of participants feel BIM certification, support or training would absolutely (13 %) or likely (75 %) be beneficial to their colleagues which is a good indication of their view about the necessity of certification courses. Additionally, after the course, training participants were asked to evaluate their competences prior to the classroom course on BIM. The intention was to get the information what is their initial knowledge on BIM as well as to see whether the course was an "eye opener" and comprehensive enough. The participants replied that they feel they had little (50 %) or good (38 %) and very good (13 %) competences. Since 75 % of course participants is already using BIM (or intends to use it in near future) the overall rating of the course as good (38 %), very good (63 %) is very encouraging and positive for the developed training materials and courses held in Italy. Trainers received positive overall rating of very good (75 %) and excellent (13 %).

The majority of course participants agree and strongly agree to the statements that the course objectives were clear with organized and easy to follow content. They are neutral and mainly agree that course materials were clear and well written and contain sufficient number of images and videos explaining the course content. There were no practical assignments so there is a significant number of participants who disagree with the claim that assignments were appropriate for the level of this class while the coursework was appropriate to their prior knowledge and the topics covered were relevant and will be useful in their future work as they received new information (51 % of participants feel they got significant amount of new information). The course also increased their interest in the subject and corresponded to their expectations. When getting more in depth and looking for their opinion on each of the training modules, participants feel that Introductory module and modules 1, 2, 4 and 5 are useful and requires no changes, while module 3 is useful but significant number of course participants feel that this module should be amended with additional content to make it better. Specifically, the general opinion is that training materials are adequate, but significant number of participants (38 %) said it should contain more practical examples (best experiences). Regarding the length of training, 63 % of training participants said that 4-hour training course is adequate, while 25 % think it should be longer and 13 % think the course should be shorter. It has to be enhanced that 63 % of course participants prefer to take this course in the classroom while only 38 % of people would prefer to take it on-line.

The quality of the course is best rated if training participants disseminated and recommend the course to their colleagues, friends and associates, and in the case of Italian classroom course for professionals,

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

participants declared they would definitely (13 %) and probably (63 %) be willing to disseminate the BIM training courses among their contacts.
Analysis of the training results, problems and solutions together with lessons learned during the courses are as follows:

- BIM is no longer a tool for the design of buildings alone, but is also a tool for designing, building, managing to maintain better buildings and surface and sub-ground infrastructures.
- The use of openBIM becomes essential to ensure information management in any sectoral, geographical and temporal context.
- The collaboration, as a basis of BIM, must have a Data Sharing Environment to foster dialogue between all the actors without loss of information but also without redundancy and avoiding misunderstandings
- BIM is a useful tool to evaluate the opportunity of deep energy renovation of building, calculating the return times with using the tax incentives available today: Eco bonus and earthquake bonus.
- BIM can be used to view the various interventions and choose the optimal one. BIM, in this case, not only allows you to simulate different options, but also serves as a communication tool with the end customers as the display of BIM models is much more "friendly" than any technical drawing.
- In the process of knowledge and intervention in historical contexts, the information assets to be managed are enormous (documents and archive photographs, surveys, diagnostic investigations, previous restoration interventions, etc.). BIM methodology applied to the analysis, management and intervention of the built history offers greater efficiency in the design, improving the interoperability of digital information in interdisciplinary work groups. The HBIM, due to its ability to organize and make data available, can be considered as a support to the choices and decisions aimed at safeguarding the asset.
- For an eco-sustainable design it is appropriate to promote the creation of BIM catalogues of local products so that designers and builders can design and build buildings with zero kilometre products and the owners can more easily provide for the management and maintenance of the technical systems of buildings. BIM object, in fact, if appropriately integrated in the BIM model, allows access to technical data sheets and maintenance booklets of products installed in the building with the use of a tablet and a few clicks.

Comments and suggestions of the training participants could be summarised in the following few lines:

- Training participants would like to have more insights about clash-detection and code checking
- Some participants declared they would like to have more practical case studies
- On the other hand, there were also training participants who congratulated for the "*excellent course for basic information*" and those who think that BIM is the future.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

2.3.2 Agenda

The seminar aims to present the BIM methodology by providing participants with a basic knowledge of Building Information Modeling. Following the new DM 560/17 (BIM Decree) and the publication of UNI 11337 (2017) standards, it is important to know BIM and its application and diffusion at national and international level. The NET-UBIEP project will be presented which aims to increase the energy performance of buildings by stimulating and promoting the use of BIM during the life cycle of a building: from the design phase to construction, management, maintenance, renovation , finally, to demolition.
To achieve the goals of net-UBIEP, all professionals must be ready to improve their skills through the use of BIM (Building Information Modeling) integrated with the introduction of the energy performance criteria of buildings to meet the needs of their customers with better quality of the project and lower cost.
The use of BIM is spreading more and more in all countries of the world who will not adapt quickly to the new digital world risks being replaced by professionals from other countries since a digital project can be realized and shared via the internet .
NET-UBIEP also promotes collaboration throughout the supply chain because it is important that all professionals and technicians, who participate in the various stages of design and construction, have a specific role in collecting, managing and storing all the necessary information during the whole life cycle of the building. Every technician, civil servant, designer, builder, facility manager or supplier, must therefore know what information can potentially be used by any other actor. Not only that, all information must be available for the entire life of the building even when the process that generated it is finished. It is essential that all the different actors use the same language, the same dictionaries and the same data structure.

ENEA
Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile

ORDINE degli INGEGNERI della PROVINCIA di TERNI

NET UBIEP
Network for Using BIM to Increase the Energy Performance

www.net-ubiep.eu

Anna Moreno
Coordinator Net-UBIEP
Tel. +39 06 3048 6474
anna.moreno@enea.it

The role of professionals in the construction industry to achieve the best energy performance using BIM: the NET UBIEP project

22/02/2019
Terni, Piazza Mario Ridolfi, 4/7

The Order of Engineers of the Province of Terni, through the activity of the Environment commission, on 22/02/2019 offers its members a free technical seminar on the topic: "The role of the professionals of the construction industry to obtain the improved energy performance using BIM: the NET UBIEP project

Program of the day

2.30 pm - 2.40 pm
Introduction to the work and initial greetings
Ing. Andrea Sconocchia
President of the Order of Engineers Commission of the Province of Terni

2.40 pm - start of work by answering online questionnaires http://www.net-ubiep.eu/it/self-assessments-5

1. Introduction: building information modeling as a tool for the sustainability of our cities
BIM is no longer a tool for the sole design of buildings, but it is also a tool for designing, building, managing and maintaining buildings and infrastructures on the surface and sub-soil better. In this context, the use of openBIM becomes essential to ensure the management of information in any sectoral, geographical and temporal context.
Anna Moreno, Enea

2. The Data Sharing Environment (ACDat) for the management of the information flow of the BIM process
The collaborative atmosphere, at the basis of BIM, must have a Data Sharing Environment to encourage dialogue between all the players without loss of information but also without redundancies and avoiding misunderstandings
Giuseppe Esposito, ACCA

3. Application of BIM in energy performance and property management contracts to reduce consumption and produce energy from renewable sources integrated into the building.
BIM modeling allows you to have a useful tool to evaluate the opportunity of a more or less profound redevelopment of a building by calculating the return times with certainty of the results using the tax incentives available today: Eco bonus and earthquake bonus.
Enrico Zoccatelli Global Power Service, Esco

4. Designing systems for improving energy performance using BIM: An application to the school of ENEA energies.
To design and redevelop an existing building, BIM can be used to view the different interventions and choose the optimal one. In this case, BIM not only allows you to simulate the different solutions by calculating the return on investment, but also serves as a communication tool with end customers, since the visualization of the BIM models is much more "friendly". of any technical report.
Anna Moreno, Enea

5. BIM applied to cultural heritage: HBIM
In the process of knowledge and intervention in historical contexts, the information assets to be managed are enormous (archive documents and photographs, findings, diagnostic investigations, previous restoration interventions, etc.). The BIM methodology applied to the analysis, management and intervention on the historical building offers greater efficiency in the design, improving the interoperability of digital information in interdisciplinary working groups. HBIM, for its ability to organize and make data available, can be considered as support for choices and decisions aimed at safeguarding the asset.
Elena Gigliarelli, CNR

6. BIM objects and vouchers for the construction of "regional catalogs"
For an eco-sustainable design it is appropriate to promote the creation of BIM catalogs of local products so that designers and builders can design and build buildings with zero kilometer products and the owners can more easily provide for the management and maintenance of the systems of buildings. The BIM object, in fact, if properly integrated into the BIM model, allows access to technical data sheets and maintenance booklets of what is inserted in the building with the use of a tablet and a few clicks.
Colacem, Clivet

18:00
Administration of the final questionnaire to be completed online http://www.net-ubiep.eu/it/assessments-5

Final debate

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

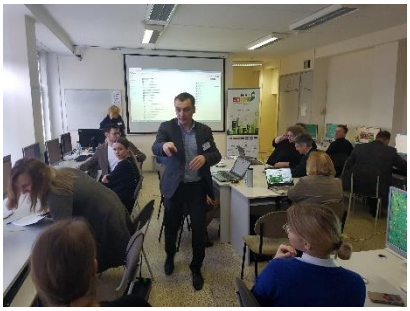
2.4 Lithuania

2.4.1 Course description and results

First classroom course for professionals was organized on **March 1st 2019** in Vilnius, Lithuania.
The course programme consisted of 8 academic hours combining theoretical part with application examples (case studies) and practical tasks.
A group of **24 participants** specialising in architecture and engineering had undertaken the classroom course in Lithuania within the framework of the Net-UBIEP project.
The overview of the partners and methodological basis of the classroom courses is shown in the figure below.

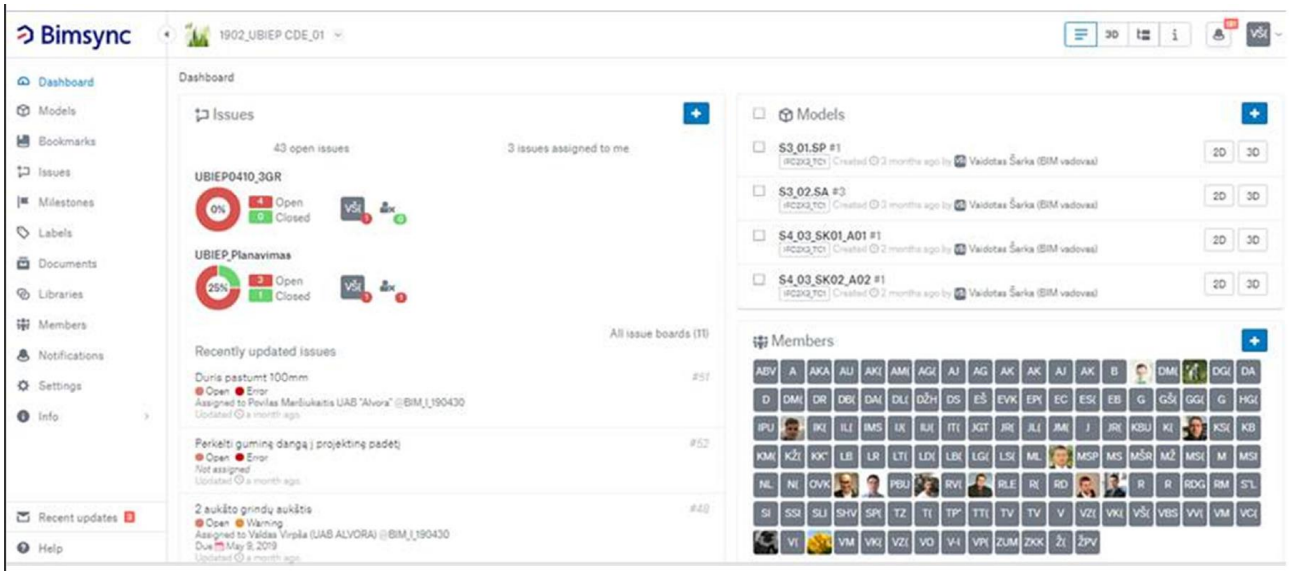
Prepared by: Doc. Dr. Vaidotas Šarka (VšĮ „Skaitmeninė statyba“); Doc. Dr. Tatjana Vilutienė (Vilnius Gediminas Technical University)

Several images from the first classroom course for professionals conducted by the **Dig.Con.** can be found bellow.



