DELIVERABLE: D21 - D4.1

First Classroom Courses for Professionals

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Authors: University of Zagreb, Faculty of Civil Engineering

Network for Using BIM to Increase the Energy Performance

Grant Agreement Number: 754016
Net-UBIEP H2020

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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.

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

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A. Deliverable Details	
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B. Short description

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

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).
First Classroom Courses for Professionals were conducted in national languages Croatian, Dutch, Estonian, Italian, Latvian, Slovak, Spanish. Validation of training material and assessment for **professionals (Engineers and Architects)** on how to use BIM for the energy performance was conducted during these classroom courses using questionnaires.
Questionnaire tailored for **training participants** were prepared (*D27-D4.7 Survey and or interview among all different Targets*) in order to validate defined competence lists for **professionals** as well as trainee satisfaction with course and instructor (trainer) effectiveness. **Training participants** were asked to judge on their competences **before the training as well as after the training**.

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

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

Two types of questionnaires were used to cover these three pillars of good education and to simultaneously perform a self-assessment of competences gained by the participants during the course.
The purpose of the "**Pre training questionnaire**" was to assess initial level of knowledge, experience and current practices regarding BIM. "**Post training questionnaire**" contains the same or similar questions as a "Pre training questionnaire" which serve to determine in simple ways the progress training participants have made during the courses and efficiency of the courses. Questions about the completeness or redundancy of the foreseen schemes and training courses were also included in the "Post training questionnaires".

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

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

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

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

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

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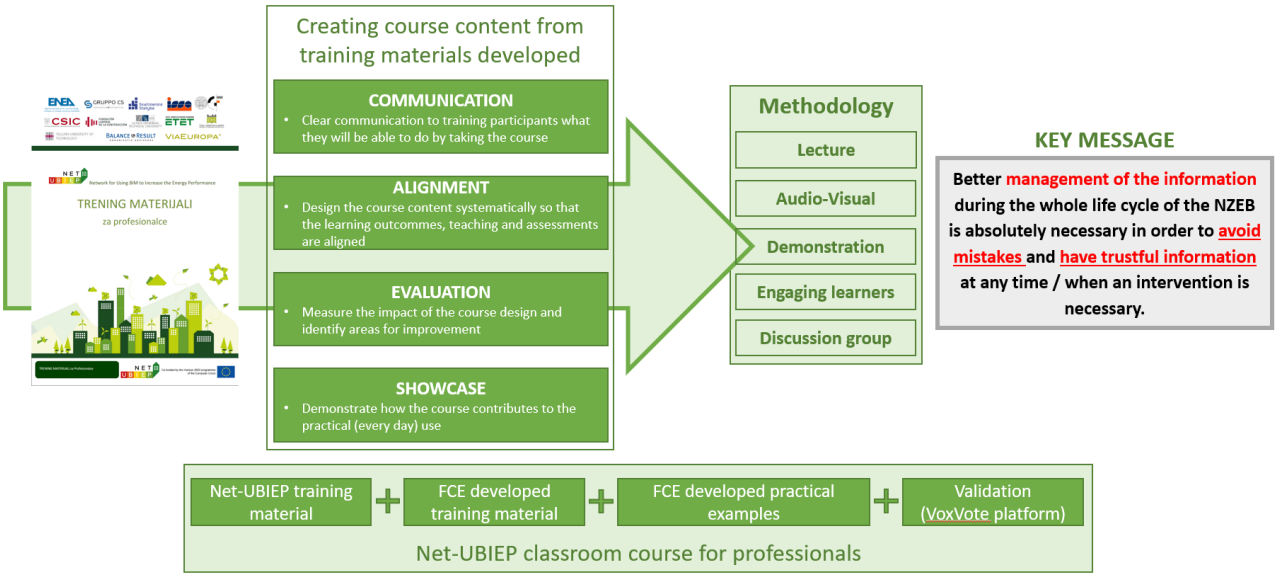
2. Conducted courses

