



## DELIVERABLE: D22 - D4.2

### Second Classroom Courses for Professionals

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**Network for Using BIM to Increase the Energy Performance**

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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.





## Contents

<b>A. Deliverable Details</b> .....	3
<b>B. Short description</b> .....	4
<b>1. Learning outcomes and training programme</b> .....	5
<b>2. Conducted courses</b> .....	6
2.1 Croatia .....	6
2.1.1 Course description and results .....	6
2.1.2 Agenda .....	15
2.2 Estonia .....	16
2.2.1 Course description and results .....	16
2.3 Italy .....	16
2.3.1 Course description and results .....	16
2.3.2 Agenda .....	24
2.4 Lithuania .....	25
2.4.1 Course description and results .....	25
2.4.2 Agenda .....	36
2.5 Slovakia .....	37
2.5.1 Course description and results .....	37
2.5.2 Agenda .....	45
2.6 Spain .....	46
2.6.1 Course description and results .....	46
2.7 The Netherlands .....	46
2.7.1 Course description and results .....	46
2.7.2 Agenda .....	53



A. Deliverable Details	
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## B. Short description

The goal of this report is to provide an overview of the second 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.

Validation of BIM Qualification Models and training materials was implemented in each partner country by the partners with more experience in training activities such as Universities and Training Centres. Mainly one partner per country organised and performed training, and these were as follows: ENEA (IT), FLC (ES), TUT (EE), FCE (HR), Dig.Con. (LT), ISSO (NL), ViaEU (SK).

Second 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 courses 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.

## 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 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. Additionally, each respective partner developed their own training aids (i.e. power point presentations, etc.) which then followed their course structure. I general partners analysed advantages and deficiencies of different approach of others and their own experiences gained through First classroom courses for professionals. The result was slightly evolved approach of partners for the second classroom courses for professionals. In some countries, partners have reached the targeted number of training participants during the First classroom course and have thus decided not to perform second and third classroom course for professionals.

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 second 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	1 - 2 March 2019	16 hours	T & P	34	VoxVote
Estonia	-	-	-	-	-
Italy	17 April 2019	8 hours	T	19	GoogleForms
Lithuania	29 March 2019	8 hours	T & P	19	BIMSync
Slovakia	2 April 2019	8 hours	T & P	13	GoogleForms
Spain	-	-	-	-	-
The Netherlands	26 March 2019	4 hours	T	7	GoogleForms
				Total No. of participants	92

## 2. Conducted courses

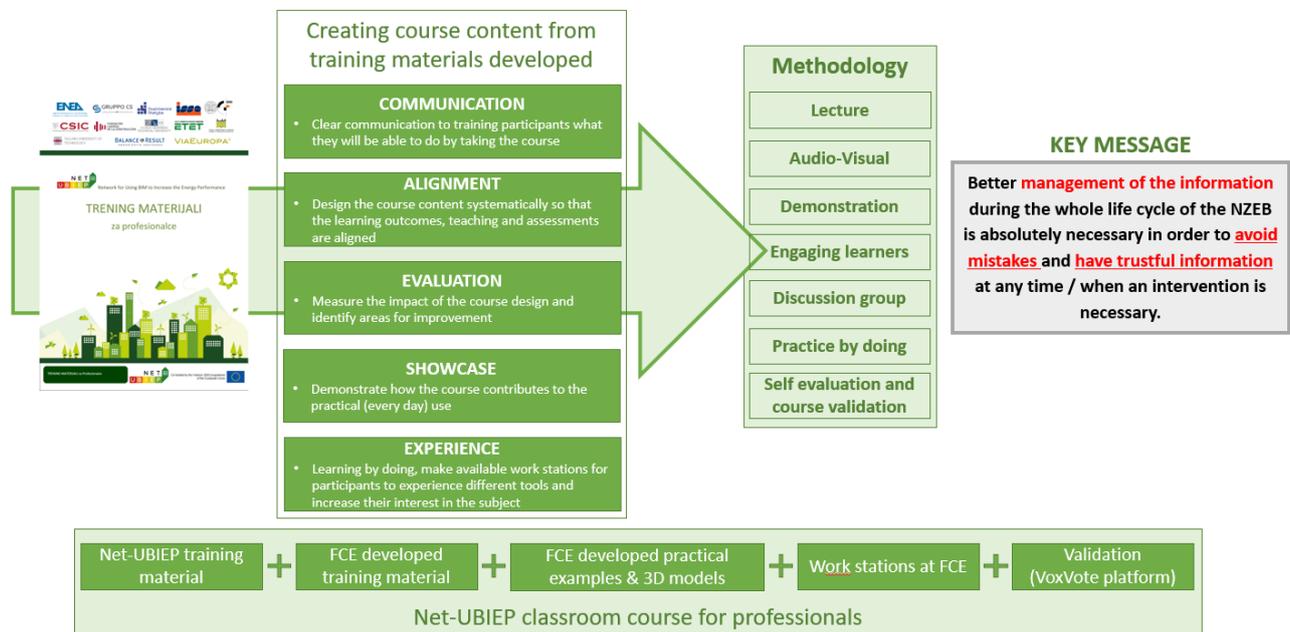
### 2.1 Croatia

#### 2.1.1 Course description and results

Second classroom course for professionals was organized on **March 1<sup>st</sup> and 2<sup>nd</sup> 2019** in Zagreb, Croatia. The course programme consisted of 16 academic hours of theoretical lectures with application examples (case studies) and with practical tasks.

A group of **34 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 second classroom course for professionals conducted by the FCE can be found below.





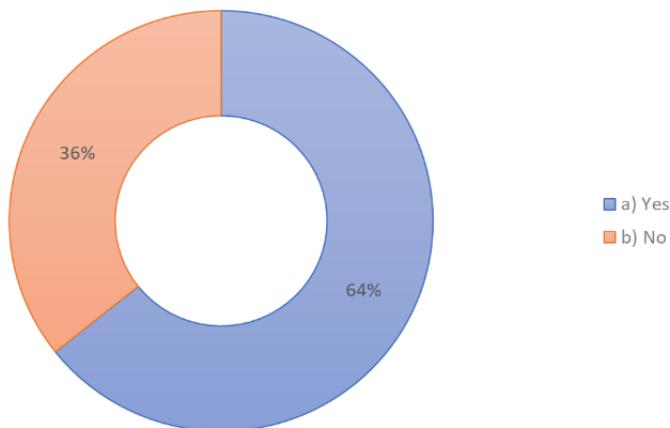
Pre- and Post-training questionnaires were translated to Croatian language and filled by training participants using interactive voting system VoxVote. Pre-training questionnaire is available at this link: <https://docs.google.com/forms/d/e/1FAIpQLSfQYVDL0b-Uic830VloYTrRaET2YvaGRmp3XeinnZgwxfe42Q/viewform>

On the other hand, Post-training questionnaire is available at this link: <https://docs.google.com/forms/d/e/1FAIpQLSeDbMImztef6JkfdPQRccDasa0pexMC3Rpi5foZyTad-UZ6gQ/viewform>

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.

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

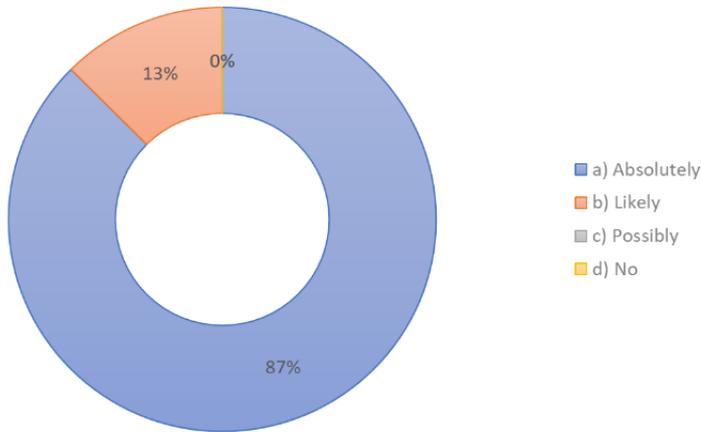
1. Do You or Your company/organization currently use BIM, or is it intending to use BIM in the near future?



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



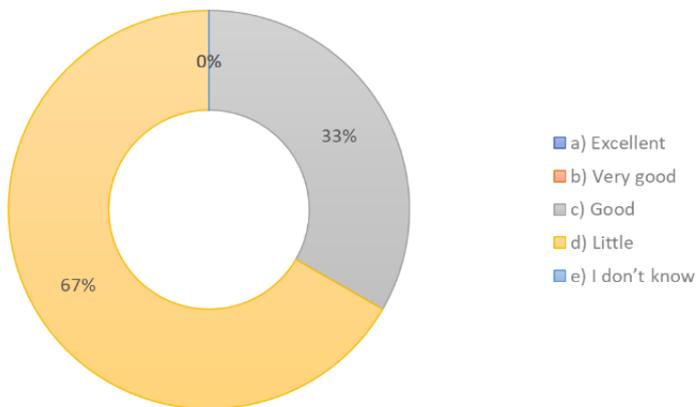
15. Would BIM certification, support or training, benefit Your colleagues?



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

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

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

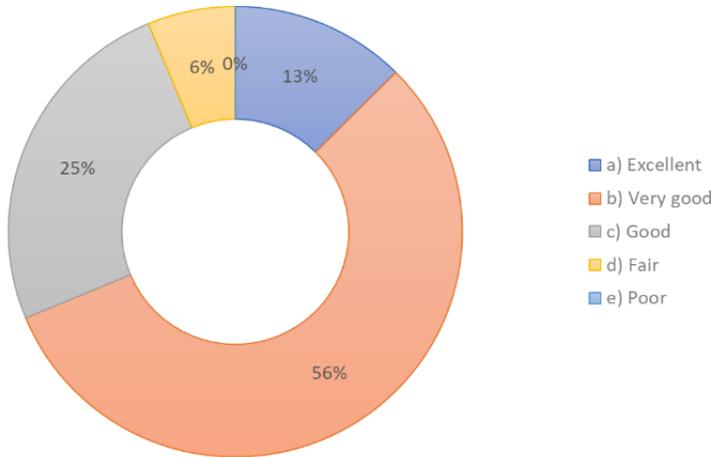


19. What overall rating would You give the course?

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



19. What overall rating would You give the course?

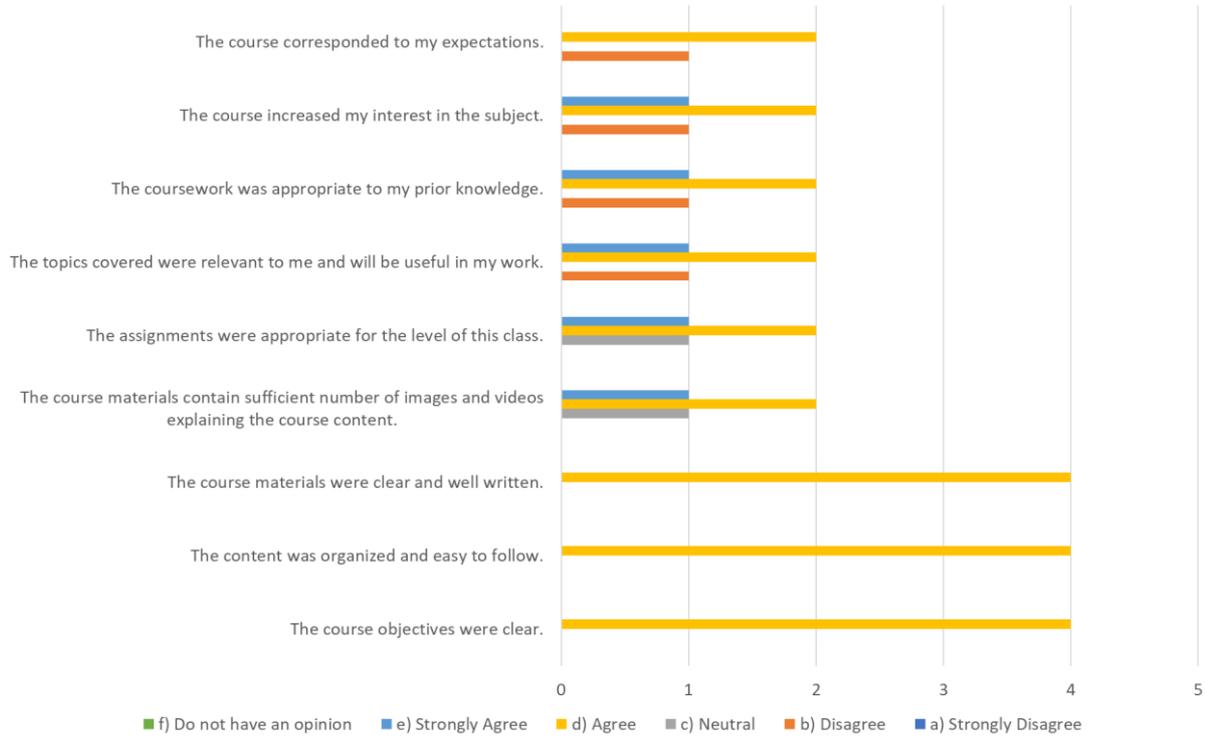


20. Please indicate your level of agreement with the following statements:

	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.						