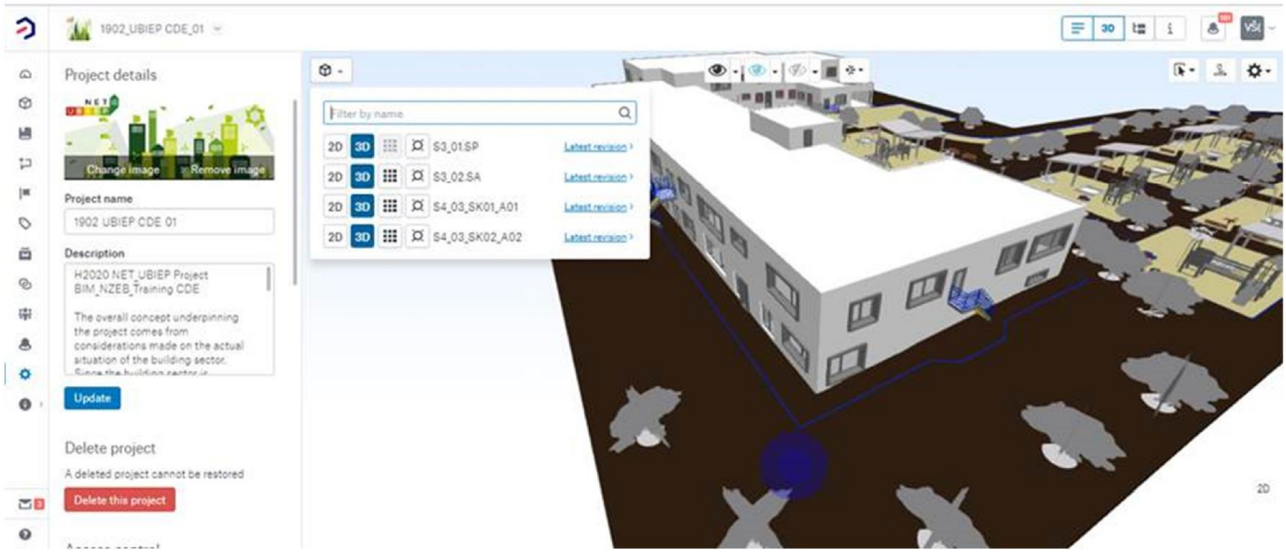
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

BIMSync platform for Common Data Environment (CDE) provided by Catena (Norway) was used during classroom courses in Lithuania. Project Dashboard (summary) within the BIMSync platform is shown in the figure below.

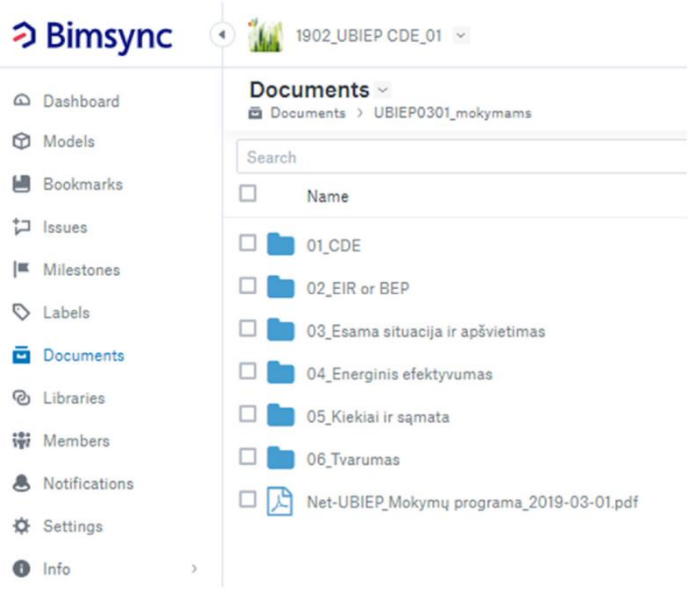


Real BIM Model (Presented by Vilnius Municipality Company “Vilniaus vystymo kompanija” – figure below) was shared with the classroom course participants as an application example and BIMSync platform was used to conduct specific tasks given to participants during the course.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016



Training documents developed for the purpose of classroom course within the Net-UBIEP project was shared among participants using BIMSync platform, as shown in figure below.



Pre- and Post-training questionnaires were translated to Lithuanian language and filled by training participants. Pre-training questionnaire is available at this link:

Lithuanian version	https://docs.google.com/forms/d/e/1FAIpQLSfK_ZgufjP2RxbOV-ZcZnvNuPrWwS7v7ETfPY57Hzzg6cXN7g/viewform
English version	https://docs.google.com/forms/d/e/1FAIpQLSduQHwnKBVoeh_hEfGY8lJLDcqlBg-KfTLxsIgxKHOhg5wtVQ/viewform?vc=0&c=0&w=1

while the responses to the Pre-training questionnaire are available at this link:
https://docs.google.com/forms/d/15uY64BIGHQjqi33KWMdtBasG6lotuPdP1h45yINCswI/edit#responses

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

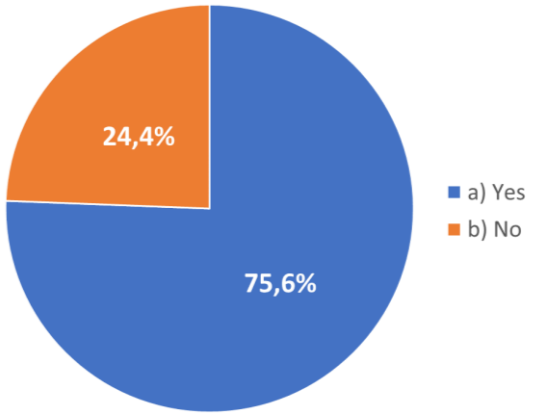
On the other hand, Post-training questionnaire is available at this link:

Lithuanian version	https://docs.google.com/forms/d/e/1FAIpQLSdGyTylhqzf7DoEsl-y0YghAbpA1ZzmKrqr7RBXyaZzm_RdsQ/viewform
English version	https://docs.google.com/forms/d/e/1FAIpQLSfUZIzUpectOF8VuGc71_9GbDWdJG3JvsuDHgJrQ730IeakWg/formResponse

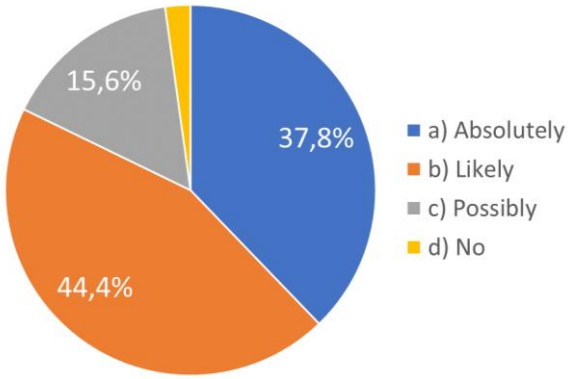
while the responses to the Post-training questionnaire are available at this link:
https://docs.google.com/forms/d/1limow7zJEoEQkZfhQaqxP0vQ_OdyfoeKR4aNsDbJ8pg/edit#responses

Few general conclusions from the classroom course validation from the participants in Lithuania is given below, while the entire questionnaire analysis is performed in deliverable *D27-D4.7 Survey and or interview among all different Targets*. Due to the fact that validation was performed in partners' native language, the analysis below has both English questions and the same questions in native language.

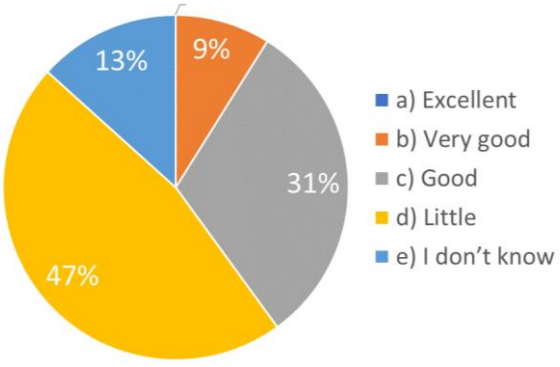
1. Do You or Your company/organization currently use BIM, or is it intending to use BIM in the near future?



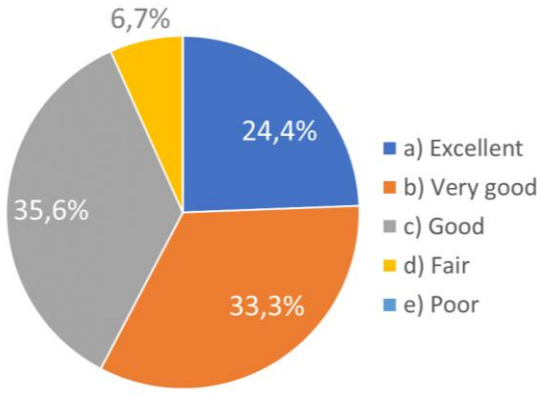
15. Would BIM certification, support or training, benefit Your colleagues?



18. In retrospective, how do You rate Your competences (knowledge, skills, responsibility and autonomy) before this BIM course?

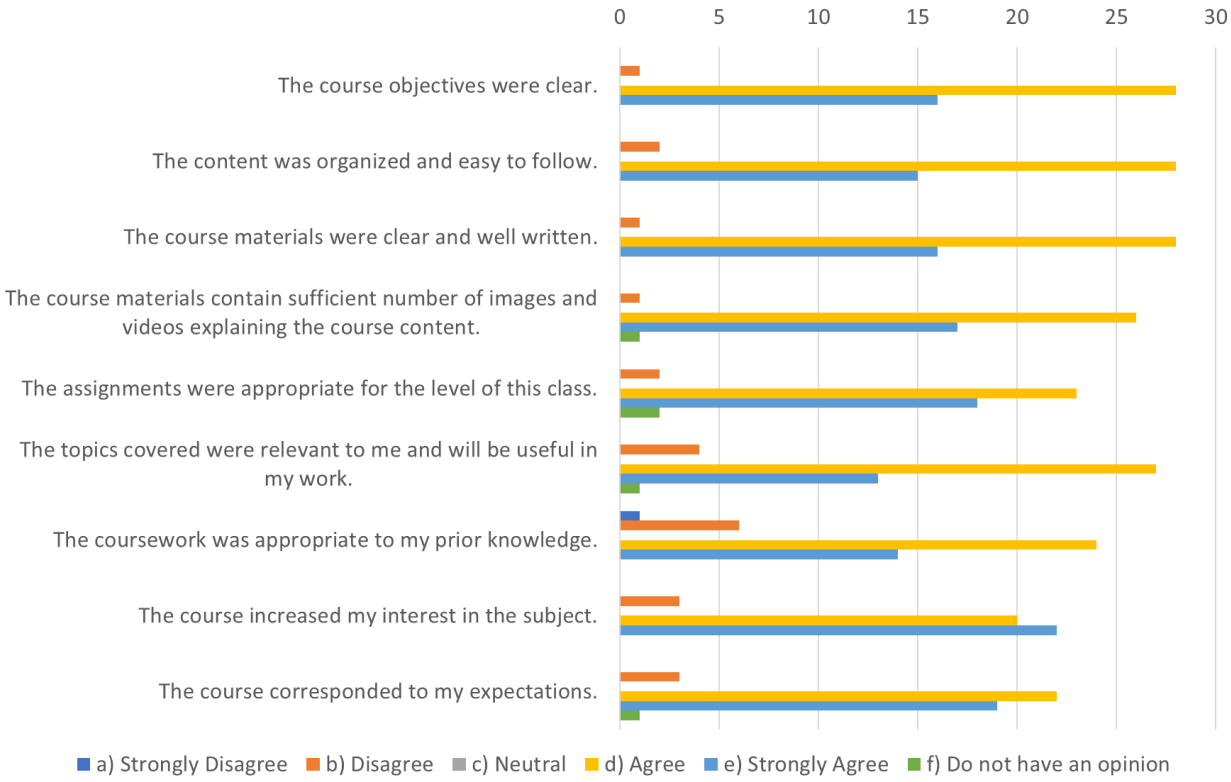


19. What overall rating would You give the course?

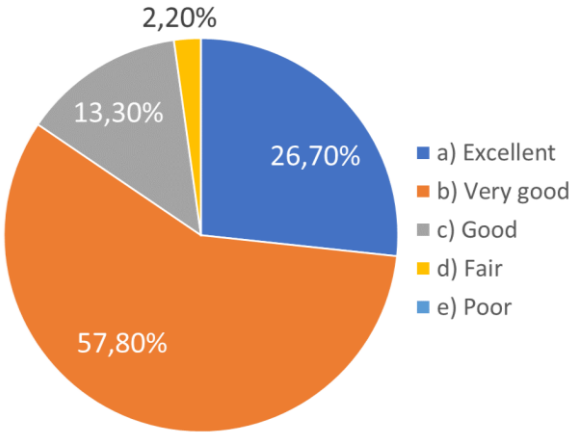


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

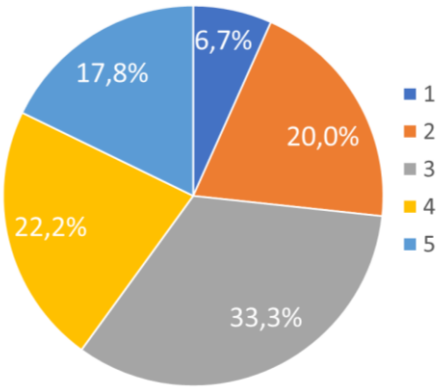
20. Please indicate your level of agreement with the following statements.