2.1 Croatia

2.1.1 Course description and results

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



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

Pre- and Post-training questionnaires were translated to Croatian language and filled by training participants.
Pre-training questionnaire is available at this link: https://docs.google.com/forms/d/e/1FAIpQLSfQYVDL0b-Uic830VIoYTrRaET2YvaGRmp3XeiNnZgwxfe42Q/viewform

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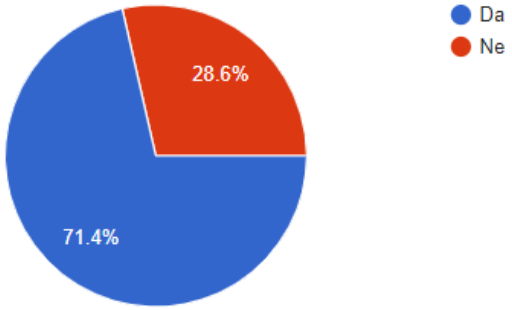
On the other hand, Post-training questionnaire is available at this link: https://docs.google.com/forms/d/e/1FAIpQLSeDbMImztef6JkfdPQRccDasa0pexMC3RPi5foZyTad-UZ6gQ/viewform

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. Da li Vi ili Vaša organizacija trenutno koristite BIM, ili ga namjeravate koristiti u bliskoj budućnosti?

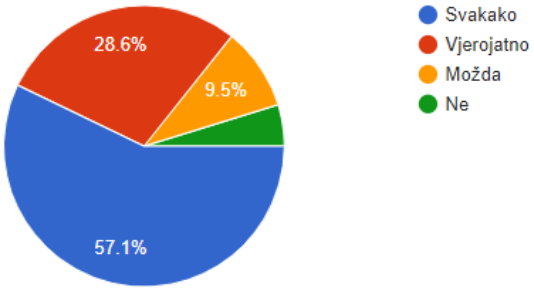
21 responses



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

15. Smatrate li da bi BIM certifikacija, edukacija ili podrška pomogla vašim kolegama?

21 responses



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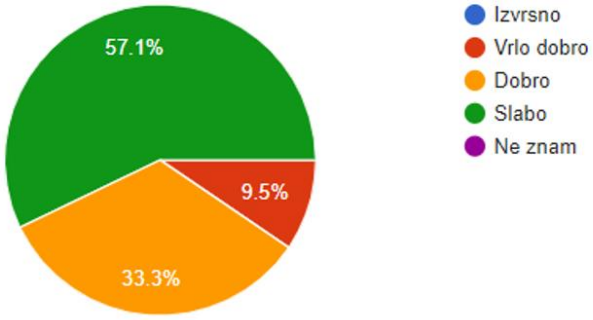
18. In retrospective, how do You rate Your competences (knowledge, skills, responsibility and autonomy) before this BIM course?	a) Excellent b) Very good c) Good d) Little e) I don't know

18. Ako se prisjetite, kako sada ocjenjujete svoje kompetencije (znanje, vještine, autonomnost i odgovornost) prije ove BIM edukacije?