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

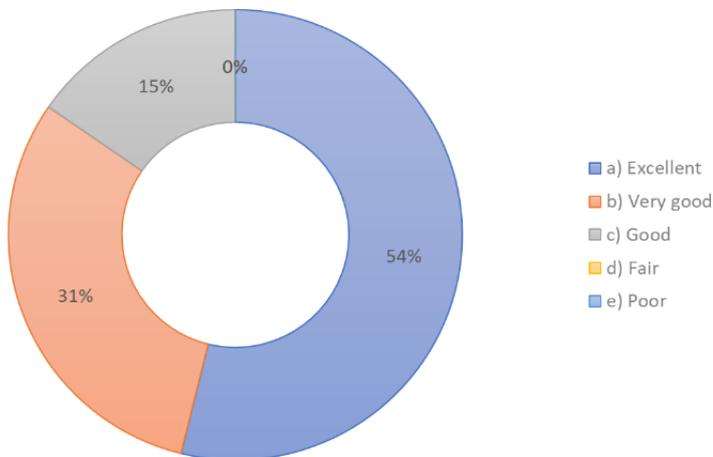


10

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

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

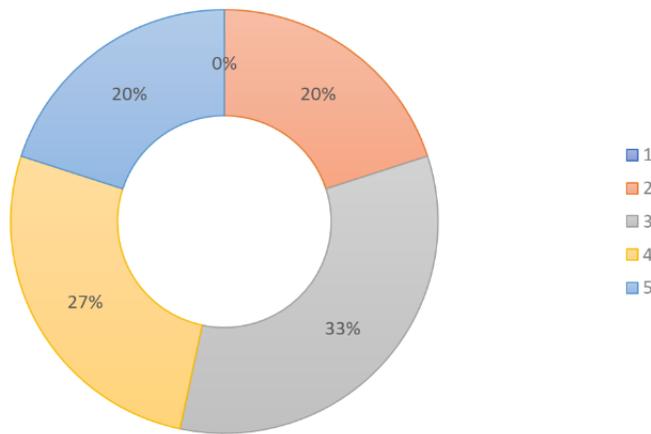
21. What overall rating would you give the trainer(s)?



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

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

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

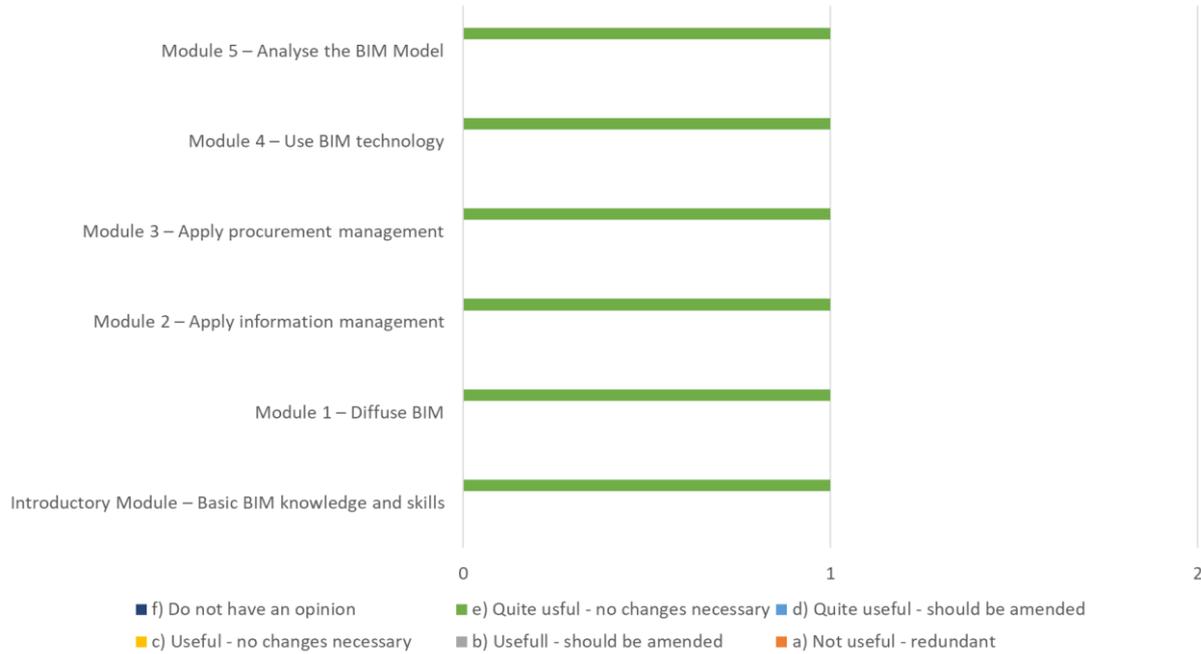


25. Please rate the following BIM course modules based on how they are useful and interesting to You.

	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						



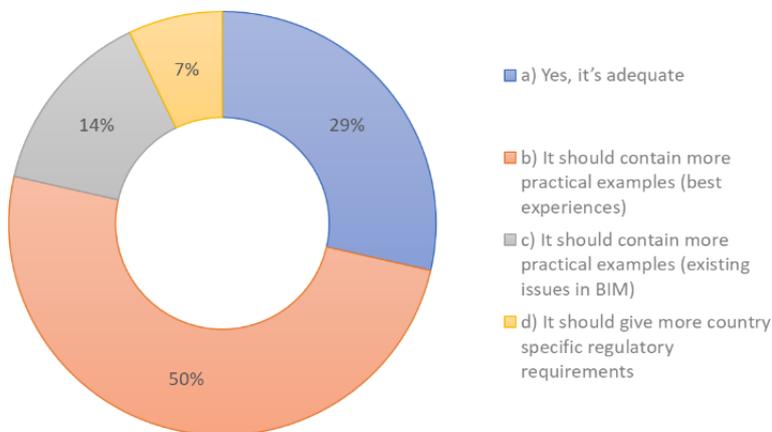
25. Please rate the following BIM course modules based on how they are useful and interesting to you.



26. What do You feel, is the training material comprehensive enough?  
(Please mark all that apply)

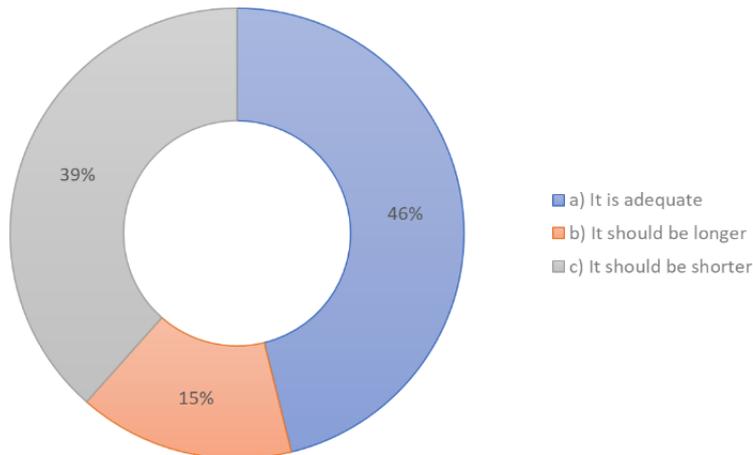
- a) Yes, it's adequate
- b) It should contain more practical examples (best experiences)
- c) It should contain more practical examples (existing issues in BIM)
- d) It should give more country specific regulatory requirements

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



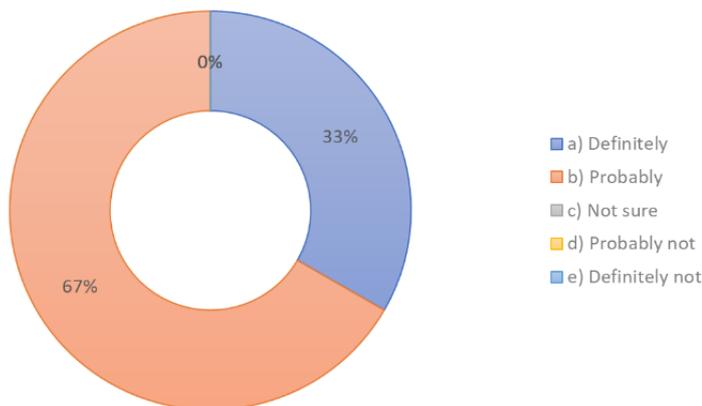
27. What do You feel about the duration of the training?  
 a) It is adequate  
 b) It should be longer  
 c) It should be shorter

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



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

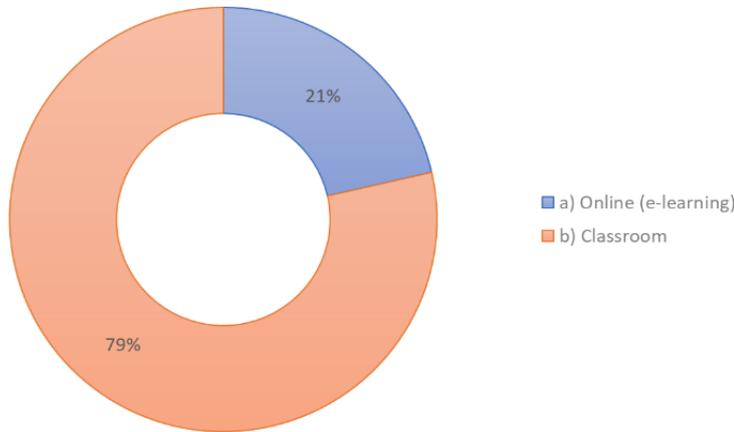
28. Would You be willing to disseminate the BIM training courses among Your contacts and associates? Without any obligation to do so!



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



29. Would you prefer to take this course online or in the classroom?



It is evident from the training validation results that all (100 %) of participants feel BIM certification, support or training would absolutely (87 %) or likely (13 %) 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 (67 %) or good (33 %) competences. Since 64 % of course participants are already using BIM (or intends to use it in near future) the overall rating of the course as good (25 %), very good (56 %) and excellent (13 %) is very encouraging and positive for the developed training materials and courses held in Croatia. Trainers received positive overall rating of very good (31 %) and excellent (54 %).

The majority of course participants 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 (80 % of participants feel they got significant amount of new information). The course also increased their interest in the subject and corresponded to their expectations.

It is difficult to appraise participants’ opinion on each of the training modules since only one participant answered this question during second classroom course for professionals. Specifically, 29 % of course participants 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), 50 % and 14 % respectively which is a significant number and should be respected. Regarding the duration of training, 46 % of training participants said that 16-hour training course is adequate, while 15 % think it should be longer and 39 % think it should be shorter. It has to be enhanced that 79 % of course participants prefer to take this course in the classroom while only 21 % 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 2<sup>nd</sup> classroom course for professionals,



33 % of participants declared they would definitely and 67 % they would probably 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) and practical session using BIM tools of their preference (Allplan and Archicad).
- The duration of trainings – 16 hours. Participants of the trainings have confirmed that duration is appropriate but significant number of participants asked for shorter training duration.
- The practical work is deemed by the trainers as necessary and a positive improvement compared to the first classroom course for professionals.

15

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.

### 2.1.2 Agenda

#### BIM za profesionalce (inženjere i arhitekte)

##### Besplatna radionica

Održavanje: 01. i 02. Ožujka 2019.

Mjesto održavanja: Sveučilište u Zagrebu, Građevinski fakultet, Kačićeva 26, 10000 Zagreb, [Vijećnica](#)

##### Kontakt osoba:

- Mergim Gaši, Građevinski fakultet Zagreb,
- Tel: +385 1 4639 121
- [mgasi@grad.hr](mailto:mgasi@grad.hr)

Prijavni obrazac: <https://goo.gl/forms/uwAIP5s22dtUvyFY2>

Petak 1.3.2019.