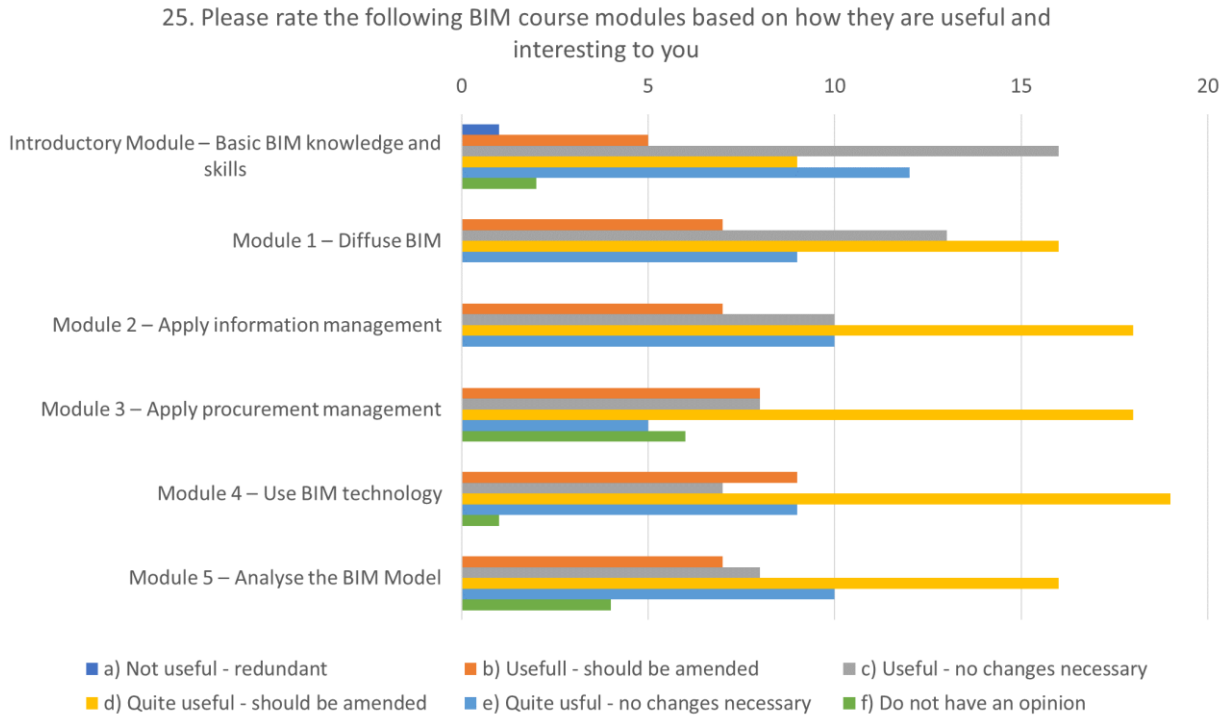
21. What overall rating would you give the trainer(s)?

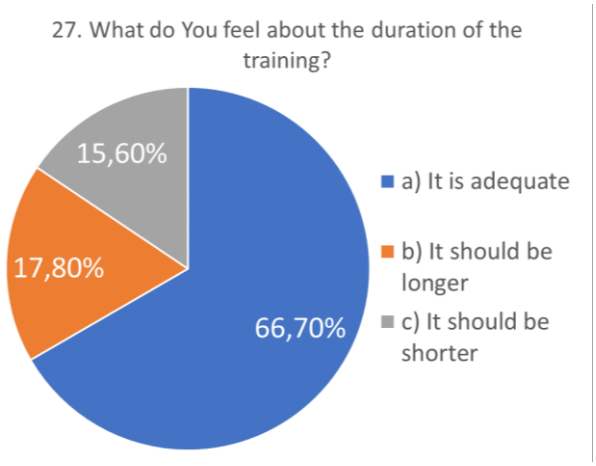


23. How much new information did you receive in the training course?
Rate on the scale: 1 (none) to 5 (a lot of new information)

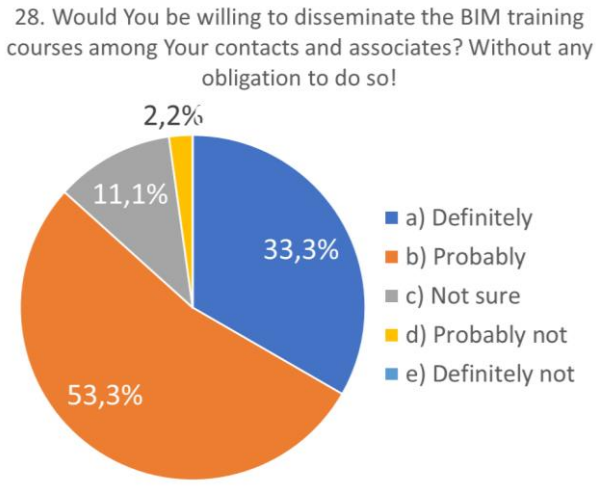


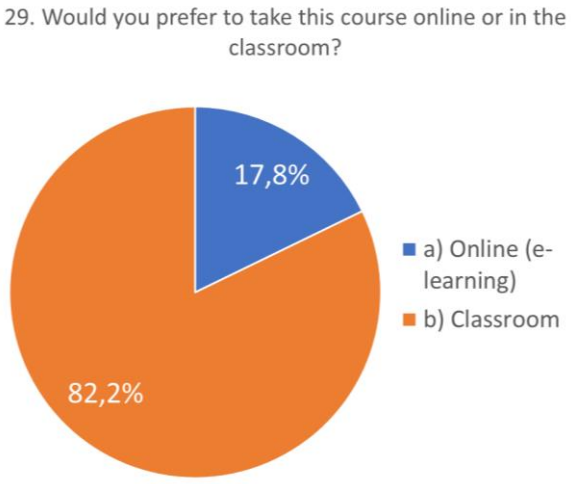
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016





This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016





It is evident from the training validation results that 82.2 % of participants feel BIM certification, support or training would absolutely (37.8 %) or likely (44.4 %) be beneficial to their colleagues which is a good indication of their view about the necessity of certification courses. Additionally, after the course, training participants were asked to evaluate their competences prior to the classroom course on BIM. The intention was to get the information what is their initial knowledge on BIM as well as to see whether the course was an “eye opener” and comprehensive enough. The participants replied that they feel they had little (46.7 %) or good (31.1 %) and very good (8.9 %) competences. Since 75.6 % of course participants is already using BIM (or intends to use it in near future) the overall rating of the course as good (35.6 %), very good (33.3 %) and excellent (24.4 %) is very encouraging and positive for the developed training materials and courses held in Lithuania. Trainers received positive overall rating of very good (57.8 %) and excellent (26.7 %).

The majority of course participants agree or are neutral to the statements that the course objectives were clear with organized and easy to follow content. They mainly agree that course materials were clear and well written and contain sufficient number of images and videos explaining the course content. The positive validation of the Lithuanian course is also evident from the fact the majority of participants agree that assignments were appropriate for the level of this class (appropriate to their prior knowledge) and the topics covered are relevant and will be useful in their future work as they received new information (73.3% of participants feel they got significant amount of new information). The course also increased their interest in the subject and corresponded to their expectations.

When getting more in depth and looking for their opinion on each of the training modules, participants feel that Introductory module is useful and requires no changes, while 5 modules developed are useful but majority of course participants feel that these modules should be amended with additional content to make it better. Specifically, the general opinion is that training materials contain more practical examples (best experiences and existing issues in BIM), 44.4 % and 51.1 % respectively. Regarding the length of training, 66.7 % of training participants said that 8-hour training course is adequate, while 17.8 % think it should be longer and 15.6 % think the course should be shorter. It has to be enhanced that 82.2 % of course participants prefer to take this course in the classroom while only 17.8 % of people would prefer to take it on-line.

The quality of the course is best rated if training participants disseminated and recommend the course to their colleagues, friends and associates, and in the case of Lithuanian classroom course for professionals, participants declared they would definitely (33.3 %) and probably (53.3 %) be willing to disseminate the BIM training courses among their contacts.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement *No.754016*

Analysis of the training results, problems and solutions together with lessons learned during the courses are as follows:

- A new model of practical trainings for BIM has been developed, combining theoretical part with application examples (case studies) and practical tasks.
- The system of documents and methodology developed by DigCon and partners was used for the trainings: system of documents, i.e. templates of EIR, BEP, LOD, BIM Use cases, etc.
- The duration of trainings – 8 hours. Participants of the trainings have confirmed that duration is appropriate.
- After the training, the majority expressed a desire to continue with the trainings.
- Real BIM project management web platform BIMSync (CDE) has been used as a platform for communication between trainers and training participants
- Training platform BIMSync used real BIM model files and related information.
- To complete the questionnaires, tasks were created through the CDE environment in BIMSync platform. This resulted in a high percentage of responses (Pre- 95%, Post -75%).

Comments and suggestions of the training participants could be summarised in the following few lines:

- The classroom course participants seek for more practical lessons and tasks, more examples of good foreign practice, and more practical project reviews.
- Training is useful for all market participants, but it needs to be clarified that training is intended for beginners
- It would be possible to invite the building contractor to describe the implementation of the construction and to evaluate it equally in the BIM modeling process. Additionally, it would be more useful to hear about practical problems in our market.
- Some course participants would like to have a more specific and deeper analysis rather than the amount of information but poorly analyzed. It would be useful to introduce more detailed application of the BIM model 4D (timing control for construction companies) and 5D (model-match mapping capabilities through classification to automate the creation of a booklet), as well as more detail on BIM usage in 6D and 7D.
- Several participants suggest that the course could be divided into a series of courses on individual topics, that more time is needed (maybe two days) since topics are taught too fast and have little time for discussions. On the other hand, a few participants said everything is fine, but they would prefer a little shorter course.
- Some participants feel they would like more links (problems) to the management of the BIM project and the legal basis for interference / assistance in building a construction document. In the course materials, provide a comparative relationship with the innovations to be implemented and the current situation according to the applicable standards. Some participants would require analysis of various BIM apps.
- Testimonial: *The courses were useful for me to get to know the system and get interested. Now I would like to learn more and deepen my practical knowledge because I still feel that there is a lack of practical application of theoretical knowledge.*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

2.4.2 Agenda

Skaitmeninė Statyba | Vilniaus Gedimino Technikos Universitetas | NET UBIEP | Co-funded by the Horizon 2020 programme of the European Union

Mokymai „Kaip efektyviai projektuoti ir statyti bei naudoti energijos beveik nenaudojančius (*angl. NZEB*) tvarius pastatus, taikant statinių informacinio modeliavimo (BIM) metodiką".

Training "How to efficiently design, build and use energy-efficient (NZEB) sustainable buildings using building information modeling (BIM) methodology"

Net-UBIEP 1-ieji mokymai statybos profesionalams (WP4) / *Net-UBIEP 1st classroom courses for Professionals (WP4)*

Data/Date: 2019-03-01, 8:30-17:00 val.