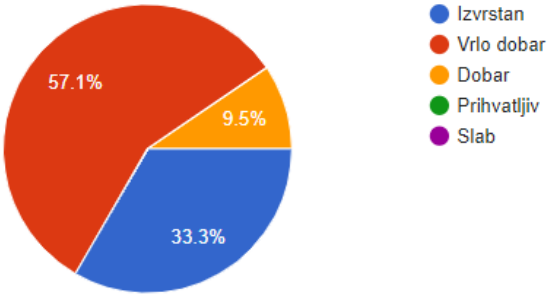
21 responses



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

19. Kako biste ukupno ocijenili ovu BIM edukaciju?

21 responses



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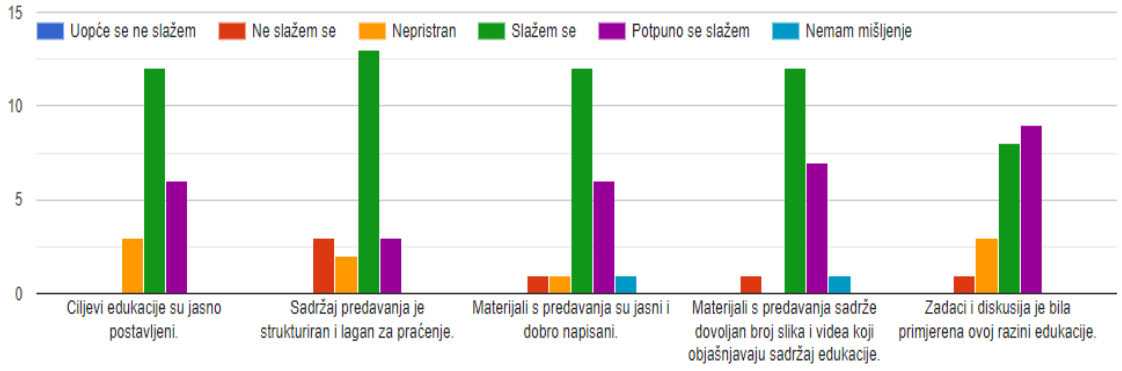
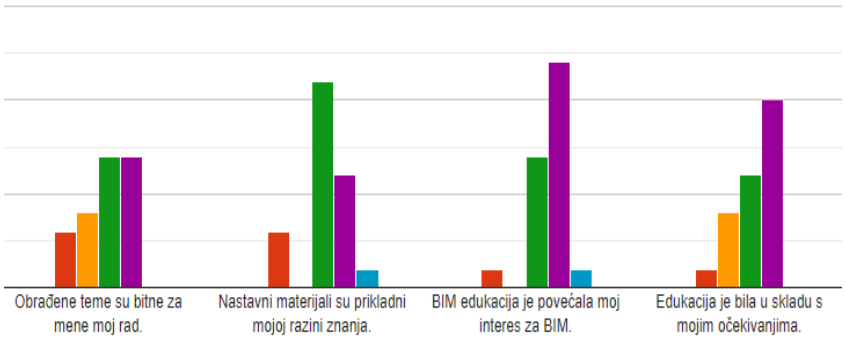
20. Please indicate your level of agreement with the following statements:

	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. Molim Vas označite da li se slažete sa slijedećim tvrdnjama:





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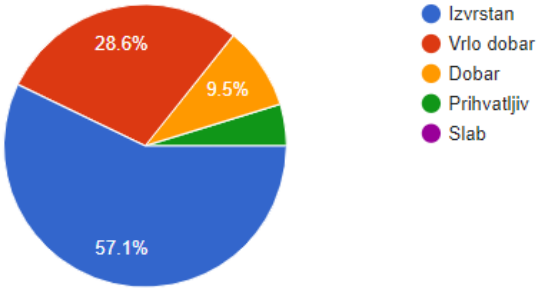
21. What overall rating would you give the trainer(s)?	a) Excellent b) Very good c) Good d) Fair e) Poor