Sat	Tema	Predavač
15.00 – 15.15	Uvodno o projektu Net-UBIEP Zašto korištenje BIM-a može poboljšati energetske učinkovitost u zgradarstvu	Bojan Milovanović
15.15 – 15.30	Diskusija – pre-training upitnici	Bojan Milovanović
15.30 – 16.00	Uvodni modul - osnovna BIM znanja i vještine • Uvod: što je BIM? • BIM Rječnik – osnovni pojmovi • Prednosti i cijena korištenja BIM-a u različite svrhe • Povrat na investiciju (ROI) • Standardi koji podupiru BIM proces • Diskusija	Ivana Burcar Dunović
16.00 - 16.15	Pauza	
16.15 – 16.45	Modul 1 – Difuzija BIM-a • Otvoreni BIM alati i standardni format • BIM uloge i odgovornosti • Dimenzije BIM-a o 4D, 5D, 6D, 7D	Ivana Burcar Dunović

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



16.45 – 17.15	<ul style="list-style-type: none"> <li>• Diskusija</li> </ul> Modul 2 – Primjena BIM-a za upravljanje podacima <ul style="list-style-type: none"> <li>• Načela upravljanja podacima u zajedničkom okruženju podataka - CDE (Okolina za razmjenu podataka)</li> <li>• Negrafičke informacije u BIM modelu zgrade</li> <li>• Plan održavanja zgrade i ugovaranje energetske usluge</li> <li>• BIM Model izvedenog stanja (eng. "as built") za poboljšanje energetske učinkovitosti zgrada</li> <li>• Diskusija</li> </ul>	Mergim Gaši
17.15 – 17.45	Modul 3 – Primjena BIM-a za upravljanje nabavom <ul style="list-style-type: none"> <li>• BIM i ugovaranje</li> <li>• BIM u javnoj nabavi</li> <li>• BEP (BIM Plan izvršenja)</li> <li>• Indeks zrelosti informacija</li> <li>• Suradnja među sudionicima u gradnji</li> <li>• Diskusija</li> </ul>	Ivana Burcar Dunović
17.45 – 18.15	Modul 4 – Korištenje BIM tehnologije Modul 5 – Analiza BIM modela <ul style="list-style-type: none"> <li>• Održivi građevinski sektor               <ul style="list-style-type: none"> <li>o Energetska učinkovitost</li> <li>o Zelena gradnja</li> </ul> </li> <li>• Automatizirana kontrola modela               <ul style="list-style-type: none"> <li>o Procjena sukladnosti s propisima</li> <li>o Otkrivanje kolizija</li> </ul> </li> <li>• BIM za upravljanje kvalitetom</li> <li>• BIM za primopredaju i održavanje (as built model)</li> <li>• Diskusija</li> </ul>	Marina Bagarić
18.15 – 18.30	Pauza	
18.30 – 19.00	Demonstracija rada s OpenBIM alatima: <ul style="list-style-type: none"> <li>• Rad na BIM modelima, kontrola preklapanja;</li> <li>• BIM model tijekom korištenja zgrade (energetska učinkovitost, održavanje zgrade)</li> <li>• Pregled i odobrenje izmjena modela od strane različitih suradnika</li> <li>• Diskusija</li> </ul>	Sanjin Gumbarević
19.00 – 19.15	Diskusija – post-training upitnici <ul style="list-style-type: none"> <li>- Validacija razvijenih trening materijala</li> </ul>	Bojan Milovanović

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



Subota 2.3.2019.

Sat	Tema	Predavač
10.00 – 13.00	Praktični rad u BIM-alatima (Archicad / Allplan) <ul style="list-style-type: none"> <li>Kako postaviti projekt u BIM-u</li> <li>Početak rada na kreiranju 3D modela i nacрта zgrade</li> <li>Kako napraviti eksport/import IFC formata</li> </ul>	Bojan Milovanović / Ivana Burcar Dunović / Marin Rajčić / Gianmarco Čurčić Baldini
13.00 – 14.00	Ručak	
14.00 – 16.00	Energetska učinkovitost <ul style="list-style-type: none"> <li>provođenje analiza energetske učinkovitosti u idejnim fazama projekata</li> <li>usporedba različitih varijantnih rješenja arhitekture</li> <li>usporedba različitih scenarija potrošnje i ušteda energije</li> </ul>	Bojan Milovanović / Ivana Burcar Dunović / Marin Rajčić / Gianmarco Čurčić Baldini

3

16

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## 2.2 Estonia

### 2.2.1 Course description and results

As shown in deliverable D21 – D4.1. *First classroom courses for professionals* it was shown that Estonian partners organized a classroom course on **January 9<sup>th</sup>** (8 hours), **January 10<sup>th</sup>** (8 hours) **2019** and **January 24<sup>th</sup>** (8 hours) **and 25<sup>th</sup>** **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 First classroom course for professionals in Estonia within the framework of the Net-UBIEP project.

Estonian partners have reached the targeted number of training participants during the first classroom course and have thus decided not to perform the second and third classroom course for professionals.

Based on the validation questionnaire responses (First classroom course for professionals) Estonian partners have also concluded that satisfactory training methodology and training content was developed which are in line with the learning outcomes.

## 2.3 Italy

### 2.3.1 Course description and results

Second classroom course for professionals was organized on **April 17<sup>th</sup>** **2019** in Milano, Italy.

The course programme consisted of 8 academic hours of theoretical lectures.

A group of **19 participants** specialising in engineering had undertaken the classroom course in Italy within the framework of the Net-UBIEP project and in cooperation with Fondazione "Ordine degli Ingegneri di Milano".

The overview of lectures held at the 2<sup>nd</sup> classroom course is shown below.



- AMAT - Agenzia Mobilità Ambiente e Territorio
- Climatology and Meteorology to support the energy sector
- BIM and Energy Efficiency
- Illustration and comments to the ENEA Sector Guidelines for Energy Diagnosis, in particular Industry and Health
- Final test and course closure

Photos from the second classroom course for professionals conducted by ENEA can be found below.

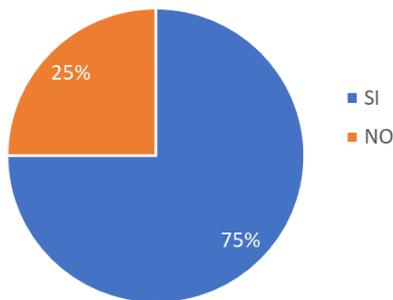


Pre- and Post-training questionnaires were translated to Italian language and filled by training participants.

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.

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

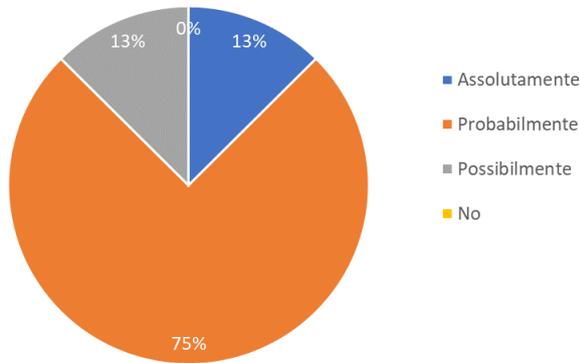
1. La sua società già lavora in ambiente BIM o intende farlo nel futuro prossimo? \*



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



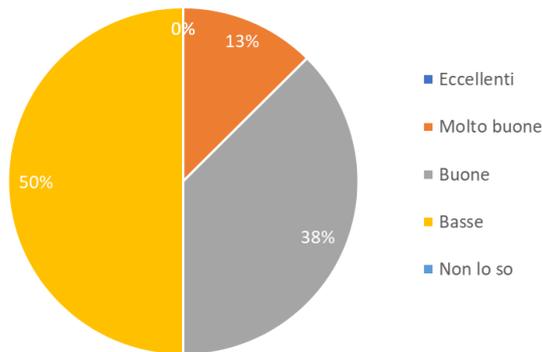
15. La certificazione BIM, il supporto o la formazione sarebbero utili a lei o ai suoi colleghi?



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

18. Come valuti le tue competenze (conoscenze, abilità, responsabilità e autonomia) prima di questo corso BIM?

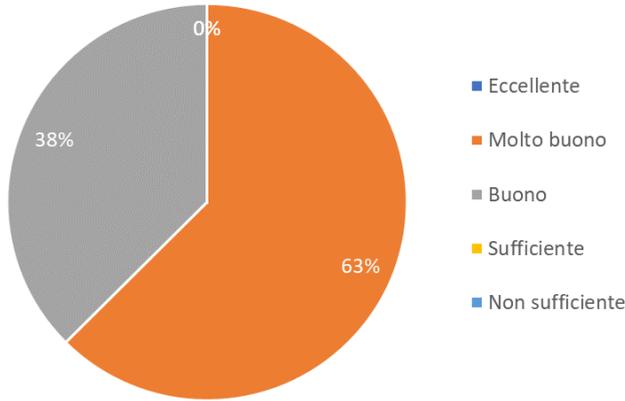


19. What overall rating would You give the course?

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

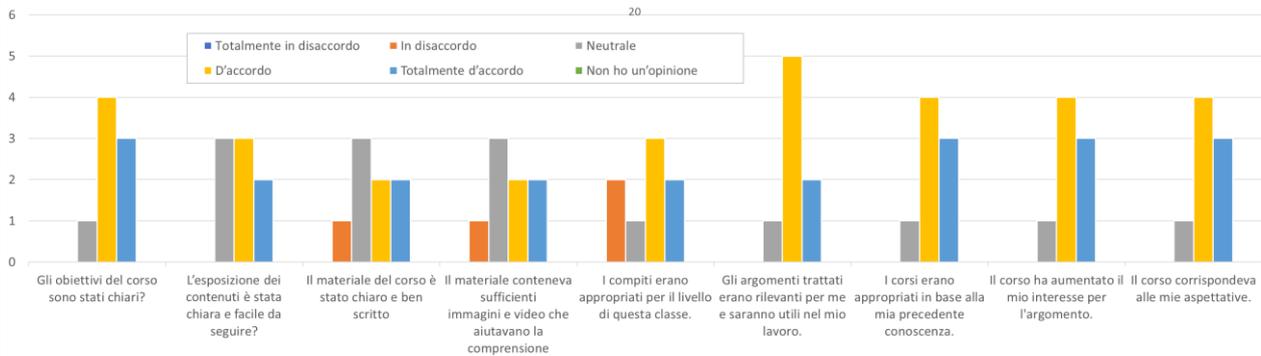


19. Quale valutazione generale daresti al corso?



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

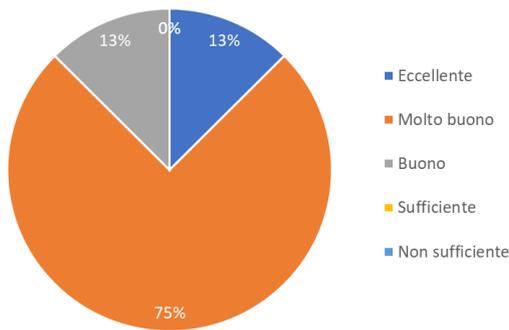
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	do not have opinion
The course objectives were clear.						
The content was organized and easy to follow.						
The course materials were clear and well written.						
The course materials contain sufficient number of images and videos explaining 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.						