Vieta/Place: Vilniaus Gedimino technikos universitetas (Saulėtekio al. 11, Vilnius), SRL-I 520

MOKYMŲ PROGRAMA / TRAINING PROGRAM		
Laikas/Time	**Tema/Topic**	**Pranešėjas/Presenter**
8:30-9:00	Registracija / Registration	
9:00-9:10	Sveikinimo žodis, mokymų tikslai / Welcome word, training goals	Dalius Gedvilas (VšĮ „Skaitmeninė statyba")
9:10-9:30	Skaitmeninė statyba Lietuvoje. Kiek esame pažengę? / Digital construction in Lithuania. How advanced are we?	Dalius Gedvilas (VšĮ „Skaitmeninė statyba")
9:30-9:50	Apie Net-UBIEP projektą. Mokymų planas / About the Net-UBIEP project. Training plan.	Tatjana Vilutienė (Vilniaus Gedimino technikos universitetas)
Praktinė dalis / Practical part		
9:50-10:20	Susipažinimas su mokymų dalyviais. *Praktinė užduotis:* Statybos projektų problematikos identifikavimas / Getting acquainted with the training participants. Practical task: Identification of construction project problems	Vaidotas Šarka (VšĮ „Skaitmeninė statyba")
10:20-10:50	*Praktinė užduotis:* CDE - projekto komandos bendradarbiavimo aplinka WEB platformoje ir Integruotos komandos formavimas (IPD) / Practical task: CDE - project team collaboration environment on WEB platform and Integrated team building (IPD)	Vaidotas Šarka (VšĮ „Skaitmeninė statyba"); Tatjana Vilutienė, Edita Šarkienė (Vilniaus Gedimino technikos universitetas)
10:50-11:10	*Kavos pertraukėlė / Komunikavimas / Coffee Break / Communication*	
11.10-11:30	Kas yra EIR ir BEP? Kodėl svarbu parengti racionalų EIR? / What are EIR and BEP? Why is it important to develop a rational EIR?	Arvydas Kiaulakis (VšĮ „Skaitmeninė statyba")
11:30-12:00	*Praktinė užduotis:* Projekto BIM tikslų nustatymas / *Practical task*: Setting project BIM goals	Tatjana Vilutienė, Edita Šarkienė (Vilniaus Gedimino technikos universitetas)
12:00-12:30	*Praktinė užduotis:* Kokius BIM taikymo būdus naudosime projekte? / *Practical task*: What kind of BIM Use Cases will we use in the project?	Tatjana Vilutienė, Edita Šarkienė (Vilniaus Gedimino technikos universitetas)
12:30-13:15	*Pietūs / Lunch*	
13:15-14:00	*Demonstravimas:* Esamos situacijos modeliavimas ir apšvietimo analizė. *Praktinė užduotis:* Užduočių pasirinktam BIM taikymo būdui formulavimas. Informacijos pateikimo plano (IPP) rengimas. Rezultatų aptarimas. / *Demonstration*: Modeling of the current situation and analysis of lighting. *Practical task*: Formulation of tasks for the discussed BIM Use Case. Preparation of an Information Delivery Plan (IDP). Discussion of results.	Violeta Motuzienė (Vilniaus Gedimino technikos universitetas) Marius Žygaitis (Architektų Sąjunga)
14:00-14:45	*Demonstravimas:* Energinio naudingumo modeliavimas *Praktinė užduotis:* Užduočių pasirinktam BIM taikymo būdui formulavimas. Informacijos pateikimo plano (IPP) rengimas. Rezultatų aptarimas. / *Demonstration*: Energy efficiency modeling. *Practical task*: Formulation of tasks for the discussed BIM Use Case. Preparation of an Information Delivery Plan (IDP). Discussion of results.	Rasa Džiugaitė-Tumėnienė (Vilniaus Gedimino technikos universitetas)

Net-UBIEP: D21-D4.1 First classroom courses for Professionals (Lithuania).
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 754016. This deliverable reflects only the author's view. The Agency is not responsible for any use that may be made of the information it contains.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

Co-funded by the Horizon 2020 programme of the European Union

MOKYMŲ PROGRAMA / TRAINING PROGRAM		
Laikas/Time	**Tema/Topic**	**Pranešėjas/Presenter**
14:45-15:00	*Kavos pertraukėlė / Komunikavimas / Coffee Break / Communication*	
15:00-15:45	*Demonstravimas*: Kiekių analizė ir sąmatų rengimas. *Praktinė užduotis:* Užduočių pasirinktam BIM taikymo būdui formulavimas. Informacijos pateikimo plano (IPP) rengimas. Rezultatų aptarimas. / *Demonstration*: Quantity analysis and estimation. *Practical task*: Formulation of tasks for the discussed BIM Use Case. Preparation of an Information Delivery Plan (IDP). Discussion of results.	Albinas Vaitkevičius (UAB „SISTELA") Vaidotas Šarka (VšĮ „Skaitmeninė statyba")
15:45-16:30	*Demonstravimas:* Tvarumo analizė, *Praktinė užduotis:* Užduočių pasirinktam BIM taikymo būdui formulavimas. Informacijos pateikimo plano (IPP) rengimas. Rezultatų aptarimas. / *Demonstration*: Sustainability analysis. *Practical task*: Formulation of tasks for the discussed BIM Use Case. Preparation of an Information Delivery Plan (IDP). Discussion of results.	Rūta Mikučionienė (Vilniaus Gedimino technikos universitetas)
16:30-17:00	*Questions / Discussion / Reflection / Questionnaires*	
17:00	Renginio pabaiga / Event Closure	

Daugiau informacijos / More information:

1. Apie net-UBIEP projektą / About Net-UBIEP project: http://www.net-ubiep.eu/lt/home-lt/
2. Apie BIM metodikos taikymą / About BIM methodology application: www.skaitmeninestatyba.lt
3. Apie statybų sektoriaus e-kompetencijų registrą / About the register of e-competencies in the construction sector: www.statreg.lt
4. Apie A, A+, A++ ir NZEB pastatų statybos technologijas / About A, A +, A ++ and NZEB building construction technologies: www.statybostaisykles.lt statybos taisyklių ir ENERGOTRAIN skiltis / building regulations and ENERGOTRAIN section

Renginio organizatoriai / Event organizers:

Renginio partneriai / Event partners:

Net-UBIEP: D21-D4.1 First classroom courses for Professionals (Lithuania).
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 754016. This deliverable reflects only the author's view. The Agency is not responsible for any use that may be made of the information it contains.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

2.5 Slovakia

2.5.1 Course description and results

On **1 April 2019** (8 hours), the First Net-UBIEP training course was organised for Professionals were held in Bratislava, Slovakia.

Slovak partners have set up the Net-UBIEP School of BIM in Slovakia. The training provided by the school is modular and open to further new modules. At present they have established 7 modules:

- MU1 - Basic module for public authorities;
- MU2 - basic module for owners of buildings;
- MU3 - basic module for facility managers;
- MP1 - basic module for professionals;
- MP2 - working with the software for BIM (for professionals);
- MP3 - planning fire protection in BIM (for professionals);
- MT1 - module for technicians and craftsmen;
- Certification module – under development - will be clarified as we have more details of using bSI platform.

During the classroom courses, Slovak partners were testing these modules:

- 1st seminar for PA, owners and facility managers (25 October 2018) and in second seminar for PA, owners and facility managers (25 April 2019);
- 1st training session for professionals (1 April 2019);
- 2nd training sessions for professionals (2 April 2019);
- third training session for professionals (23-24 May 2019);
- in-class training for technicians (28 March 2019) - they had to organise the training for technicians in-class, as reading the information material using e-learning would be not enough for them and Slovak partners were delivering through this session practical demonstrations for augmented reality using phones, tablets and 3D-glasses; and they could personally test working with 3D-glasses (this exercise was prepared by a company affiliated to the school.

The Net-UBIEP School of BIM is supported by affiliates that include: construction association, Chamber of Architects, training institute, providers of software (for the moment only Revit, but others are interested to come), many technical companies that are providing BIM related services (mostly SMEs) for integrated planning, construction and facility management (still we have to cover liquidation and recycling), architect studios.
These affiliates provide input to the training, provide speakers, equipment for practical demonstrations and exercises (Slovak partners have established a rule that they are neutral in respect of brand - so no company presentations allowed) etc. The network is growing.
Certainly, this school will continue to work beyond expiry of the project and they already have many plans with their affiliates.
Additionally, Slovak partners have an ambition to include also the Czech Republic and organise joint "Summer BIM Schools" (they have contacted the representatives of czBIM).
After they are done with the validation classroom courses, they would like to organise additional routine training in the second half of the year (2019), and they scheduled with the Chamber of Architects MP1

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

module for October 2019 and second session of MP2 as the number of participants (due to the need of personal guidance) is limited and the interest has been overwhelming.

The First in-class course for professionals consisted of 8 academic hours combining theoretical part with application examples (case studies) and practical tasks.
A group of **15 participants** specialising in architecture and engineering had undertaken the first classroom course in Slovakia within the framework of the Net-UBIEP project.

The key objectives of the seminar were:

- Present key elements of BIM and train architects/planners using the relevant software (Autodesk family);
- Explain how to use the available tools for BIM-based energy efficiency assessment of buildings;
- Discuss the barriers in efficient and effective use of BIM in integrated design and planning;
- Discuss the barriers to the digitalization of spatial planning and delivery of e-permits.

Particular objectives of the seminar were set as follows:

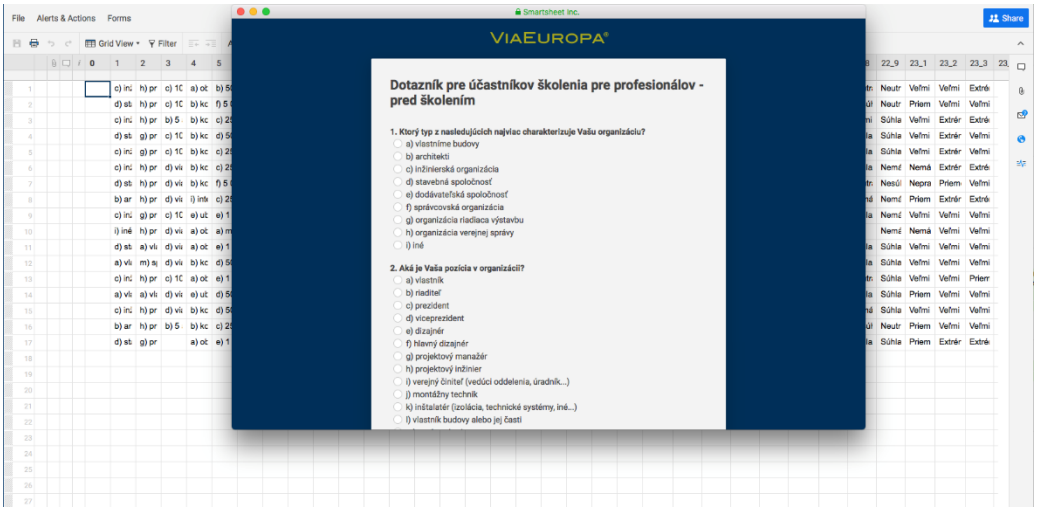
- Test the content of the training for modules MP1, MP2 and MP3;
- Receiving feed-back from the participating professionals on how to improve and further develop the offer of the Net-Ubiep Academy in Slovakia (fine-tuning existing modules, development of new modules);
- Discuss the tentative projects for supporting market uptake of skills and knowledge on BIM and its support to energy optimisation of buildings;
- Discuss specific issues, such as planning fire protection (specific legislative requirements in Slovakia and the Czech Republic that needs to be addressed).

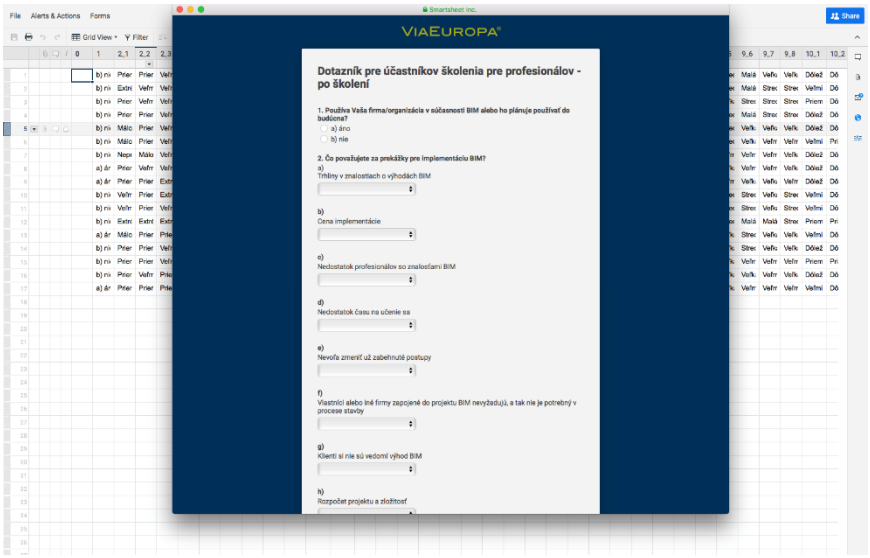
The following main topics were discussed in detail:

- How BIM helps the target group in achieving the targeted energy performance of the building during the relevant (to the target group) phases of the building's life cycle;
- What tools the target groups need to master in order to reap the benefits of BIM;
- Digitalised building model and how to work with it in performing the target groups' duties and responsibilities;
- Infrastructure and training needed for the target groups to perform their duties and responsibilities.