21. Koju biste ukupnu ocjenu dali predavačima?

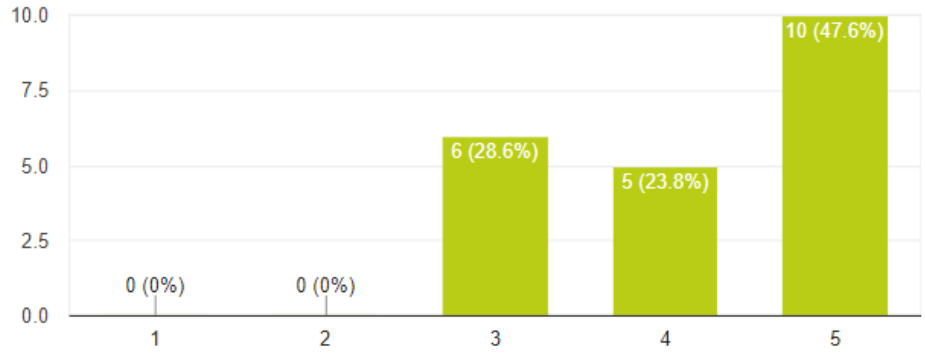
21 responses



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

23. Koliko ste novih informacija saznali tijekom ove BIM edukacije?

21 responses



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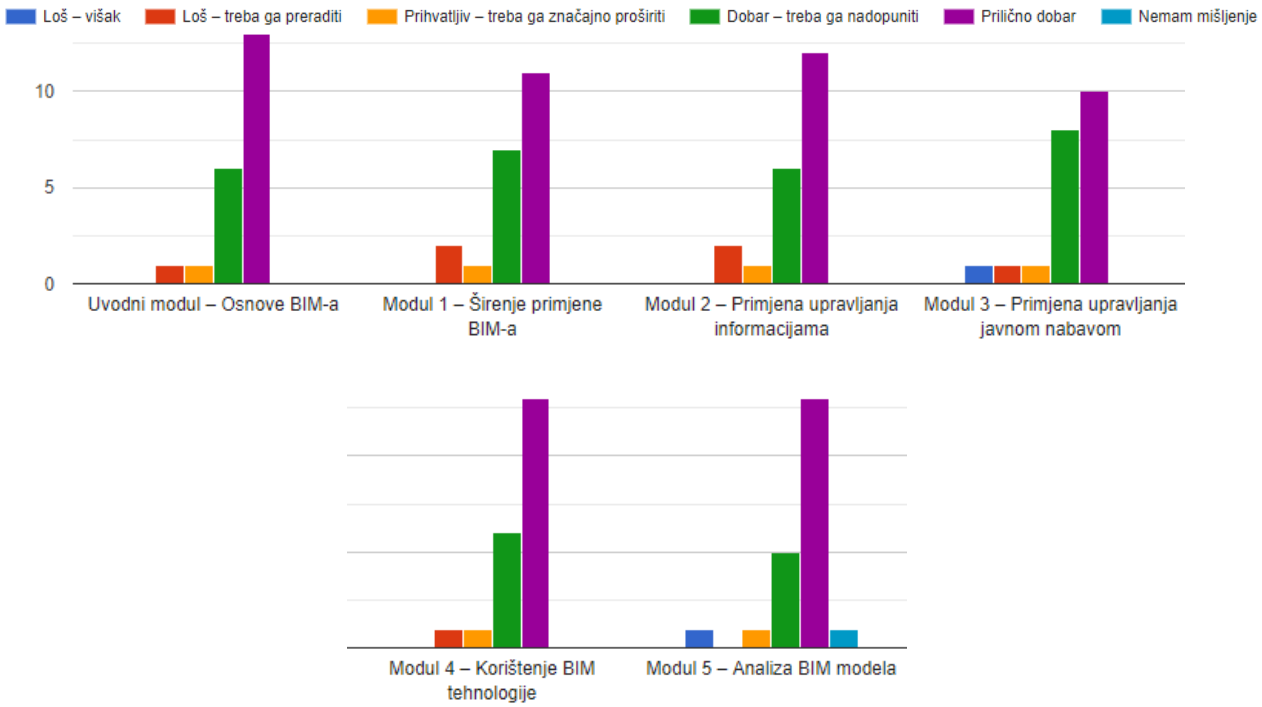
25. Please rate the following BIM course modules based on how they are useful and interesting to You.

	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. Molim Vas, ocijenite navedene module BIM edukacije.



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

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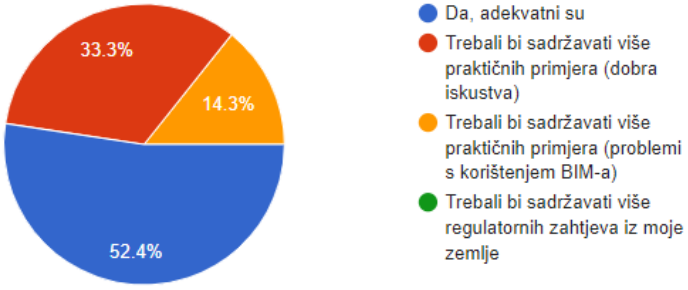
26. Smatrate li da su materijali s edukacije dovoljno sveobuhvatni?