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

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

21. Quale valutazione generale daresti al / ai formatore / i?

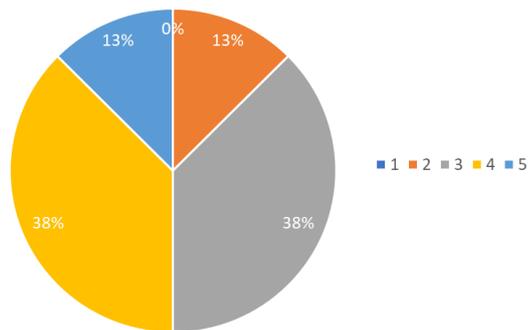


23. How much new information did you receive in the training course?

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

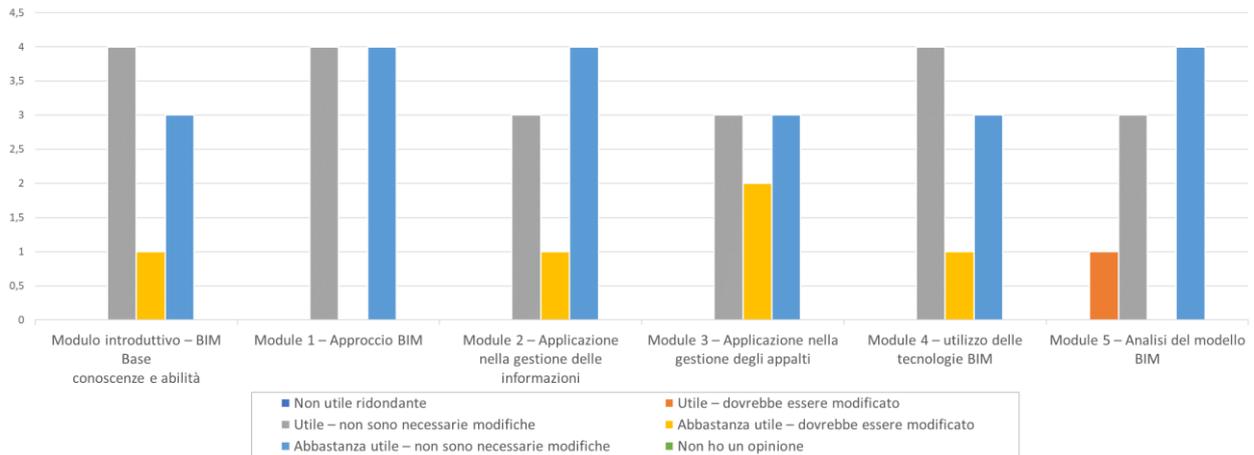
Rate on the scale from: 1 (none) to 5 (a lot of new information)

23. Quante nuove informazioni hai ricevuto nel corso di formazione ? Valuta sulla scala da: 1 (nessuna) a 5 (molte nuove informazioni)



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

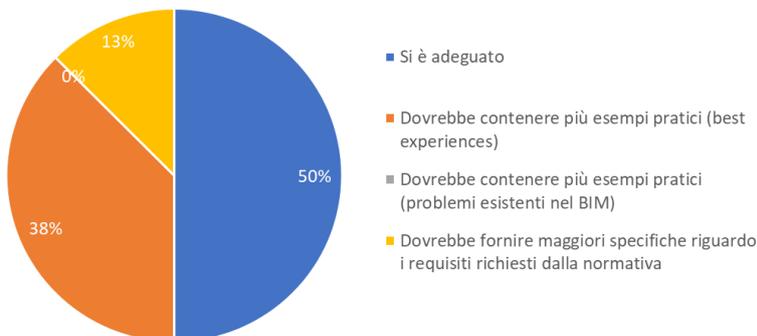
	Not useful - redundant	Useful – should be amended	Useful – no changes necessary	Quite useful – should be amended	Quite useful – no changes necessary	Do not have opinion
Introductory Module – Basic BIM knowledge and skills						
Module 1 – Diffuse BIM						
Module 2 – Apply information management				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



26. What do You feel, is the training material comprehensive enough?  
(Please mark all that apply)

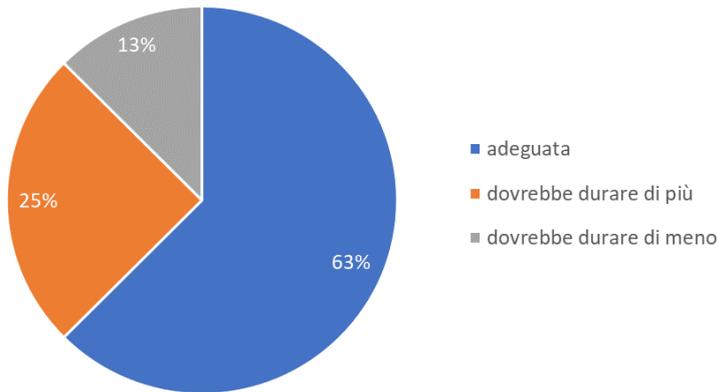
- a) Yes, it's adequate
- b) It should contain more practical examples (best experiences)
- c) It should contain more practical examples (existing issues in BIM)
- d) It should give more country specific regulatory requirements

26. Il materiale didattico è abbastanza completo?



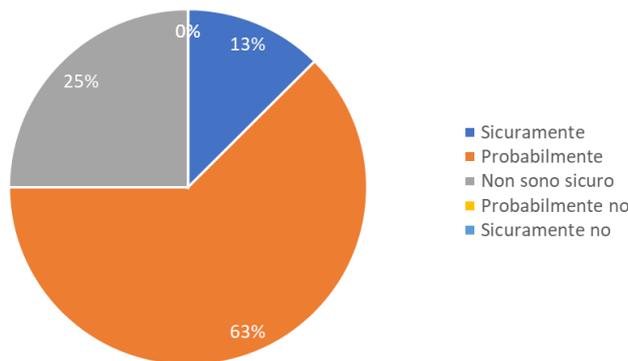
27. What do You feel about the duration of the training?  
 a) It is adequate  
 b) It should be longer  
 c) It should be shorter

27. Che cosa ne pensi della durata del corso?



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

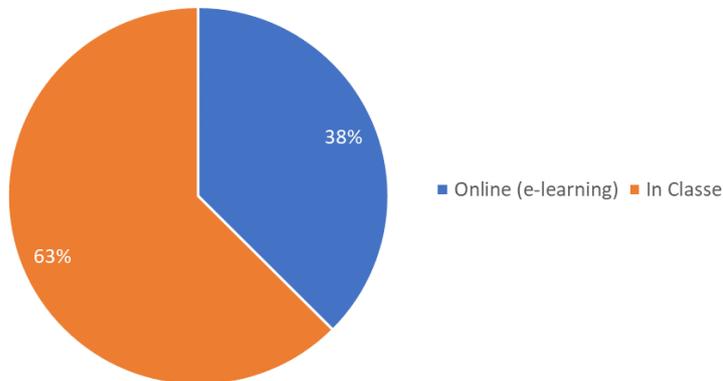
28. Saresti disposto a divulgare i corsi di formazione BIM tra i tuoi contatti e collaboratori?  
 Senza obbligo di farlo! \*



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



29. Preferiresti fare il corso on-line o frontale in classe?



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 8-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,

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.

### 2.3.2 Agenda



L'ORDINE DEGLI INGEGNERI DELLA PROVINCIA DI  
MILANO ORGANIZZA:

480-18

Corso

**AGGIORNAMENTO ESPERTI GESTIONE ENERGIA (EGE) UNI EN 11339**  
settore civile e industriale

**Mercoledì 17 Aprile 2019, ore 09:00-13:00 – 14:00-18:00**

**Descrizione**

Il mantenimento annuale della certificazione di parte terza approvato con il Decreto Direttoriale MISE MATT del 12/05/2015 prevede, fra l'altro, che l'interessato dia evidenza di aver maturato almeno 8 crediti EGE (1 credito/ora) attraverso la partecipazione ad attività specificamente finalizzata a tale scopo. Il corso proposto è concepito per assolvere al susposto requisito.

**Responsabile Scientifico**

Ing. **Franco Baretich** - Vicepresidente Commissione Energia Ordine Ingegneri Milano

**Programma**

08:45 Registrazione partecipanti

09:00 Ing. **Villavecchia** - *Amat*

11:00 **Dr.sa Cristina Lavecchia** e **Dr. Giuseppe Frustaci** - *Fondazione Osservatorio Meteorologico Milano Duomo FOMMD*

Climatologia e Meteorologia a supporto del settore energetico

13:00 Pausa pranzo

14:00 Ing. **A. Moreno** - *Enea*  
BIM ed Efficienza Energetica

16:00 Ing. **Sergio La Mura** - *Commissione Impianti Ordine Ingegneri Milano*  
Illustrazione e commenti alle Linee Guida Settoriali ENEA per le Diagnosi Energetiche in particolare Industria e Sanità

18:00 Test finale e chiusura corso

**Materiale**

Traccia delle presentazioni

**Crediti Formativi Professionali:**

VALIDO PER IL RILASCIO DI 8 CREDITI FORMATIVI PROFESSIONALI (D.P.R. 137 DEL 07/08/2012) per i soli iscritti all'Albo degli Ingegneri (Crediti validi su tutto il territorio nazionale)

Evento approvato da TÜV Examination Institute (centro per la valutazione delle competenze di TÜV Italia) per la validità di 8 ore di aggiornamento per lo schema Esperto in Gestione dell'Energia (EGE), sviluppato in accordo alla norma UNI CEI 11339:2009 ed alla norma UNI CEI EN ISO/IEC 17024:2012

Segreteria Organizzativa:  
FONDAZIONE DELL'ORDINE DEGLI INGEGNERI DI MILANO  
Telefono 0283420200 – fax 0283420206  
e-mail: [info@foim.org](mailto:info@foim.org)  
[www.foim.org](http://www.foim.org)



AGGIORNAMENTO ESPERTI GESTIONE ENERGIA (EGE) UNI EN 11339  
settore civile e industriale

**BIM e efficienza energetica**

Ing. **Anna Moreno**, project manager ENEA



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

## 2.4 Lithuania

### 2.4.1 Course description and results

Second classroom course for professionals was organized on **March 29<sup>th</sup> 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 **19 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.





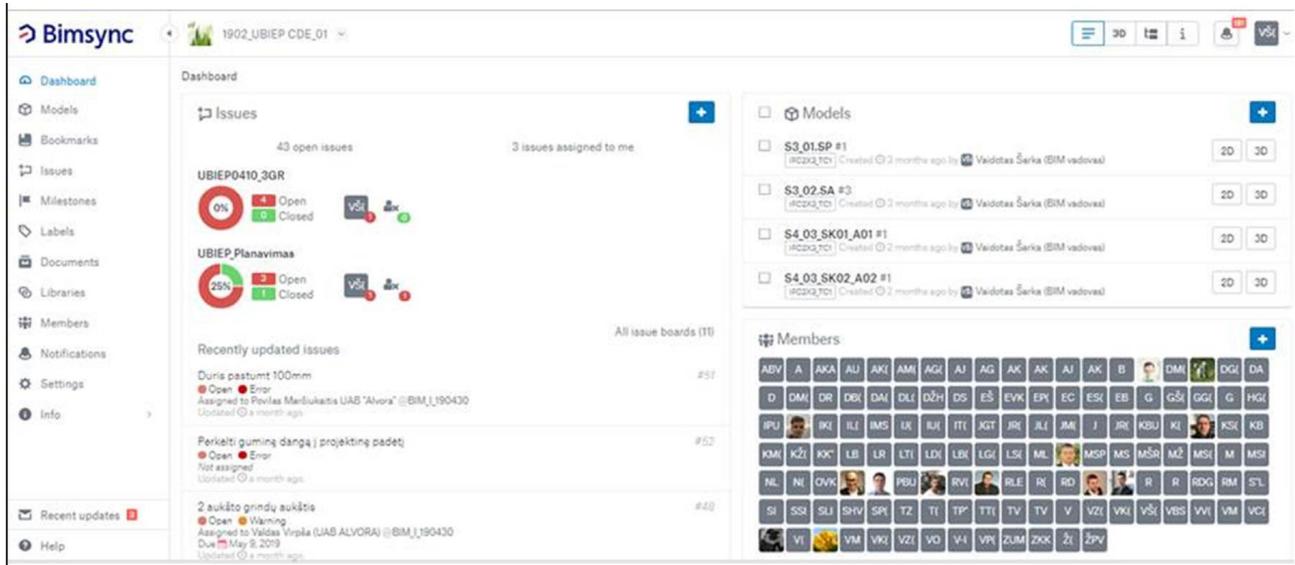
Prepared by: Doc. Dr. Vaidotas Šarka (VŠĮ „Skaitmeninė statyba“); Doc. Dr. Tatjana Vilutienė (Vilnius Gediminas Technical University)