Pre- and Post-training questionnaires were translated to Slovak language and filled by training participants.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

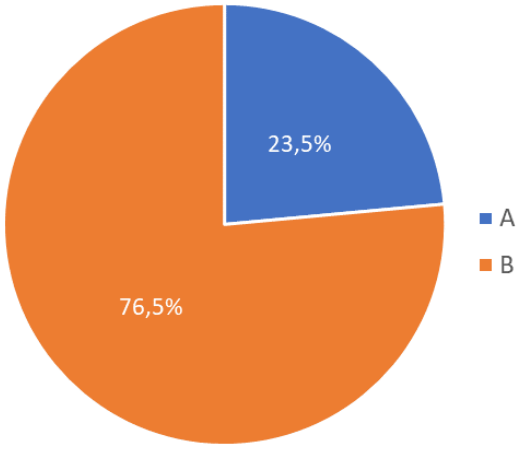




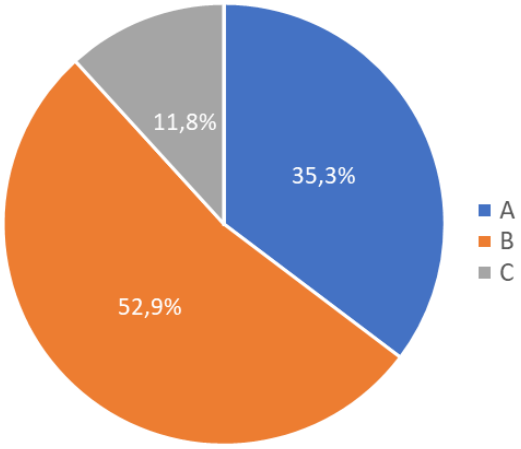
Few general conclusions from the classroom course validation from the participants in Slovakia is given below, while the entire questionnaire analysis is performed in deliverable *D27-D4.7 Survey and or interview among all different Targets*. Due to the fact that validation was performed in partners' native language, the analysis below has both English questions and the same questions in native language.

1. Do You or Your company/organization currently use BIM, or is it intending to use BIM in the near future?	a) Yes b) No

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

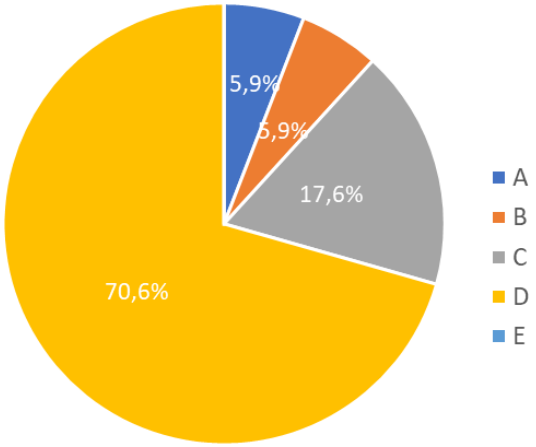


15. Would BIM certification, support or training, benefit Your colleagues?	a) Absolutely b) Likely c) Possibly d) No

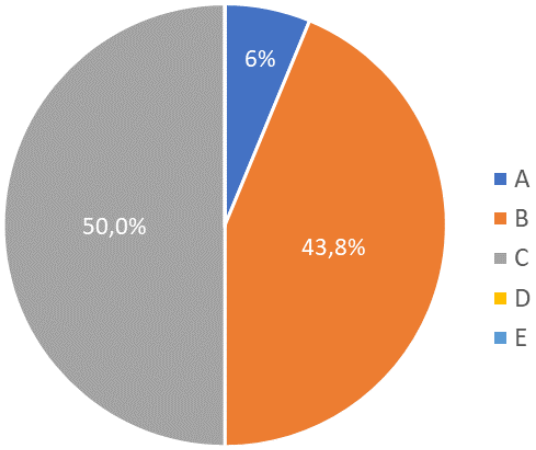


18. In retrospective, how do You rate Your competences (knowledge, skills, responsibility and autonomy) before this BIM course?	a) Excellent b) Very good c) Good d) Little e) I don't know

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016



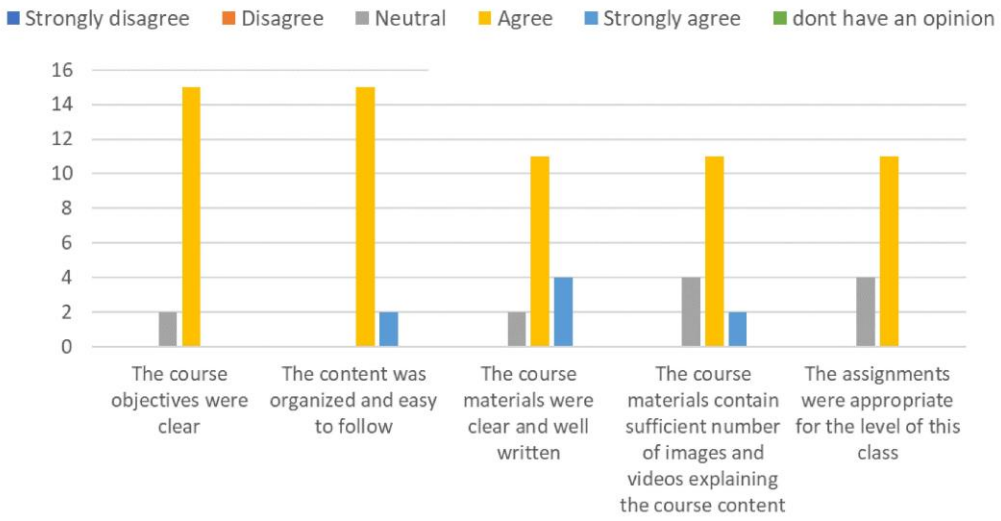
19. What overall rating would You give the course?	a) Excellent b) Very good c) Good d) Fair e) Poor

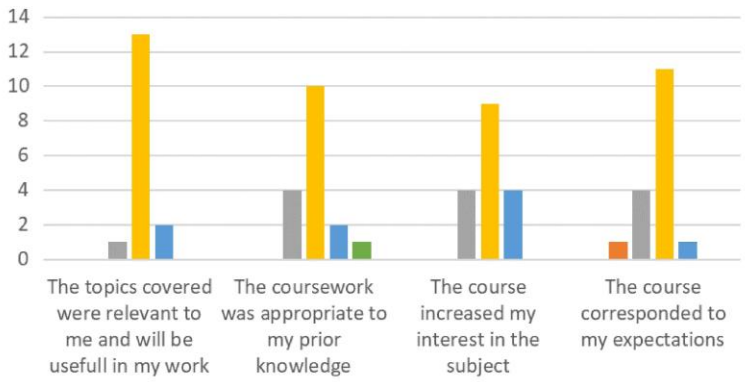


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

20. Please indicate your level of agreement with the following statements:

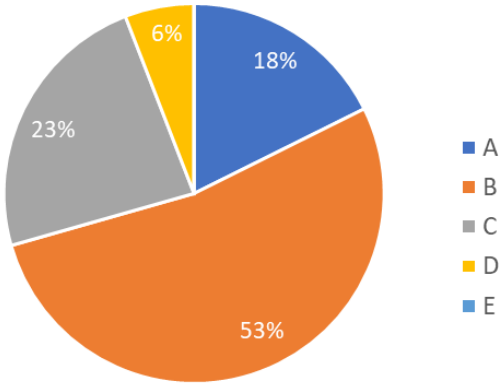
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	do not have opinion
The course objectives were clear.						
The content was organized and easy to follow.						
The course materials were clear and well written.						
The course materials contain sufficient number of images and videos explaining the course content.						
The assignments were appropriate for the level of this class.						
The topics covered were relevant to me and will be useful in my work.						
The coursework was appropriate to my prior knowledge.						
The course increased my interest in the subject.						
The course corresponded to my expectations.						



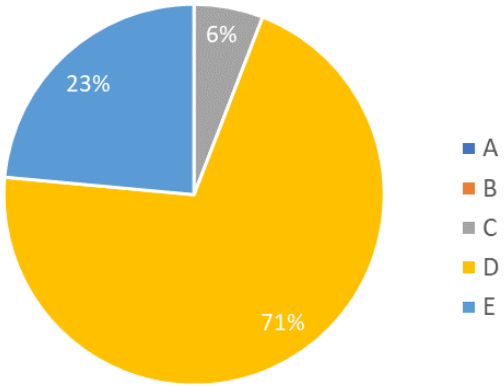


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

21. What overall rating would you give the trainer(s)?	a) Excellent b) Very good c) Good d) Fair e) Poor



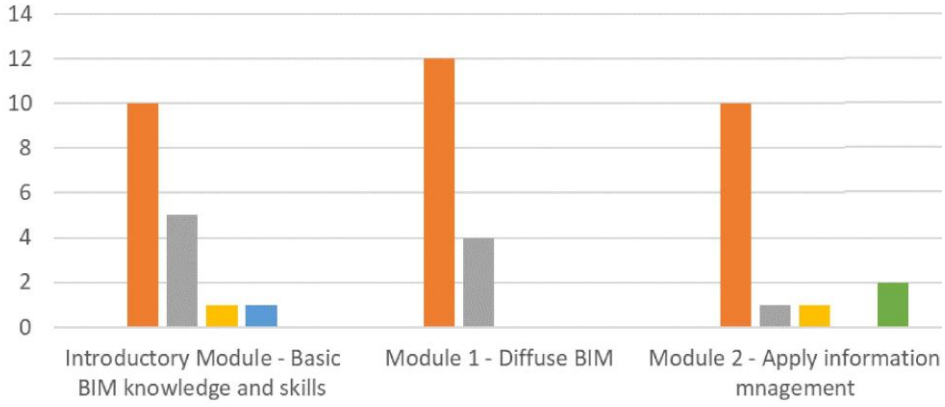
23. How much new information did you receive in the training course? Rate on the scale from: 1 (none) to 5 (a lot of new information)	a) 1 b) 2 c) 3 d) 4 e) 5

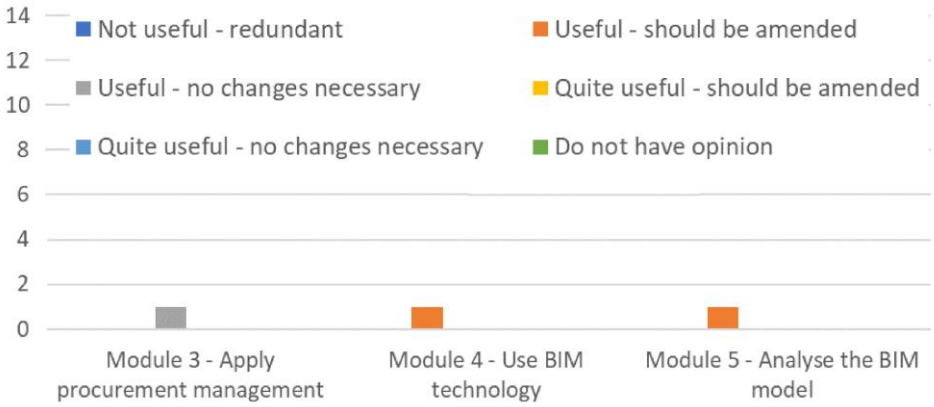


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

25. Please rate the following BIM course modules based on how they are useful and interesting to You.

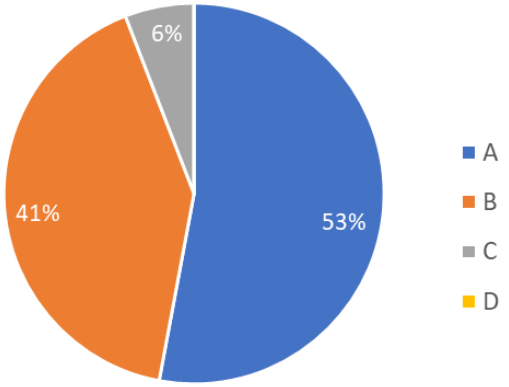
	Not useful - redundant	Useful – should be amended	Useful – no changes necessary	Quite useful – should be amended	Quite useful – no changes necessary	Do not have opinion
Introductory Module – Basic BIM knowledge and skills						
Module 1 – Diffuse BIM						
Module 2 – Apply information management						
Module 3 – Apply procurement management						
Module 4 – Use BIM technology						
Module 5 – Analyse the BIM Model						