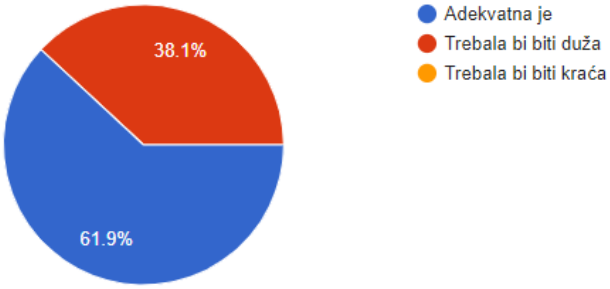
21 responses



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

27. Što mislite o duljini trajanja BIM edukacije?

21 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

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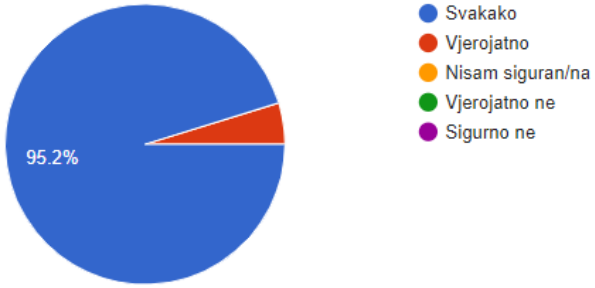
28. Ukoliko se uvjerite u kvalitetu, biste li bili voljni podijeliti informaciju o BIM edukaciji među svojim suradnicima i kontaktima?

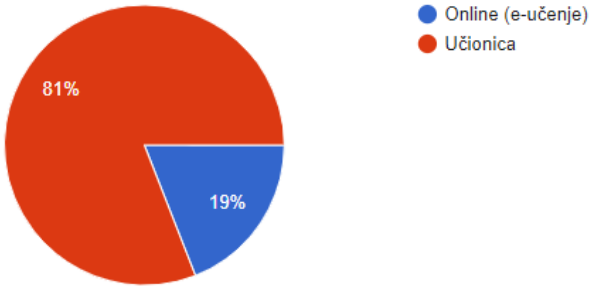
21 responses



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

29. Biste li više voljeli pohađati ovakvu edukaciju na internetu (online) ili u učionici?

21 responses



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

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and well written and contain sufficient number of images and videos explaining the course content. The positive validation of the Croatian course is also evident from the fact the majority of participants agree that assignments were appropriate for the level of this class (appropriate to their prior knowledge) and the topics covered are relevant and will be useful in their future work as they received new information (71.4% of participants feel they got significant amount of new information). The course also increased their interest in the subject and corresponded to their expectations.
When getting more in depth and looking for their opinion on each of the training modules, participants feel that Introductory module is useful and requires no changes, while 5 modules developed are useful but significant number of course participants also feel that these modules should be amended with additional content to make it better. Specifically, approximately half of course participants (52.4 %) feel the training material is adequate and comprehensive enough, while remaining participants think that training materials should contain more practical examples (best experiences and existing issues in BIM), 33.3 % and 14.3 % respectively which is a significant number and should be respected. Regarding the duration of training, 61.9 % of training participants said that 8-hour training course is adequate, while 38.1 % think it should be longer. It has to be enhanced that 81.0 % of course participants prefer to take this course in the classroom while only 19.0 % of people would prefer to take it on-line.
The quality of the course is best rated if training participants disseminated and recommend the course to their colleagues, friends and associates, and in the case of Croatian 1st classroom course for professionals, 95.2 % of participants declared they would definitely be willing to disseminate the BIM training courses among their contacts.

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

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

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

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

2.1.2 Agenda

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

BIM za djelatnike javne uprave i vlasnike (upravitelje zgradama)

1

Besplatna radionica

Održavanje: 20.12.2018.