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

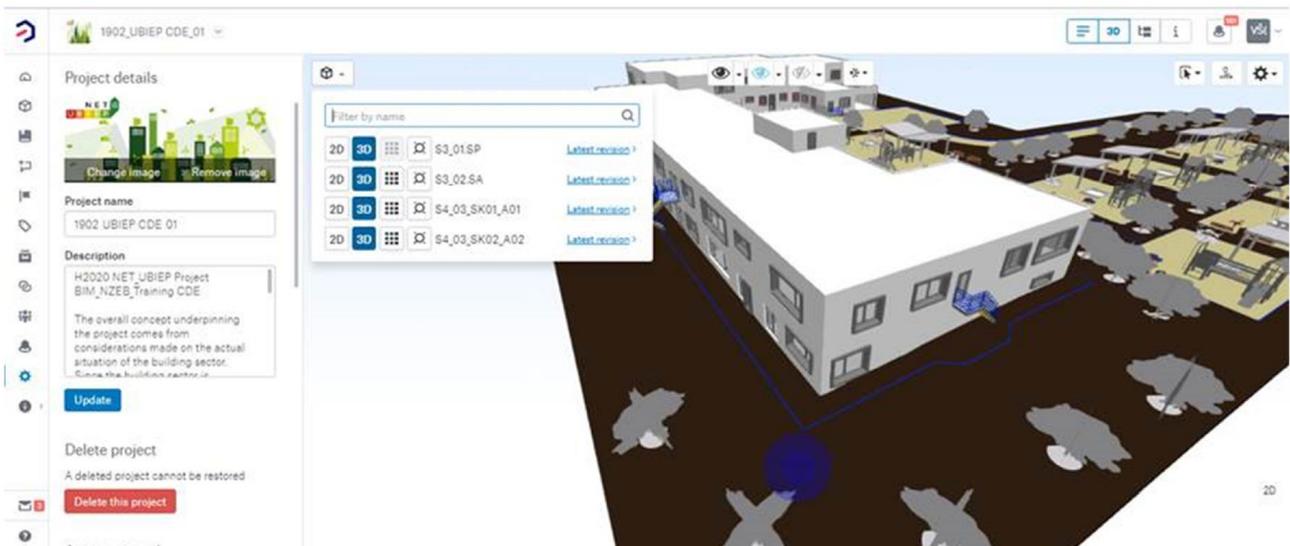


BIMSync platform for Common Data Environment (CDE) provided by Catena (Norway) was used during classroom courses in Lithuania. Project Dashboard (summary) within the BIMSync platform is shown in the figure below.



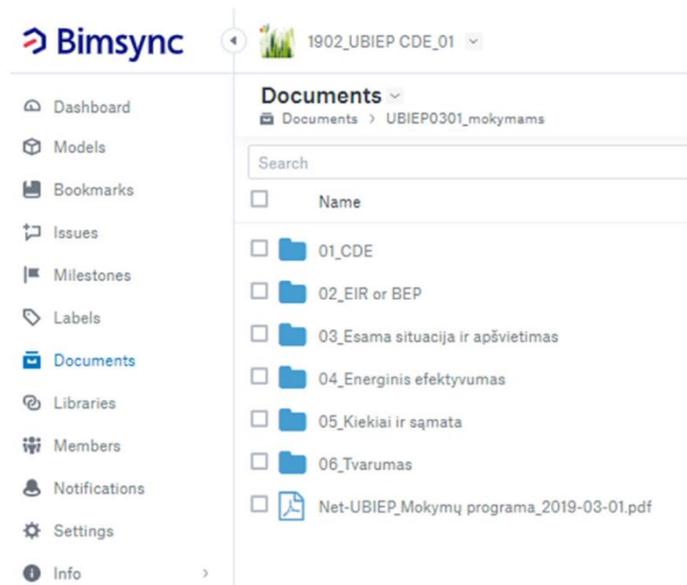


Real BIM Model (Presented by Vilnius Municipality Company “Vilniaus vystymo kompanija” – figure below) was shared with the classroom course participants as an application example and BimSync platform was used to conduct specific tasks given to participants during the course.



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:

[https://docs.google.com/forms/d/e/1FAIpQLSfK\\_ZgufjP2RxbOV-ZcZnvNuPrWwS7v7ETfPY57Hzzg6cXN7g/viewform](https://docs.google.com/forms/d/e/1FAIpQLSfK_ZgufjP2RxbOV-ZcZnvNuPrWwS7v7ETfPY57Hzzg6cXN7g/viewform),

while the responses to the Pre-training questionnaire are available at this link:

<https://docs.google.com/forms/d/15uY64BIGHQjqj33KWMdtBasG6lotuPdP1h45yINCswl/edit#responses>

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

[https://docs.google.com/forms/d/e/1FAIpQLSdGyTyIhqzf7DoEsl-y0YghAbpA1ZmKqr7RBXyaZm\\_RdsQ/viewform](https://docs.google.com/forms/d/e/1FAIpQLSdGyTyIhqzf7DoEsl-y0YghAbpA1ZmKqr7RBXyaZm_RdsQ/viewform) ,

while the responses to the Post-training questionnaire are available at this link:

[https://docs.google.com/forms/d/1limow7zJEoEQkZfhQaqxP0vQ\\_OdyfoeKR4aNsDbJ8pg/edit#responses](https://docs.google.com/forms/d/1limow7zJEoEQkZfhQaqxP0vQ_OdyfoeKR4aNsDbJ8pg/edit#responses)

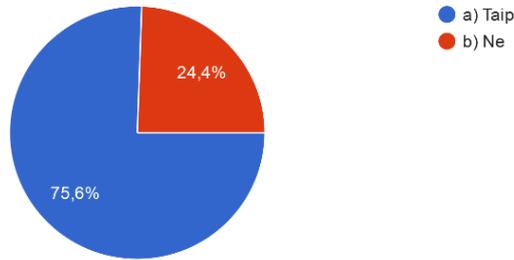
Few general conclusions from the classroom course validation from the participants in Lithuania is given below, while the entire questionnaire analysis is performed in deliverable *D27-D4.7 Survey and or interview among all different Targets*. Due to the fact that validation was performed in partners' 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? | a) Yes |
|   | b) No  |



1. Ar jūsu ģimē/organizācija šiuo metu taiko BIM (bet koku lygmeniu), ar ketina artimiausiu metu taikyti?

45 odgovora

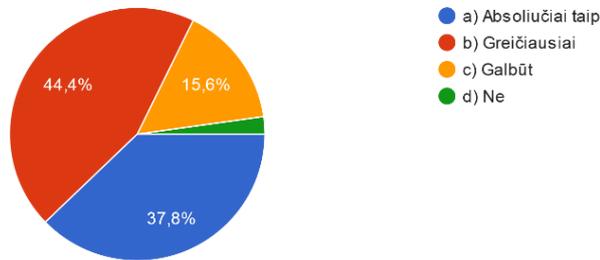


15. Would BIM certification, support or training, benefit Your colleagues?

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

15. Ar BIM kompetenciju sertifikavimas ar mokymas bus naudingas jūsu kolegomams?

45 odgovora



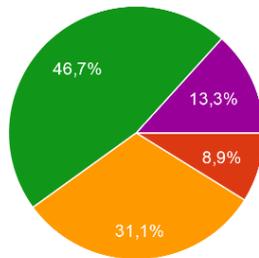
18. In retrospective, how do You rate Your competences (knowledge, skills, responsibility and autonomy) before this BIM course?

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



18. Retrospektyviai, kaip vertinate savo kompetencijas (žinias, įgūdžius, atsakomybę ir autonomiją) prieš šį BIM kursą?

45 odgovora



- a) Puikiai
- b) Labai gerai
- c) Gerai
- d) Vidutiniškai
- e) Nežinau

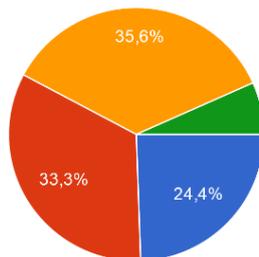
30

19. What overall rating would You give the course?

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

19. Kaip vertinate mokymus?

45 odgovora



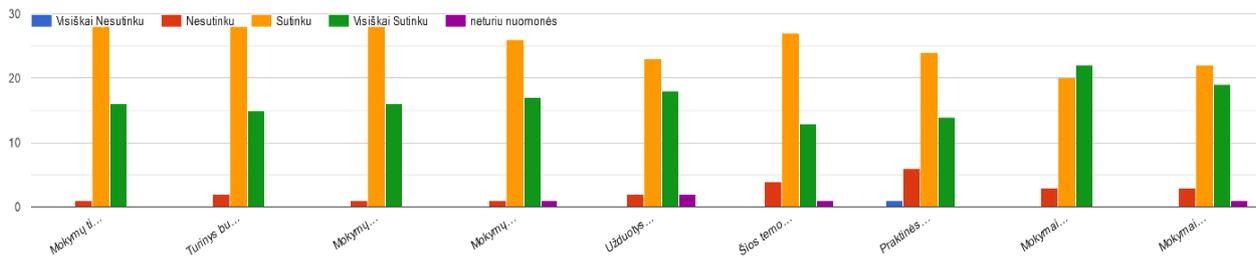
- a) Puikiai
- b) Labai gerai
- c) Gerai
- d) Vidutiniškai
- e) Blogai



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.						

20. Pažymėkite savo nuomonę dėl šių teiginių:

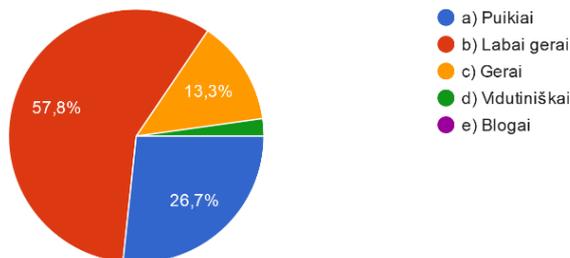


21. What overall rating would you give the trainer(s)?

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

21. Kaip vertinate mokytojus?

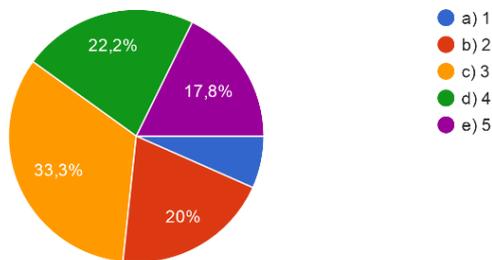
45 odgovora



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

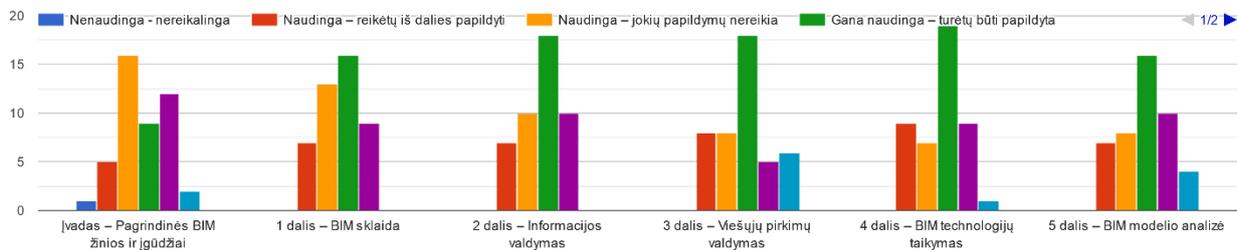
23. Kiek naujos informacijos gavote mokymu metu ? Įvertinkite skalėje nuo 1 (nėra) iki 5 (daug naujos informacijos)  
 45 odgovora



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						

25. Įvertinkite šių BIM mokymų atskiras temas pagal tai, ar jos buvo naudingos ir įdomios.