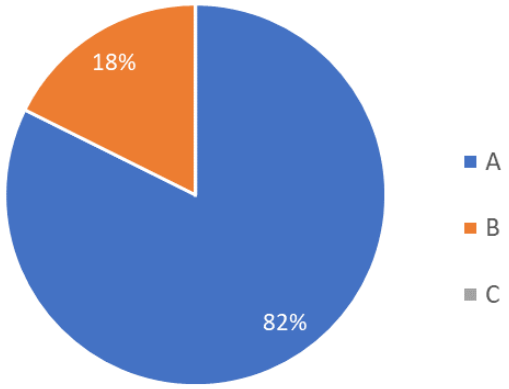


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

26. What do You feel, is the training material comprehensive enough? (Please mark all that apply)	a) Yes, it's adequate b) It should contain more practical examples (best experiences) c) It should contain more practical examples (existing issues in BIM) d) It should give more country specific regulatory requirements

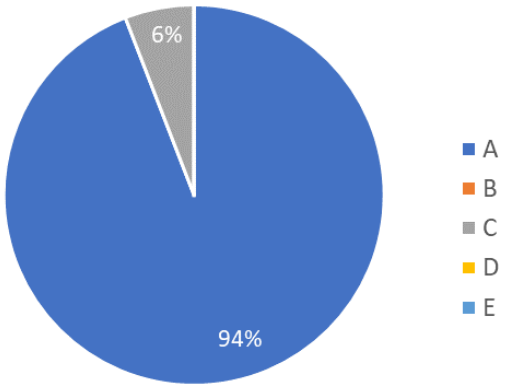


27. What do You feel about the duration of the training?	a) It is adequate b) It should be longer c) It should be shorter

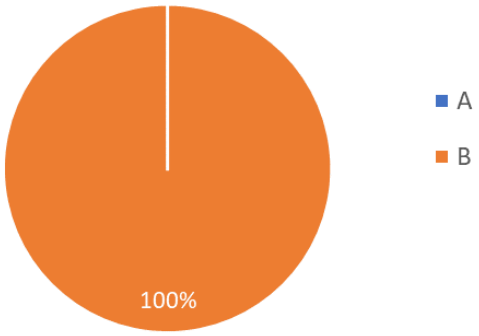


28. Would You be willing to disseminate the BIM training courses among Your contacts and associates? Without any obligation to do so!	a) Definitely b) Probably c) Not sure d) Probably not e) Definitely not

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016



29. Would you prefer to take this course online or in the classroom?	a) Online (e-learning) b) Classroom



It is evident from the training validation results that 88.2 % of participants feel BIM certification, support or training would absolutely (35.3 %) or likely (52.9 %) be beneficial to their colleagues which is a good indication of their view about the necessity of certification courses. Additionally, after the course, training participants were asked to evaluate their competences prior to the classroom course on BIM. The intention was to get the information what is their initial knowledge on BIM as well as to see whether the course was an “eye opener” and comprehensive enough. The participants replied that they feel they had little (70.6 %) or good (17.6 %) and very good (5.9 %) competences. Since 76.5 % of course participants is not using BIM this was to be expected for the case of Slovakia. The overall rating of the course as good (50.0 %), very good (43.8 %) and excellent (6.0 %) is very encouraging and positive for the developed training materials and courses held in Slovakia. Trainers received positive overall rating of very good (53 %) and excellent (18 %).

The majority of course participants agree to the statements that the course objectives were clear, with organized and easy to follow content. They mainly agree that course materials were clear and well written and contain sufficient number of images and videos explaining the course content. The positive validation of the Slovak course is also evident from the fact that the majority of participants agree that assignments were appropriate for the level of this class (appropriate to their prior knowledge) and the topics covered are relevant and will be useful in their future work as they received new information (94 % of participants feel they got significant amount of new information). The course also increased their interest in the subject and corresponded to their expectations.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No.754016

When getting more in depth and looking for their opinion on each of the training modules, participants feel that Introductory module, Module 1 and Module 2 are useful but should be amended with additional content. For other three modules (module 3 – 5) it seems course participants did not have the need to fill the questionnaire and thus made it difficult to draw any conclusions. Specifically, the general opinion is that training materials are adequate, but significant number of course participants declared more practical examples are needed (best experiences), 53 % and 41 % respectively. Regarding the length of training, 82 % of training participants said that 32-hour training course is adequate, while 18 % think it should be longer. It has to be enhanced that all of the course participants (100 %) prefer to take this course in the classroom while nobody would prefer to take it on-line.

The quality of the course is best rated if training participants disseminated and recommend the course to their colleagues, friends and associates, and in the case of Slovak classroom course for professionals, 94 % of participants declared they would be definitely willing to disseminate the BIM training courses among their contacts.

2.5.2 Agenda

4.1 Module MP1: Introduction to BIM

1 April 2019, Hotel Max Inn, Pri Suchom mlyne, Bratislava, Slovakia

Time	Agenda Item	Methodology
09:00	**Introduction to the agenda** • ***Marta Minarovičová (UVS)***	Oral presentation
09:20	**Presentation of the project** • ***Frantisek Doktor (ViaEuropa)***	PPT presentation
10:00	**What is BIM? Key elements and key concepts.** • ***Marta Minarovičová (UVS)***	PPT presentation
10:40	**Discussion**	Q&A session
11:00	**Coffee break**	
11:15	**BIM-based energy assessment of buildings: Autodesk tools** • ***Frantisek Doktor (ViaEuropa)***	Video presentations
12:15	**Break for lunch**	
13:00	**Qualification requirements for working with BIM** • ***Zuzana Kyrinovičová (UVS)***	Presentation of 3D matrix

Time	Agenda Item	Methodology
13:45	**Discussion on the role of BIM Academy in helping dissemination of skills and knowledge among professionals**	Brainstorming discussion
14:45	**Applications supported by BIM** • ***Frantisek Doktor (ViaEuropa)***	Video presentations
15:30	**Coffee break**	
16:00	**4IR and construction sector – vision for the future** • ***Frantisek Doktor (ViaEuropa)***	PPT presentation
17:00	**Conclusion of the training session** • ***Zuzana Kyrinovičová (UVS)*** • ***Frantisek Doktor (ViaEuropa)***	Oral summary of the discussions
18:00	**End of the training session** • ***Marta Minarovičová (UVS)***	

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

2.6 Spain

2.6.1 Course description and results

First classroom course for professionals was organized on **April 25th 2019** in Madrid, Spain.
The course programme consisted of 4 academic hours of theoretical lectures.
A group of **54 participants** specialising in architecture and engineering had undertaken the classroom course in Spain within the framework of the Net-UBIEP project.

Spanish partners organised a training workshop on BIM and nZEB as a joint initiative of two Horizon 2020 projects (Construye 2020+ and Net-Ubiep).

The overview of lectures held at the 1st classroom courses is shown below.

- Building Information Modeling (BIM). Practical basics
- Nearly zero energy buildings (NZEB)
- Official tools: HULC and XML Viewer
- BIM tools

Several images from the first classroom course for professionals conducted by the **FLC** can be found bellow.

Pre- and Post-training questionnaires were translated to Spanish language but only pre-training questionnaire was filled by training participants. Since Spanish partners agreed that the post – training questionnaires were quite similar, training participants did not provide any answer to them.
For the reason of lacking post-training questionnaire results validation of classroom courses held in Spain cannot be competed.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

2.6.2 Agenda

Training workshop in BIM and nZEB, aimed at engineers and architects

Cofinanciado por el Programa "Horizonte 2020" de la Unión Europea

CONSTRUYE 2020+

NET UBIEP

Madrid, 25 April 2019
Time: 10:00 till 14:00 hours
Venue: Instituto de Ciencias de la Construcción Eduardo Torroja (IETCC-CSIC)
C/ Serrano Galvache, 4. 28033 Madrid

Program

10:00	**Welcome** Ángel Castillo, director of the Instituto Ciencias de la Construcción Eduardo Torroja (IETCC-CSIC)
10:15	**Presentation of the European projects of the Horizon 2020 program: Build 2020+ and Net-Ubiep** Javier González, responsable de Proyectos Internacionales de la Fundación Laboral de la Construcción José Antonio Tenorio, científico Titular del Instituto Ciencias de la Construcción Eduardo Torroja (IETCC-CSIC)
10:45	**Presentation of the European projects of the Horizon 2020 program: Build 2020+ and Net-Ubiep** David Rodríguez, asesor técnico de BIM de la Fundación Laboral de la Construcción
11:30	**Near Zero Energy Buildings (nZEB)** Rafael Villar, Unidad de Calidad en la Construcción del Instituto Ciencias de la Construcción Eduardo Torroja (IETCC-CSIC)
12:15	Coffee break
12:40	**Official tools: HULC and XML Viewer** Marta Sorribes, Unidad de Calidad en la Construcción del Instituto Ciencias de la Construcción Eduardo Torroja (IETCC-CSIC)
13:20	**BIM tools** Benjamin González, director de Desarrollo Corporativo de Cype Ingenieros
14:00	**Closure**

BIM and nZEB training workshop

Joint initiative of two European projects belonging to the Horizon 2020 program: Construye 2020+ and Net-Ubiep

Presentation

The BIM and nZEB Training Workshop is a joint initiative of two European projects of the Horizon 2020 program: Construye 2020+ and Net-Ubiep.

The Construye 2020+ project aims to go one step further in the transition towards an efficient construction industry, in the use of sustainable and competitive energy, by defining and developing an updated training and accreditation scheme for professionals in 'green' skills. This scheme will address the professional, market and customer barriers that stand in the way of consolidating Energy Efficiency, Renewable Energy Systems and Nearly Zero Energy Buildings.

www.construye2020plus.eu

The Net-Ubiep project aims to increase the energy performance of buildings by stimulating and increasing the use of BIM during the construction life cycle. The use of BIM will allow the energy behavior of buildings to be simulated using different materials and components, both in new construction and rehabilitation projects.

www.net-ubiep.eu/es

Organizan:

CSIC FUNDACIÓN LABORAL DE LA CONSTRUCCIÓN

Who is it for?

The workshop is especially aimed at engineers and architects, representatives of:

- Construction companies and business associations.
- Organizations and public administrations.
- Vocational Education and Training Centers and trainers in the sector.
- Professional associations of energy efficiency.
- Technicians, consultants and specialists in EE, SER and nZEB.
- Researchers specialized in EE, SER and nZEB, BIM methodology and Lean Construction, etc.

Registration

Participation is free, upon registration until the capacity is complete. *

* Attendees will have the opportunity to complete an online questionnaire to evaluate the day. Those who fill it out and provide their email will receive free access to an 8-hour BIM course.

@Construye2020EU
@net_ubiep
#GreenSkills #BIM

Convenio Construye 2020+: H2020-EE-2017-CSA-PPI Nº 785019. Convenio Net-Ubiep: H2020-EE-2016-2017/H2020-EE-2016-CSA Nº 754016.
Esta publicación refleja únicamente la opinión del autor. La Agencia Ejecutiva de la Pequeña y Mediana Empresa (EASME) de la Comisión Europea no es responsable del uso que pueda hacerse de la información que contiene.

2.7 The Netherlands

2.7.1 Course description and results

First classroom course for professionals was organized on **March 12th 2019** in Rotterdam, The Netherlands. The course programme consisted of 4 academic hours of theoretical lectures.
A group of **9 participants** specialising in architecture and engineering had undertaken the classroom course in The Netherlands within the framework of the Net-UBIEP project.

The Dutch partners provided an explanation why there were only several participants for the professional trainings. Dutch partners are trying to get more people interested in the professional training via the professional networks of ISSO, B&R, TVVL, the NetUBIEP website, LinkedIn and BIMloket, but so far we had little success.
The reasons for this are:

- A large part of the Dutch construction sector has already some professional education or knowledge on BIM. Also professionals are already trained in some degree on nZEB in the last

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

years. Added value of Net-UBIEP project is to create a link between these subjects. However, it is very difficult to convey possible participants of this added value.

- Lack of time: the Dutch construction sector is at its peak. Moreover, employees are scarce at the moment. Therefore, the existing workforce is very busy with their construction projects instead of educating themselves. To solve this, we are building an e-learning module for professionals so people can follow the course at their convenience.
- Legislation (NTA8800/BENG) in The Netherlands about nZEB is changing in 2018 and 2019 and is not yet final. A lot of the workforce is waiting with training until there is more clarity about the legislation. After this we expect things will go faster.