Mjesto održavanja: Sveučilište Sjever, 104. brigade, UNIN 1, Varaždin, Dvorana 36

Kontakt osoba:

- Mergim Gaši, Građevinski fakultet Zagreb,
- Tel: +385 1 4639 121
- mgasi@grad.hr

Prijavni obrazac: http://www.net-ubiep.eu/hr/registracija-2/

Sat	Tema	Predavač
9.00 – 9.30	Uvodno o projektu Net-UBIEP Zašto korištenje BIM-a može poboljšati energetsku učinkovitost u zgradarstvu	Bojan Milovanović
9.30 – 9.45	Diskusija – pre-training upitnici	Bojan Milovanović
09.45 – 10.30	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	Kristijan Robert Prebanić
10.30 - 10.45	Pauza	
10.45 – 11.30	Modul 1 – Difuzija BIM-a • Otvoreni BIM alati i standardni format • BIM uloge i odgovornosti • Dimenzije BIM-a ○ 4D, 5D, 6D, 7D • Diskusija	Kristijan Robert Prebanić
11.30 – 12.15	Modul 2 – Primjena BIM-a za upravljanje podacima	Mergim Gaši

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	• Načela upravljanja podacima u zajedničkom okruženju podataka - CDE (Okolina za razmjenu podataka) • Negrafičke informacije u BIM modelu zgrade • Plan održavanja zgrade i ugovaranje energetske usluge • BIM Model izvedenog stanja (eng. "as built") za poboljšanje energetske učinkovitosti zgrada • Diskusija	
12.15 – 13.00	Ručak	
13.00 – 13.45	Modul 3 – Primjena BIM-a za upravljanje nabavom • BIM i ugovaranje • BIM u javnoj nabavi • BEP (BIM Plan izvršenja) • Indeks zrelosti informacija • Suradnja među sudionicima u gradnji • Diskusija	Sanjin Gumbarević

13.45 – 14.45	Modul 4 – Korištenje BIM tehnologije
	Modul 5 – Analiza BIM modela
	• Održivi građevinski sektor
	  ○ Energetska učinkovitost
	  ○ Zelena gradnja
	• Automatizirana kontrola modela
	  ○ Procjena sukladnosti s propisima
	  ○ Otkrivanje kolizija
	• BIM za upravljanje kvalitetom
	• BIM za primopredaju i održavanje (as built model)
	• Diskusija
		Marina Bagarić

14.45 – 15.00	Pauza	
15.00 – 16.00	Demonstracija rada s OpenBIM alatima: • Rad na BIM modelima, kontrola preklapanja; • BIM model tijekom korištenja zgrade (energetska učinkovitost, održavanje zgrade) • Pregled i odobrenje izmjena modela od strane različitih suradnika • Diskusija	Sanjin Gumbarević
16.00 – 16.15	Diskusija – post-training upitnici - Validacija razvijenih trening materijala	Bojan Milovanović

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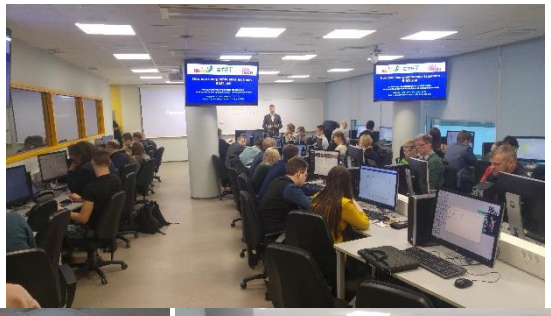
2.2 Estonia