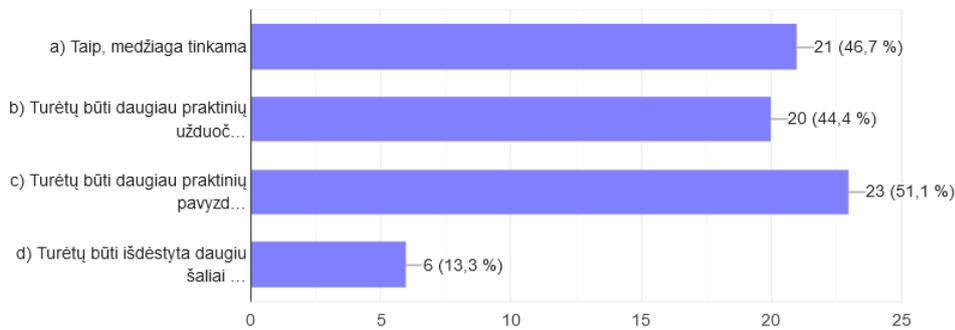


26. What do You feel, is the training material comprehensive enough?  
(Please mark all that apply)

- 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

26. Ką manote, ar mokymo medžiaga yra pakankamai išsami?  
(Pažymėkite visus tinkamus atsakymus)

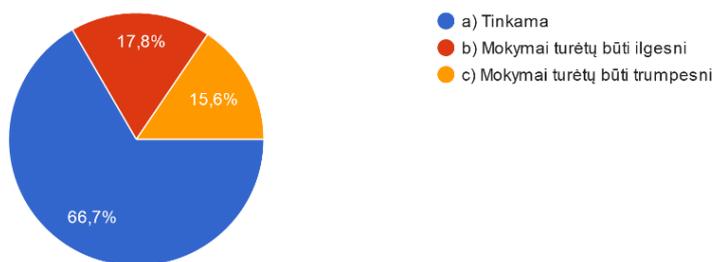
45 odgovora



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

27. Kaip jus vertinate mokymų trukmę?

45 odgovora



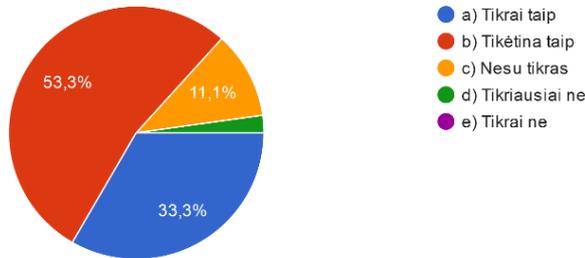
28. Would You be willing to disseminate the BIM training courses among Your contacts and associates?  
Without any obligation to do so!

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



28. Ar sutiktumėte platinti informaciją apie BIM mokymus savo partneriams? (Be įsipareigojimo tai daryti!)

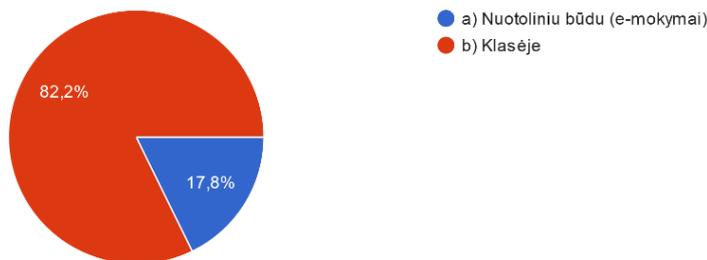
45 odgovora



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

29. Ar šiuos mokymus jums būtų patogiau išklaudyti klasėje ar nuotoliniu būdu ?

45 odgovora



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.

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.*

### 2.4.2 Agenda



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

**Net-UBIEP 2-iejį mokymai statybos profesionalams (WP4)**

**Data:** 2019-03-29, 8:30-17:00 val.

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

MOKYMŲ PROGRAMA		
Laikas	Tema	Pranešėjas
8:30-9:00	Registracija / Sutikimo kava	
9:00-9:10	Sveikinimo žodis, mokymų tikslai.	Dalius Gedvilas (VšĮ „Skaitmeninė statyba“)
9:10-9:30	Skaitmeninė statyba Lietuvoje. Kiek esame pažengę?	Dalius Gedvilas (VšĮ „Skaitmeninė statyba“)
9:30-9:50	Apie Net-UBIEP projektą. Mokymų planas.	Tatjana Vilutienė (Vilniaus Gedimino technikos universitetas)
<b>Praktinė dalis</b>		
9:50-10:20	Susipažinimas su mokymų dalyviais. <i>Praktinė užduotis:</i> Statybos projektų problematikos identifikavimas	Vaidotas Šarka (VšĮ „Skaitmeninė statyba“)
10:20-10:50	<i>Praktinė užduotis:</i> CDE - projekto komandos bendradarbiavimo aplinka WEB platformoje ir integruotos komandos formavimas (IPD).	Vaidotas Šarka (VšĮ „Skaitmeninė statyba“) Tatjana Vilutienė, Edita Šarkienė (Vilniaus Gedimino technikos universitetas)
10:50-11:10	Kavos pertraukėlė / <i>Kamunikavimas</i>	
11:10-11:30	Kas yra EIR ir BEP? Kodėl svarbu parengti racionalų EIR?	Arvydas Kiaulakis (VšĮ „Skaitmeninė statyba“)
11:30-12:00	<i>Praktinė užduotis:</i> Projekto BIM tikslų nustatymas	Tatjana Vilutienė, Edita Šarkienė (Vilniaus Gedimino technikos universitetas)
12:00-12:30	<i>Praktinė užduotis:</i> Kokius BIM taikymo būdus naudosime projekte?	Tatjana Vilutienė, Edita Šarkienė (Vilniaus Gedimino technikos universitetas)
12:30-13:15	<i>Pietūs</i>	
13:15-14:00	<i>Demonstravimas:</i> Apšvietimo analizė <i>Praktinė užduotis:</i> Užduočių pasirinktam BIM taikymo būdui formulavimas. Informacijos pateikimo plano (IPP) rengimas. Rezultatų aptarimas.	Violeta Motuzienė (Vilniaus Gedimino technikos universitetas)
14:00-14:45	<i>Demonstravimas:</i> Energinio naudingumo modeliavimas <i>Praktinė užduotis:</i> Užduočių pasirinktam BIM taikymo būdui formulavimas. Informacijos pateikimo plano (IPP) rengimas. Rezultatų aptarimas.	Rasa Džiugaitė-Tumėnienė (Vilniaus Gedimino technikos universitetas)

Net-UBIEP: D21-D4.1 Second 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.



MOKYMŲ PROGRAMA		
Laikas	Tema	Pranešėjas
14:45-15:00	Kavos pertraukėlė / <i>Kamunikavimas</i>	
15:00-15:45	<i>Demonstravimas:</i> Tvarumo analizė <i>Praktinė užduotis:</i> Užduočių pasirinktam BIM taikymo būdui formulavimas. Informacijos pateikimo plano (IPP) rengimas. Rezultatų aptarimas.	Rūta Mikučionienė (Vilniaus Gedimino technikos universitetas)
15:45-16:30	<i>Demonstravimas:</i> Kiekių analizė ir sąmatų rengimas. <i>Praktinė užduotis:</i> Užduočių pasirinktam BIM taikymo būdui formulavimas. Informacijos pateikimo plano (IPP) rengimas. Rezultatų aptarimas.	Albinas Vaitkevičius (UAB „SISTELA“) Vaidotas Šarka (VšĮ „Skaitmeninė statyba“)
16:30-17:00	<i>Klausimai / Diskusija / Mokymų refleksija / Klausimynas</i>	
17:00	Renginio pabaiga	

Daugiau informacijos:

1. Apie net-UBIEP projektą: <http://www.net-ubiep.eu/lt/home-lt/>
2. Apie BIM metodikos taikymą: [www.skaitmeninesstatyba.lt](http://www.skaitmeninesstatyba.lt)
3. Apie statybų sektoriaus e-kompetencijų registrą: [www.statreg.lt](http://www.statreg.lt)
4. Apie A, A+, A++ ir NZEB pastatų statybos technologijas: [www.statybostaisykles.lt](http://www.statybostaisykles.lt) statybos taisyklių ir ENERGOTRAIN skiltis

Renginio organizatoriai:



Renginio partneriai



Net-UBIEP: D21-D4.1 Second classroom courses for Professionals (Lithuania).  
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## 2.5 Slovakia

### 2.5.1 Course description and results

On **2 April 2019** (8 hours) the second Net-UBIEP Training in class courses for Professionals was organised 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);
- 1<sup>st</sup> and 2<sup>nd</sup> training sessions for professionals (1 - 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).

The second in class course programme for professionals consisted of 8 academic hours combining theoretical part with application examples (case studies) and practical tasks.

A group of **13 participants** specialising in architecture and engineering had undertaken the second in class 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.

38

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 optimization of buildings;
- Discuss specific issues, such as planning fire protection (specific legislative requirements in Slovakia and the Czech Republic that needs to be addressed).

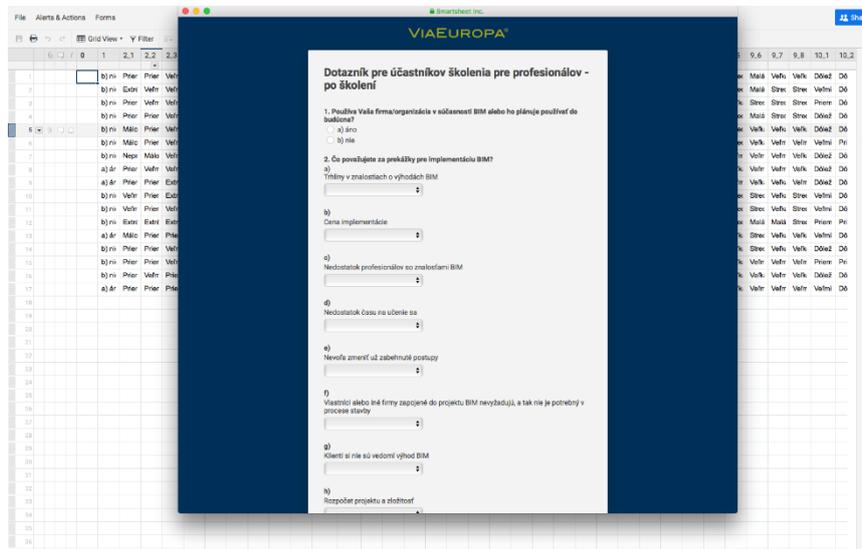
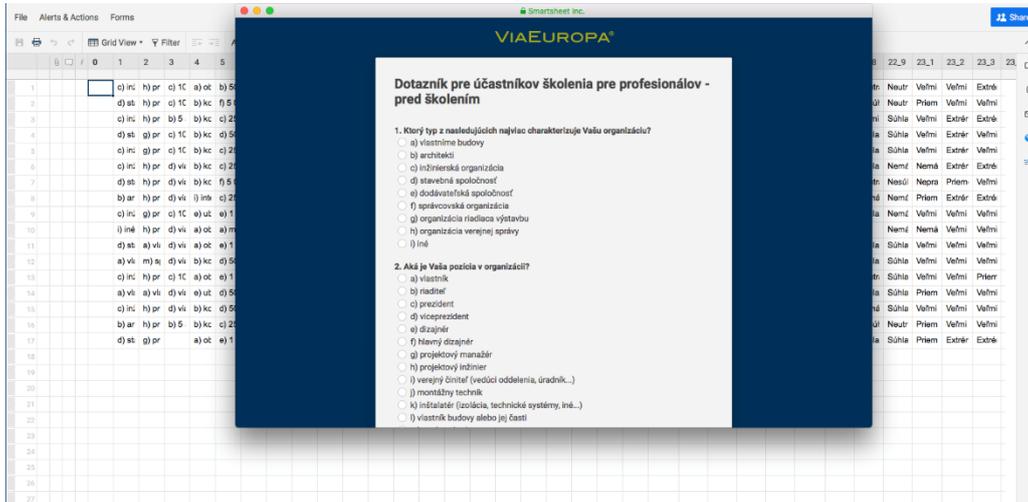
The following main topics were discussed in detail:

- 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.

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



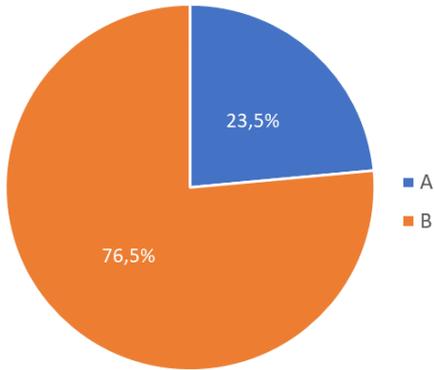
Pre- and Post-training questionnaires were translated to Slovak language and filled by training participants.



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.

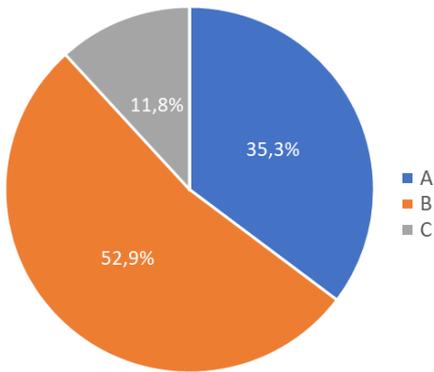
1. Do You or Your company/organization currently use BIM, or is it intending to use BIM in the near future?  
 a) Yes  
 b) No





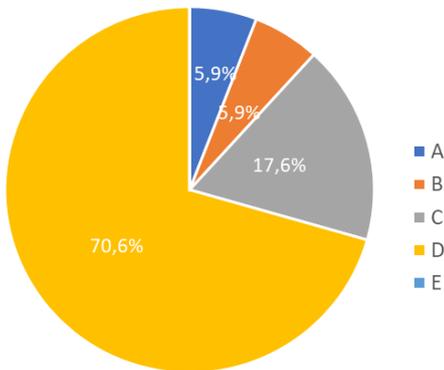
15. Would BIM certification, support or training, benefit Your colleagues?