In other words, things are going slower than expected. However, Dutch partners are trying to disseminate the results and the education material with professional educators who expressed interest. So they think the results and materials will be used by these professional educators, but this is a slow process.

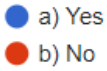
Several images from the first classroom course for professionals conducted by **ISSO** can be found bellow.

Pre- and Post-training questionnaires were translated to Dutch language and filled by training participants. Dutch partners used Googleforms version of questionnaires for the course validation.

Few general conclusions of the classroom course validation from the participants in the Netherlands is given below, while the entire questionnaire analysis is performed in deliverable *D27-D4.7 Survey and or interview among all different Targets*. Due to the fact that validation was performed in partners' native language, the analysis below has both English questions and the same questions in native language.

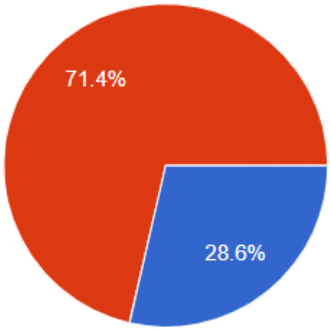
1. Do You or Your company/organization currently use BIM, or is it intending to use BIM in the near future?	a) Yes b) No

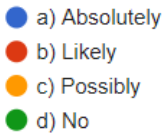
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*



15. Would BIM certification, support or training, benefit Your colleagues?

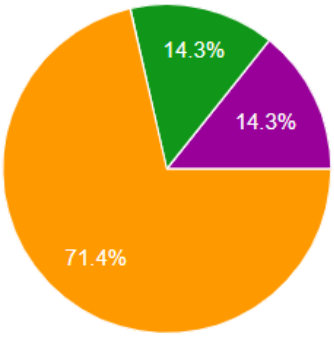
a) Absolutely
b) Likely
c) Possibly
d) No

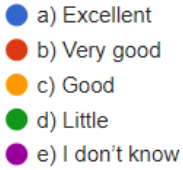




18. In retrospective, how do You rate Your competences (knowledge, skills, responsibility and autonomy) before this BIM course?

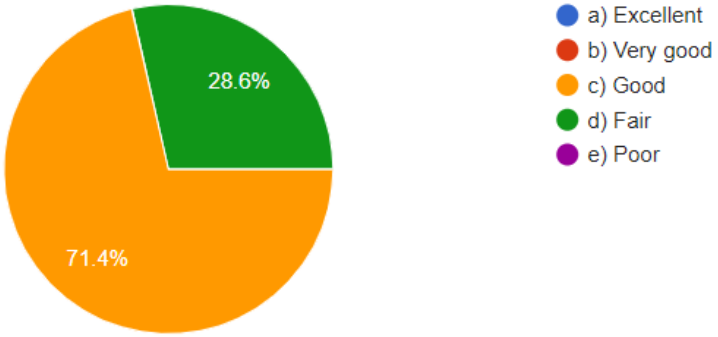
a) Excellent
b) Very good
c) Good
d) Little
e) I don't know





This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

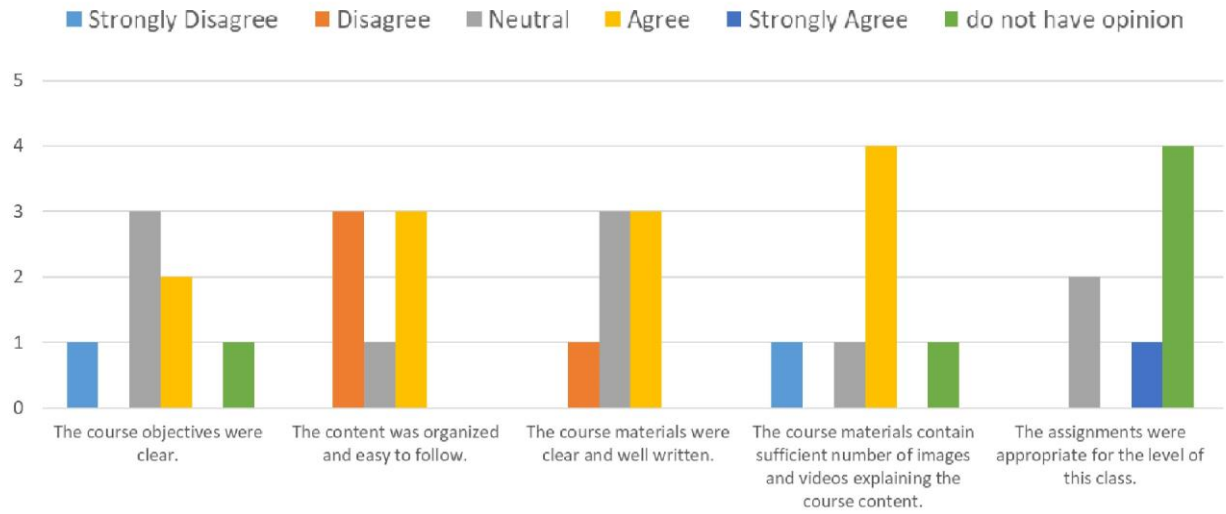
19. What overall rating would You give the course?	a) Excellent b) Very good c) Good d) Fair e) Poor

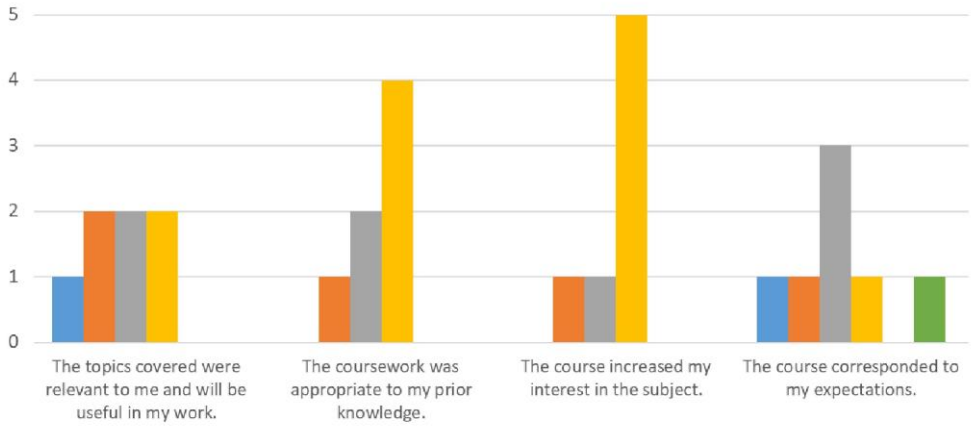


20. Please indicate your level of agreement with the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	do not have opinion
The course objectives were clear.						
The content was organized and easy to follow.						
The course materials were clear and well written.						
The course materials contain sufficient number of images and videos explaining the course content.						
The assignments were appropriate for the level of this class.						
The topics covered were relevant to me and will be useful in my work.						
The coursework was appropriate to my prior knowledge.						
The course increased my interest in the subject.						
The course corresponded to my expectations.						

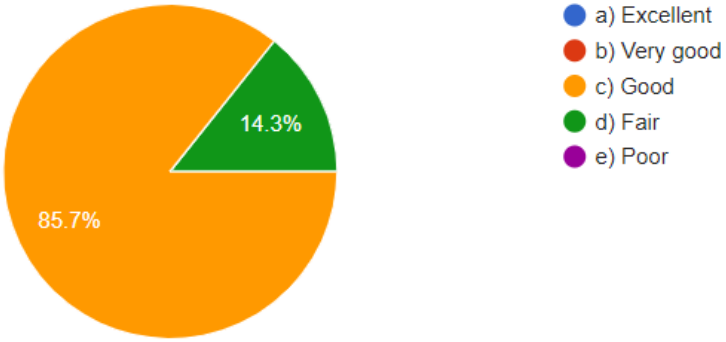
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016





21. What overall rating would you give the trainer(s)?

a) Excellent
b) Very good
c) Good
d) Fair
e) Poor



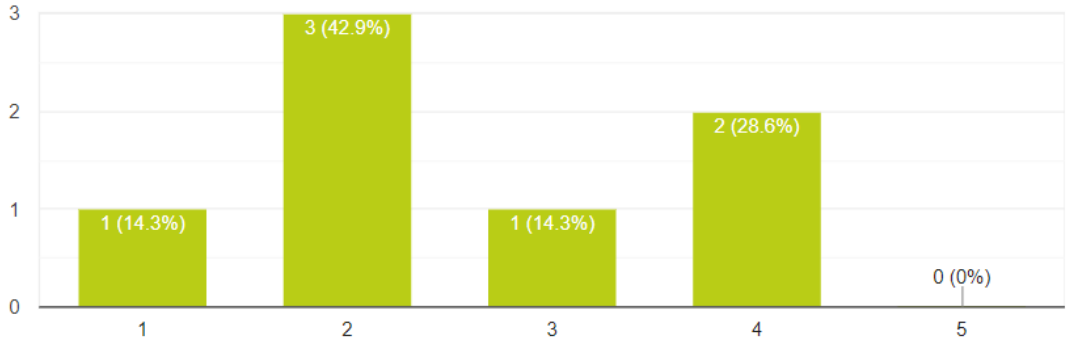
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

23. How much new information did you receive in the training course?

Rate on the scale from: 1 (none) to 5 (a lot of new information)

a) 1
b) 2
c) 3
d) 4
e) 5

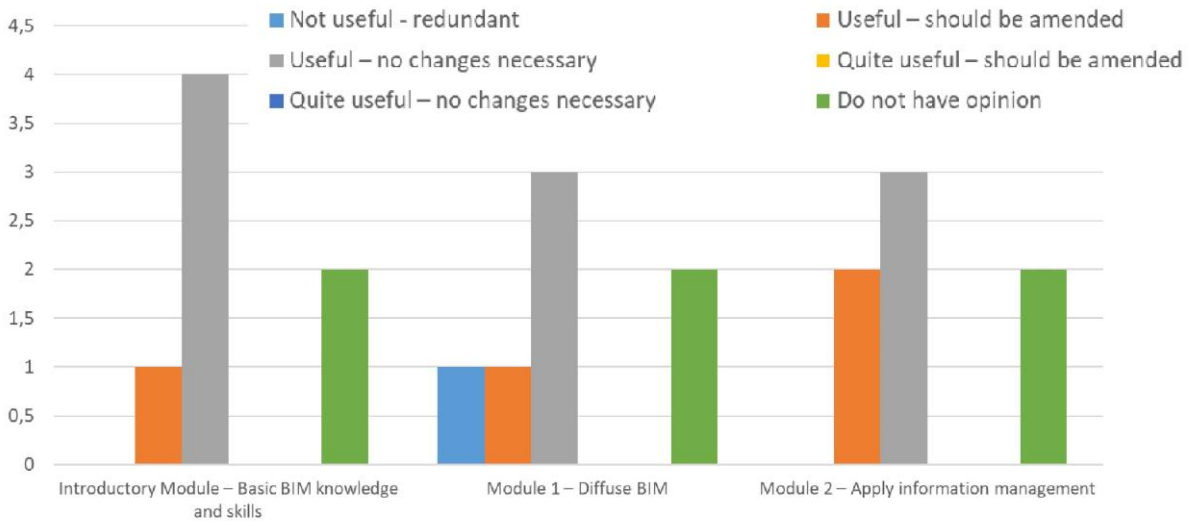
7 responses

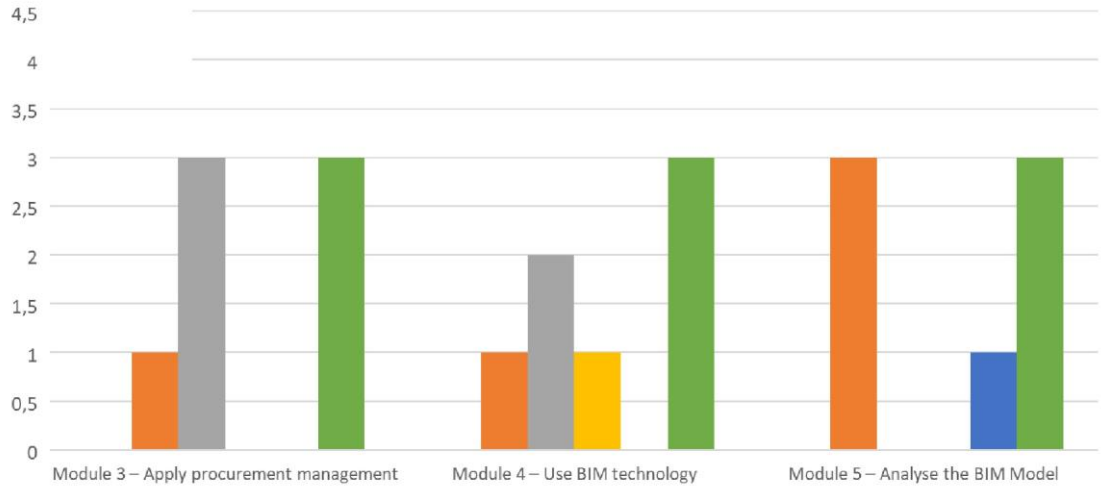


25. Please rate the following BIM course modules based on how they are useful and interesting to You.

	Not useful - redundant	Useful – should be amended	Useful – no changes necessary	Quite useful – should be amended	Quite useful – no changes necessary	Do not have opinion
Introductory Module – Basic BIM knowledge and skills						
Module 1 – Diffuse BIM						
Module 2 – Apply information management						
Module 3 – Apply procurement management						
Module 4 – Use BIM technology						
Module 5 – Analyse the BIM Model						