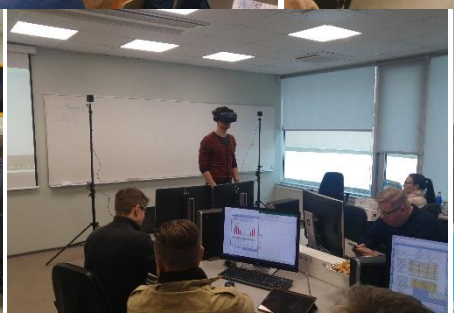
2.2.1 Course description and results

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

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

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





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

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

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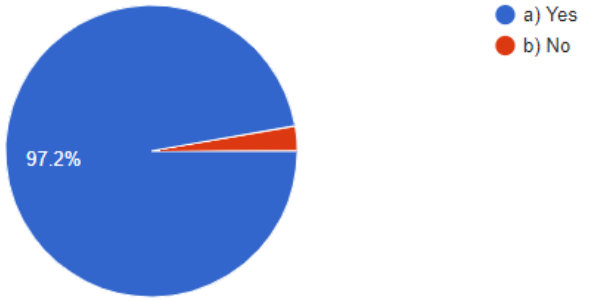
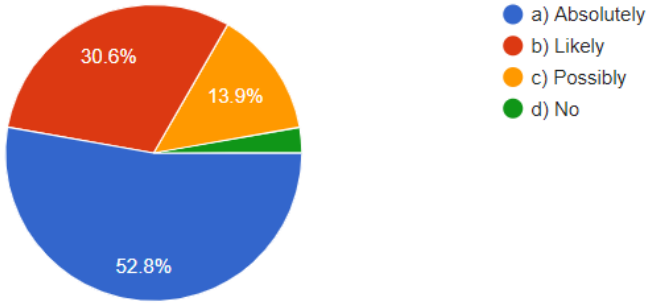
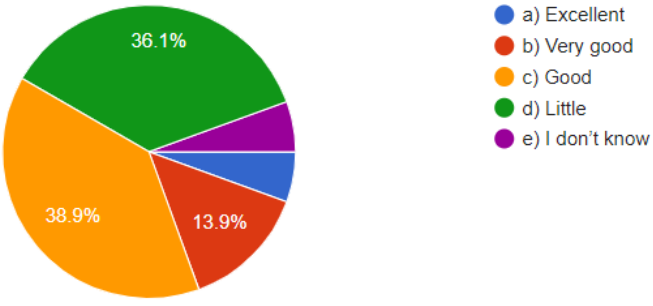
1. Do You or Your company/organization currently use BIM, or is it intending to use BIM in the near future?
   a) Yes
   b) No



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



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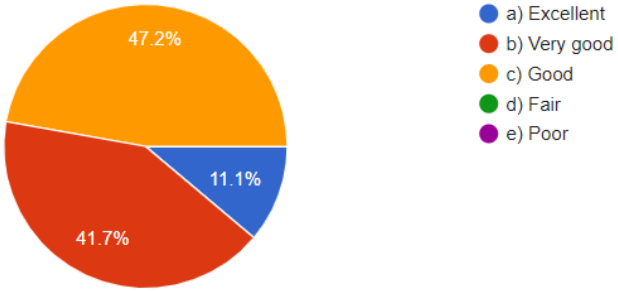
19. What overall rating would You give the course?	a) Excellent b) Very good c) Good d) Fair e) Poor



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.						