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



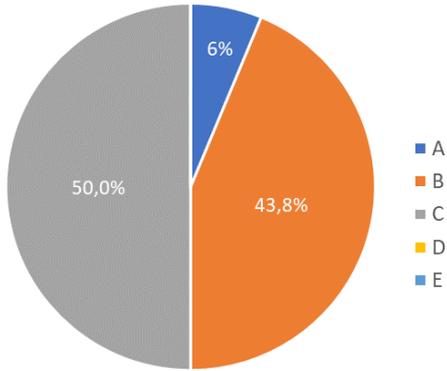
18. In retrospective, how do You rate Your competences (knowledge, skills, responsibility and autonomy) before this BIM course?

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



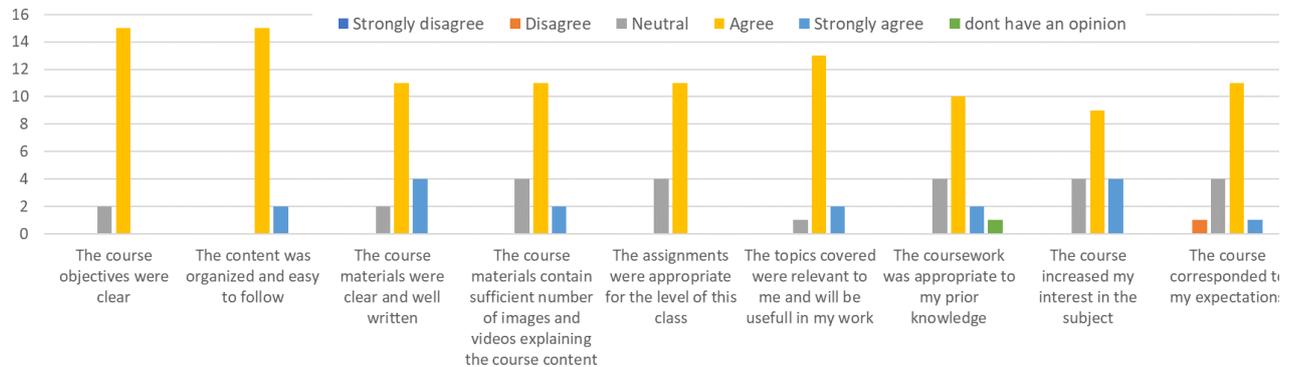
19. What overall rating would You give the course?

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



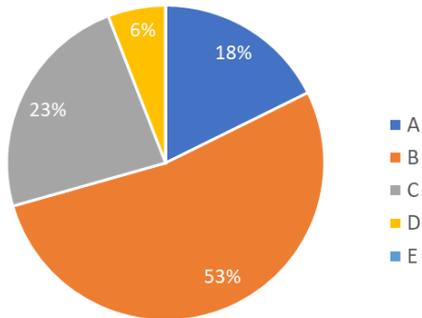
20. Please indicate your level of agreement with the following statements:

	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.						



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

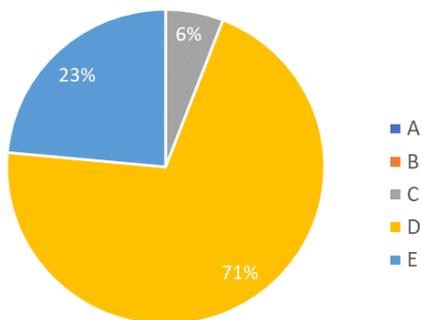
- a) Excellent
- b) Very good
- c) Good
- d) Fair
- e) Poor



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

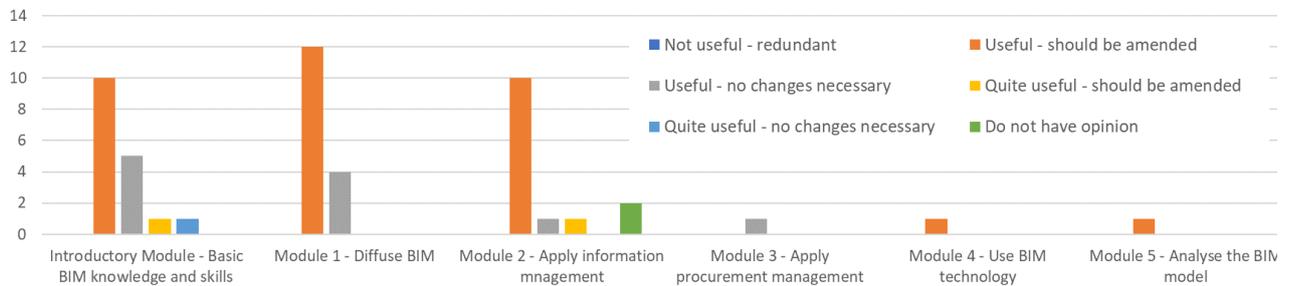
- a) 1
- b) 2
- c) 3
- d) 4
- e) 5

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



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

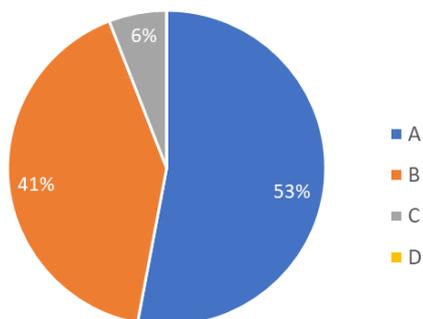
	Not useful - redundant	Useful – should be amended	Useful – no changes necessary	Quite useful – should be amended	Quite useful – no changes necessary	Do not have opinion
Introductory Module – Basic BIM knowledge and skills						
Module 1 – Diffuse BIM						
Module 2 – Apply information management				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



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

(Please mark all that apply)

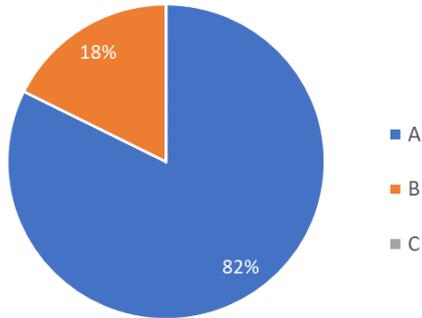
- a) Yes, it's adequate
- b) It should contain more practical examples (best experiences)
- c) It should contain more practical examples (existing issues in BIM)
- d) It should give more country specific regulatory requirements



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

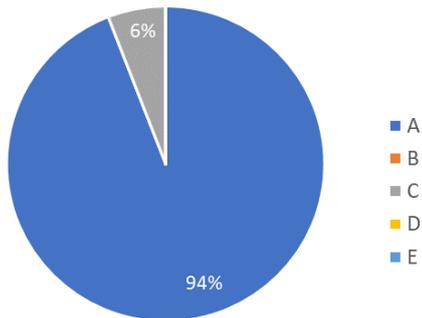
- a) It is adequate
- b) It should be longer
- c) It should be shorter





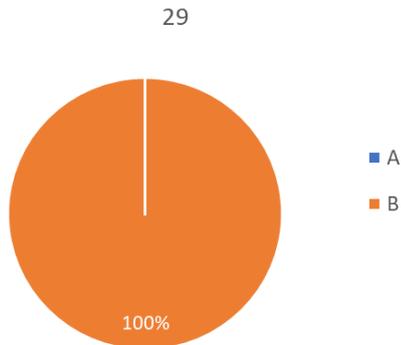
28. Would You be willing to disseminate the BIM training courses among Your contacts and associates?  
Without any obligation to do so!

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



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.

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

#### 4.2 Module 3: Planning fire protection in BIM

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

Time	Agenda Item	Methodology
09:00	Introduction to the agenda • <i>Marta Minarovičová (UVS)</i>	Oral presentation
09:20	Presentation of the project • <i>Frantisek Doktor (ViaEuropa)</i>	Oral presentation
09:45	What is BIM? Key elements and key concepts. • <i>Ján Dekánek (UVS)</i>	PPT presentation
10:00	Communication dimensions, LODs, CDE, BEP • <i>Ján Dekánek (UVS)</i>	PPT presentation
11:00	Coffee break	
11:15	Standardisation in Slovakia and the Czech Republic relevant to the module • <i>Ján Dekánek (UVS)</i>	PPT presentation
12:15	Break for lunch	
13:00	Fire protection in BIM in the design and planning stage • <i>Ján Dekánek (UVS)</i>	PPT Presentation
13:45	Spaces • <i>Ján Dekánek (UVS)</i>	PPT Presentation
14:45	Fire protection sections - structure • <i>Ján Dekánek (UVS)</i>	PPT Presentation
15:30	Coffee break	
16:00	Fire protection sections – fire risks • <i>Ján Dekánek (UVS)</i>	PPT presentation
16:30	Fire protection sections – level of fire protection • <i>Ján Dekánek (UVS)</i>	PPT presentation
17:00	Fire protection section – construction products • <i>Ján Dekánek (UVS)</i>	PPT presentation
17:30	Discussion	Q&A session

## 2.6 Spain

### 2.6.1 Course description and results

As shown in deliverable *D21 – D4.1. First classroom courses for professionals* it was shown that Estonian partners organized a classroom course on **April 25<sup>th</sup>** 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, therefore the FLC think that there is no need to organise more trainings because the target number was reached.

Since there was no post-training validation performed using the designed questionnaires during the First classroom course for professionals, it was not possible to draw any on training methodology and training content developed by Spanish partners and their coherence with the developed learning outcomes.

## 2.7 The Netherlands

### 2.7.1 Course description and results

First classroom course for professionals was organized on **March 26<sup>th</sup> 2019** in Rotterdam, The Netherlands. The course programme consisted of 4 academic hours of theoretical lectures.

A group of **7 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 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.

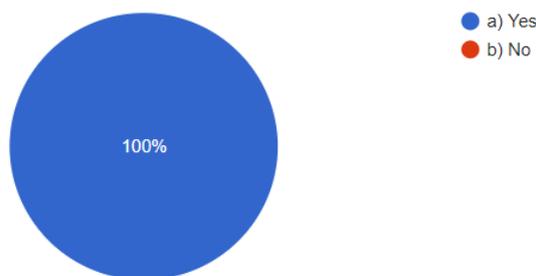
In other words, things are going slower than expected. However, Dutch partners are trying to disseminate the results and the education material with professional educators who expressed interest. So they think the results and materials will be used by these professional educators, but this is a slow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

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

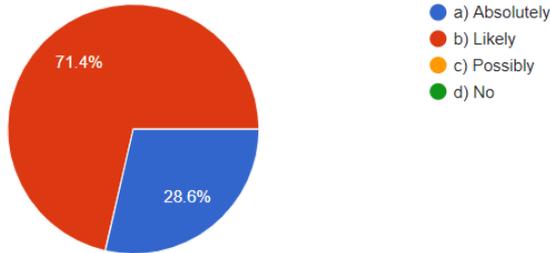
7 responses



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

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

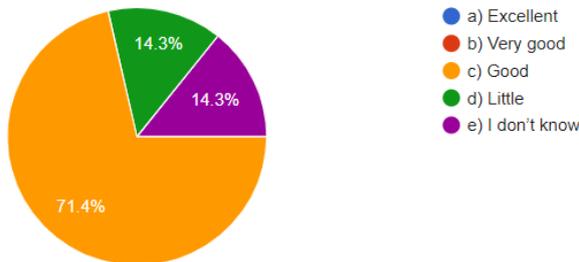
7 responses



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

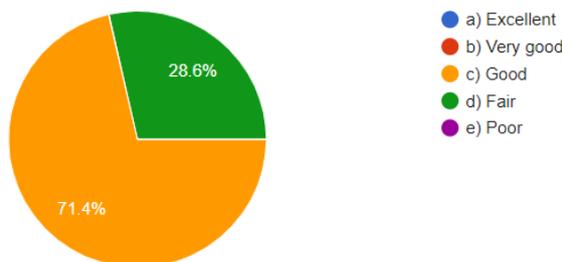
7 responses



19. What overall rating would You give the course?

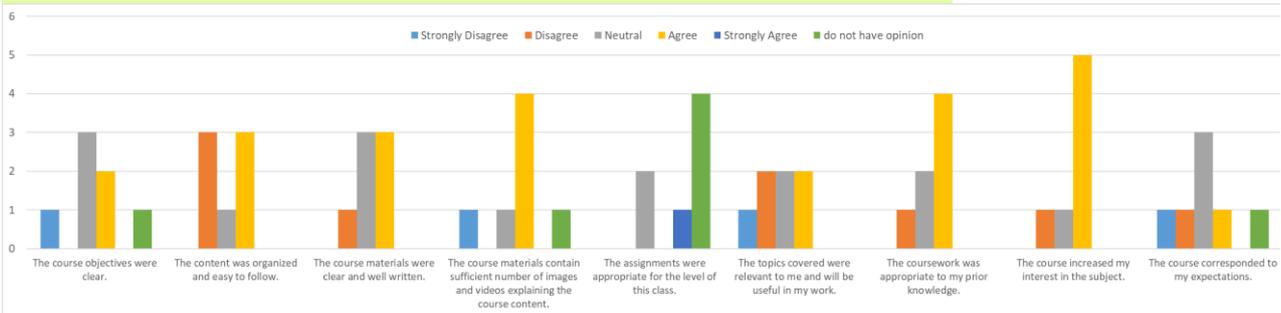
- a) Excellent
- b) Very good
- c) Good
- d) Fair
- e) Poor