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

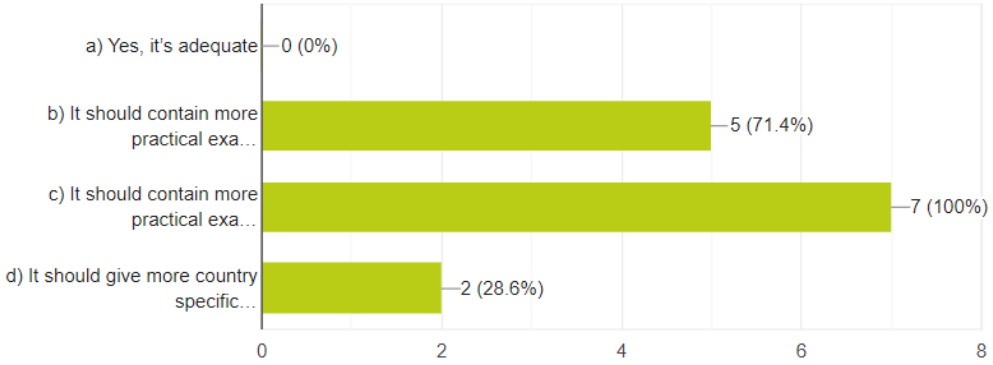




26. What do You feel, is the training material comprehensive enough? (Please mark all that apply)	a) Yes, it's adequate b) It should contain more practical examples (best experiences) c) It should contain more practical examples (existing issues in BIM) d) It should give more country specific regulatory requirements

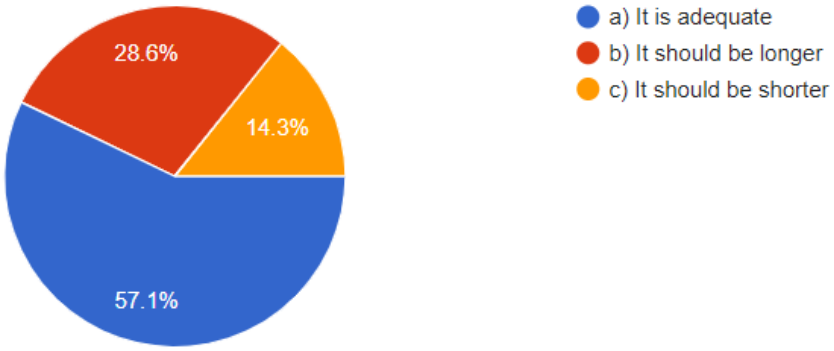
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

7 responses



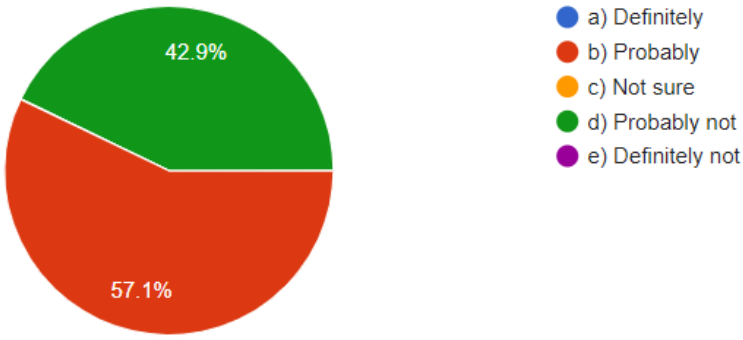
27. What do You feel about the duration of the training?

a) It is adequate
b) It should be longer
c) It should be shorter



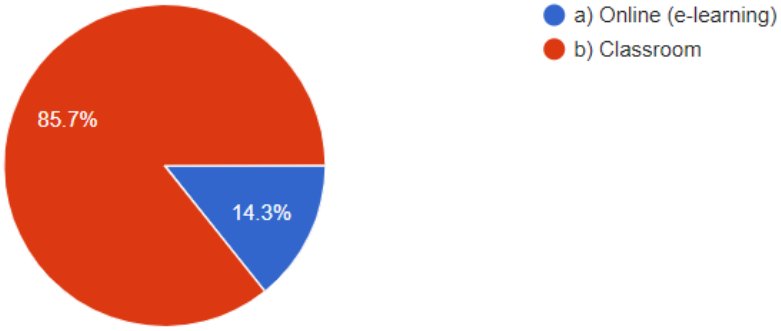
28. Would You be willing to disseminate the BIM training courses among Your contacts and associates?
Without any obligation to do so!

a) Definitely
b) Probably
c) Not sure
d) Probably not
e) Definitely not



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

29.	Would you prefer to take this course online or in the classroom?	a) Online (e-learning) b) Classroom



It is evident from the training validation results that all participants feel BIM certification, support or training would absolutely (28.6 %) or likely (71.4 %) be beneficial to their colleagues which is a good indication of their view about the necessity of certification courses. Additionally, after the course, training participants were asked to evaluate their competences prior to the classroom course on BIM. The intention was to get the information what is their initial knowledge on BIM as well as to see whether the course was an "eye opener" and comprehensive enough. The participants replied that they feel they had little (14.3 %) or good (71.4 %) while 14.3 % of course participants feel they cannot judge their previous competences. Since all (100 %) course participants are already using BIM (or intend to use it in near future) the overall rating of the course as good (71.4 %) and fair (28.6 %) is very encouraging and positive for the developed training materials and courses held in The Netherlands. These responses can also serve as a warning to project partners to improve the courses, especially since also the trainers received overall rating of good (85.7 %) and fair (14.3 %), where team leader should take as mild criticism and encourage his trainers (lecturers) to improve.

The majority of course participants are neutral or agree to the statements that the course objectives were clear while significant number of participants disagree that the content was organized and easy to follow content. They mainly agree or are neutral that course materials were clear and well written and agree that it contains sufficient number of images and videos explaining the course content. Since there were no assignments and the course was purely theoretical, participants are neutral to this claim. The Dutch partners should improve the course content to emphasise topics which would be relevant and useful to participants in their future work since they don't recognize it in current form as they also declare they didn't receive a lot of new information (57.2 % of participants feel they got little amount of new information). The positive validation of the Dutch course can be seen through the fact that the course was appropriate to participants' prior knowledge and the fact it increased their interest in the subject. The course participants are mainly neutral to the question if the course corresponded to their expectations.

When getting more in depth and looking for their opinion on each of the training modules it is evident that a lot of course participants don't have an opinion, which could indicate the fact they were not introduced correctly to the training materials developed by the Net-UBIEP project which is significant since the courses were serving primarily as validation courses. Those participants who expressed their opinion feel that Introductory module is useful and requires no changes, while 4 modules (Module 1 - 4) are deemed useful with Module 2 which should be amended as per significant number of participants. On the other hand, Module 5 should definitely be amended with additional content in the view of course participants. Specifically, the general opinion is that training materials should definitely contain more practical examples (best experiences and existing issues in BIM), 71.4 % and 100 % respectively as well as more country specific

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

regulatory requirements (28.6 %), while nobody thinks training materials were adequate. Regarding the length of training, 57.1 % of training participants said that 4-hour training course is adequate, while 28.6 % think it should be longer and 14.3 % think the course should be even shorter. It has to be enhanced that 85.7 % of course participants prefer to take this course in the classroom while only 14.3 % of people would prefer to take it on-line.
The quality of the course is best rated if training participants disseminated and recommend the course to their colleagues, friends and associates, and in the case of Dutch classroom course for professionals, 57.1 % of participants declared they would probably be willing to disseminate the BIM training courses among their contacts while as much as 42.9 % of participants would probably not like to disseminate the course.

Analysis of the training results, problems and solutions together with lessons learned during the courses are as follows:

- The validation process (using developed post training questionnaires) indicates the necessity for improvements of Dutch training courses.
- On the other hand, since in the Netherlands there is some professional education or knowledge on BIM these results could indicate that the Net-UBIEP training materials need to be improved if they are to be regarded as training materials for people with higher level of knowledge on BIM and NZEB.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.754016

2.7.2 Agenda

12.2.2019

Training setup

- Training goal, focus on comfort, quality, circular construction, energy performance
- Target groups for the training
- Division training
- Measurement of zero level, maturity scan, BIM levels

Intro BIM

- Introduction of BIM, what do we mean by BIM (terms). Advantages of BIM, which challenges arise
- Which BIM functions (functionalities) exist
- BIM as a life cycle platform, phases and processes
- BIM users / BIM roles / competences
- BIM landscape, which software solutions are available to the sector
- BIM standards

Introduction BENG (nZEB / Nearly Zero Energy Buildings)

- Introduction of NZEB, what do we mean by NZEB (concepts), urgency and necessity
- NZEB applied in the Netherlands / European context, legislation and regulations, requirements
- NZEB applied in the Dutch context, energy performance determination method (NTA 8800) NZEB
- NZEB landscape, which software solutions / calculation methods are available to the sector
- Impact of NZEB on the TCO of a building
- Environmental performance for buildings (MPG)

LEED evaluation and certification system with which the sustainability performance of buildings can be determined

BREEAM is an assessment method for determining the sustainability performance of buildings and areas

Strategic choice BIM for NZEB, build NZEB with BIM

- BIM for NZEB as part of the integrated BIM process, which BIM functions are included in this training
- Benefits to be obtained by applying BIM for NZEB for the various stakeholders
- Business case BIM for NZEB
- BIM for NZEB as a chain collaboration tool, BIM coordination
- Implementation BIM for NZEB, impact on the existing working method

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

- BIM for NZEB competences
- BIM libraries, parametric modelling

Contract BIM for NZEB

- Different contract types in relation to use of BIM
- Request for BIM for NZEB, the services / specifications to be delivered
- Request for BIM for NZEB, the information delivery specification (ILS), reference to standards
- BIM for NZEB formalize the cooperation and division of roles based on BIM protocol / BIM implementation plan
- BIM for NZEB aspect models per phase and discipline
- BIM for NZEB Risk analysis
- Off the gas / demonstrate quality, choice of material, detailing

BIM for NZEB designs New construction up to LOD 300 (BIM for engineers and architects)

- BIM for NZEB thinking in systems / building boundaries
- Determination of heating and cooling demand
- Transmission
- Calculating and simulating building installations, heating, cooling, dehumidification, hot tap water, lighting
- 5D BIM and estimate, feasibility study
- Clash detection greenhouse and installation
- Model check

BIM for NZEB realizing new construction LOD 350-400 (BIM for contractors / suppliers)

- BIM for NZEB detail engineering / working with reference details
- Quality control / quality inspection / quality assurance / building file
- 5D BIM Quantity determination and calculation
- Augmented reality for instruction
- Clash detection greenhouse and installation
- 4D BIM / planning
- Continuous improvement / feedback from new construction realization to design
- Handover of files and validation

Maintaining and managing BIM for NZEB LOD 500 (BIM for owners / facility managers)

- Validation handover file as built and reality
- Sustainable maintenance asset management by means of BIM for NZEB / condition measurement

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 754016.

This deliverable reflects only the author's view. The Agency is not responsible for any use that may be made of the information it contains.

The present deliverable will be update during the project in order to align the outcome to the market needs as well as to other BIM related projects realized within Horizon 2020 program.

The updated version of the deliverable will be only available in the website of the project www.net-ubiep.eu.

Some deliverables could also be translated in partners' national languages and could be find in the respective national web pages. Click on the flags to open the correspondence pages:

International web page

Italian web page

Croatian web page

Slovak web page

Spanish web page

Dutch web page

Estonian web page

Lithuanian web page

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement *No.754016*