7 responses



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

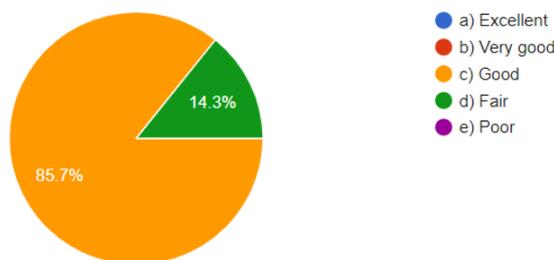
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	do not have opinion
The course objectives were clear.						
The content was organized and easy to follow.						
The course materials were clear and well written.						
The course materials contain sufficient number of images and videos explaining 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.						



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

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

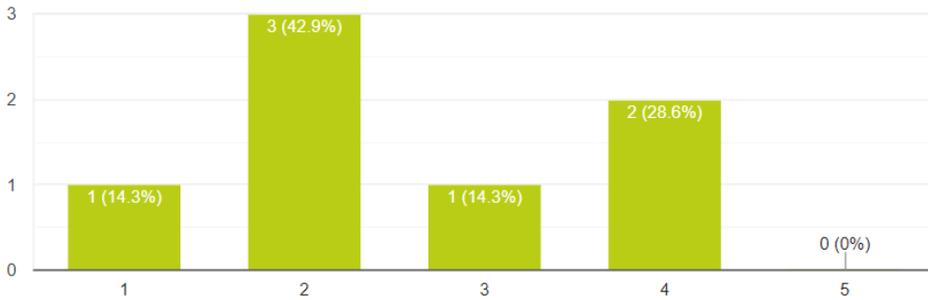
7 responses



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)

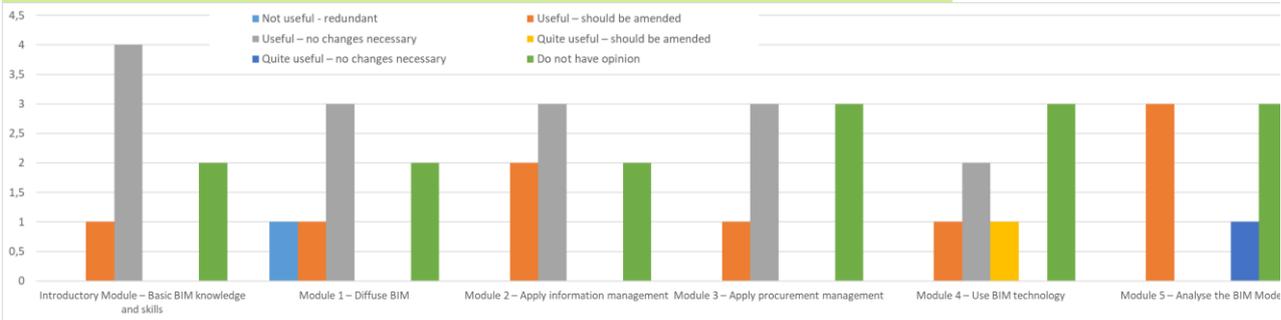
a) 1  
 b) 2  
 c) 3  
 d) 4  
 e) 5

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						

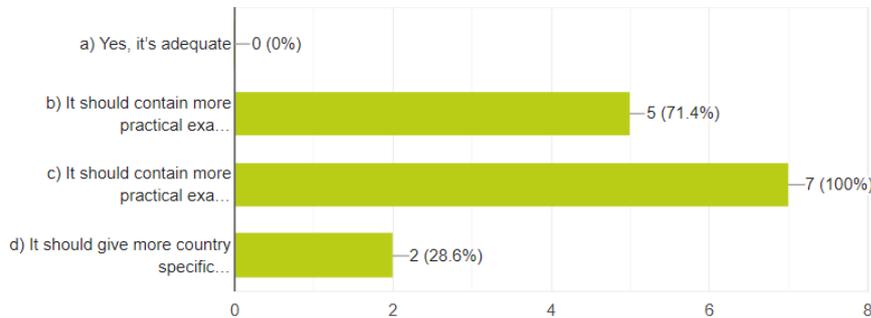


26. What do You feel, is the training material comprehensive enough?  
 (Please mark all that apply)

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

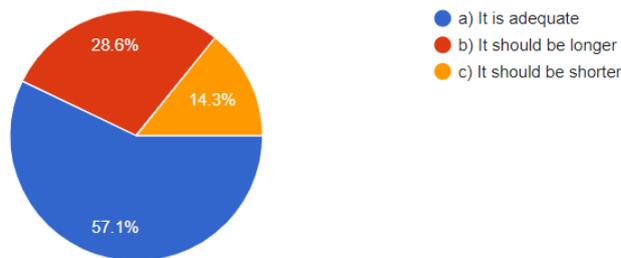


7 responses



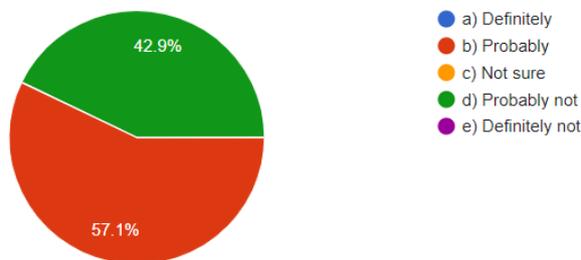
27. What do You feel about the duration of the training?  
 a) It is adequate  
 b) It should be longer  
 c) It should be shorter

7 responses



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

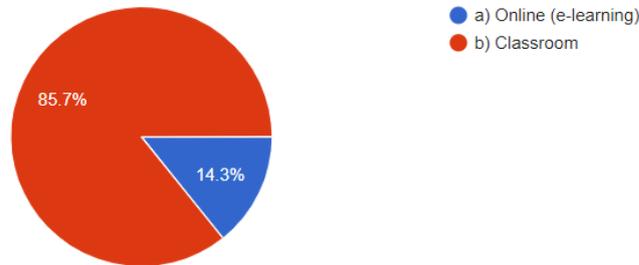
7 responses



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



7 responses



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 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.

## 2.7.2 Agenda

12.2.2019

### Training opzet

Doel training, focus op comfort, kwaliteit, circulair bouwen, energie prestatie  
Doelgroepen voor de training  
Opdeling training  
Nul meting, maturity scan, BIM levels

### Intro BIM

Introductie BIM, wat verstaan we onder BIM (begrippen). Voordelen van BIM, welke uitdagingen ontstaan  
Welke BIM functies (functionaliteiten) bestaan er  
BIM als levenscyclus platform, faseringen en processen  
BIM gebruikers / BIM rollen / competenties  
BIM landschap, welke software oplossingen staan de sector ter beschikking  
BIM standaarden

Rekenen en simuleren gebouwinstallaties, verwarming, koeling, be-ontvochtiging, warm tapwater, verlichting  
5D BIM en raming, haalbaarheidsstudie  
Clash detection kasko en installatie  
Model check

### Introductie BENG (nZEB / Bijna Energie Neutrale Gebouwen)

Introductie BENG, wat verstaan we onder BENG (begrippen), urgentie en noodzaak  
BENG toegepast in de Nederlandse / Europese context, wet en regelgeving, gestelde eisen  
BENG toegepast in de Nederlandse context, bepalingmethode energieprestatie (NTA 8800) BENG  
BENG landschap, welke software oplossingen / reken methodieken staan de sector ter beschikking  
Impact BENG op de TCO van een gebouw  
Milieu prestatie voor gebouwen (MPG)

### BIM voor BENG realiseren Nieuwbouw LOD 350-400 (BIM voor aannemers / toeleveranciers)

BIM voor BENG detailengineering / werken met referentiedetails  
Kwaliteitscontrole / kwaliteitsinspectie / kwaliteitsborging / gebouwdossier  
5D BIM Hoeveelhedenbepaling en calculatie  
Augmented reality voor instructie  
Clash detection kasko en installatie  
4D BIM / planning  
Continu verbeteren / terugkoppeling vanuit nieuwbouw realisatie naar ontwerp  
Handover dossier en validatie

*LEED evaluatie en certificatiesysteem waarmee de duurzaamheidsprestaties van gebouwen bepaald kunnen  
BREEAM is een beoordelingsmethode om de duurzaamheidsprestatie van gebouwen en gebieden te bepalen*

### Strategische keuze BIM voor BENG, BENG bouwen m.b.v. BIM

BIM voor BENG als onderdeel van het integrale BIM proces, welke BIM functies komen in deze training in  
Voordelen te behalen door toepassing BIM voor BENG voor de verschillende belanghebbende  
Business case BIM voor BENG  
BIM voor BENG als ketensamenwerking instrument, BIM coordinatie  
Implementatie BIM voor BENG, impact op de bestaande werkwijze  
BIM voor BENG competenties  
BIM bibliotheken, parametrisch modelleren

### BIM voor BENG onderhouden en beheren LOD 500 (BIM voor eigenaren / facility managers)

Validatie handoverdossier als built en de werkelijkheid  
Duurzaam onderhoud asset management m.b.v. BIM voor BENG / conditiemeting  
Conditie meting / Meerjaren onderhoudsplanung / Resultaatgericht vastgoed onderhoud  
Traceability welke materialen waar toegepast (materialen paspoort / gebouwdossier)  
Sloop, hergebruik gebruikmakend van het materialen paspoort  
Continu verbeteren / terugkoppeling vanuit gebruik naar ontwerp  
Total cost of ownership  
Digital twin

### BIM voor BENG contracteren

Verschillende contractvormen in relatie tot gebruik BIM  
Uitvraag t.b.v BIM voor BENG, de te leveren prestaties / bestek  
Uitvraag t.b.v BIM voor BENG, de informatie leveringsspecificatie (ILS), referentie naar standaarden  
BIM voor BENG de samenwerking en rolverdeling formaliseren op basis van BIM protocol / BIM uitvoeringsplan  
BIM voor BENG aspectmodellen per fase en discipline  
BIM voor BENG Risico analyse  
Van het gas los / aantonen kwaliteit, materiaal keuze, detaillering

### BIM voor BENG voor verduurzaming bestaande voorraad (renovatie)

Inventarisatie actuele situatie, digitaliseren bestaande situatie/ laserscanning / genereer mesh model  
Rekenen en simuleren gebouwinstallaties, verwarming, koeling, be-ontvochtiging, warm tapwater, verlichting  
5D BIM hoeveelhedenbepaling en calculatie voor renovatie  
4D BIM / planning  
Clash detection kasko, installatie en bestaande omgeving  
Model check  
Continu verbeteren / terugkoppeling vanuit renovatie naar ontwerp

### BIM voor BENG ontwerpen Nieuwbouw tot LOD 300 (BIM voor engineers and architects)

BIM voor BENG denken in systemen / gebouwbegrenzing  
Bepaling warmte en koude behoefte  
Transmissie

### BIM voor BENG casus

Praktijkvoorbeeld

### BIM toekomst

BIM trends en ontwikkelingen



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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](http://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