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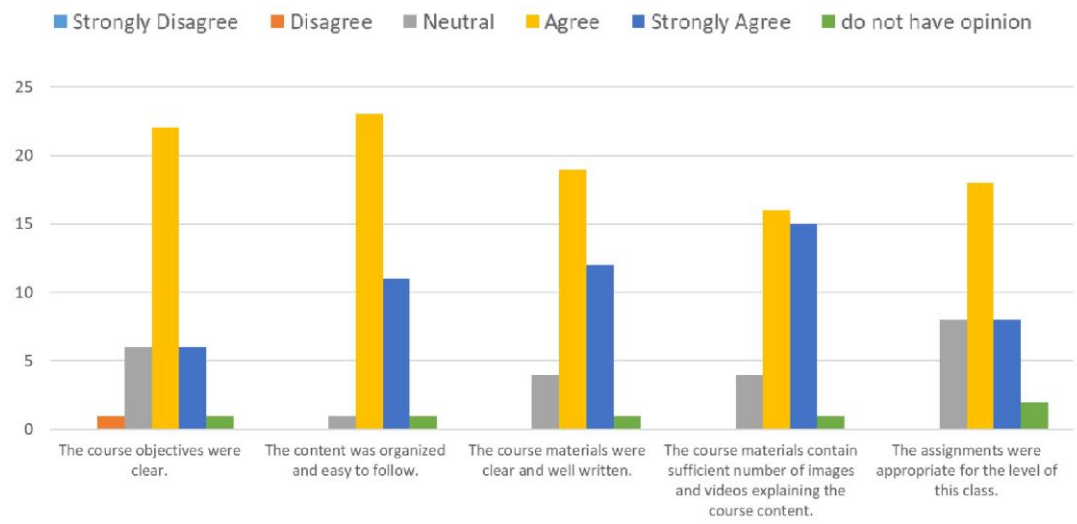
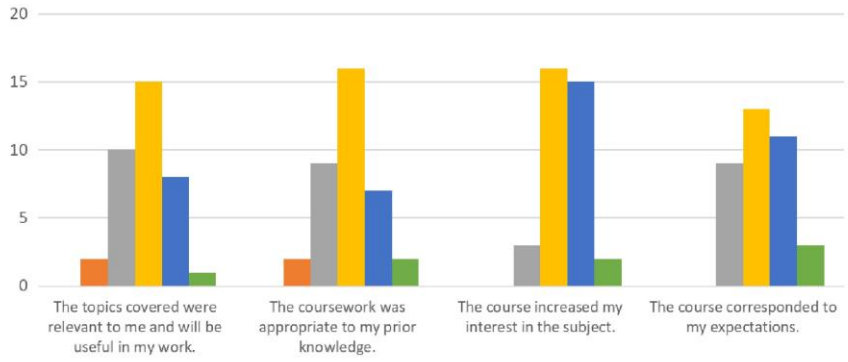
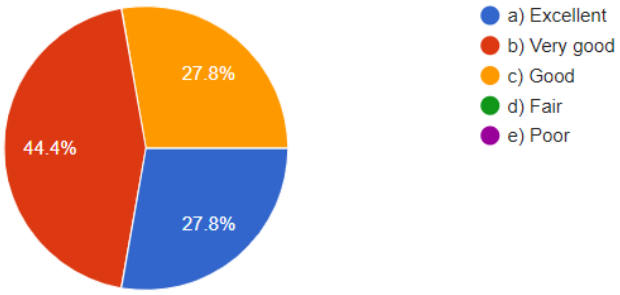




21. What overall rating would you give the trainer(s)?

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



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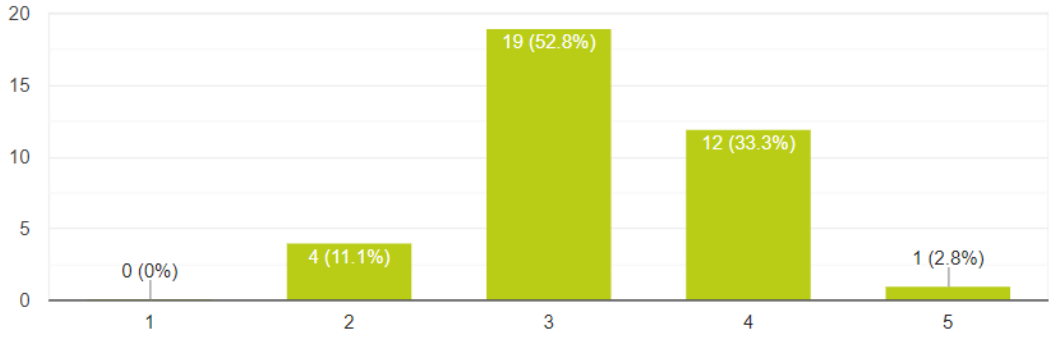
23. How much new information did you receive in the training course?

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

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



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

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

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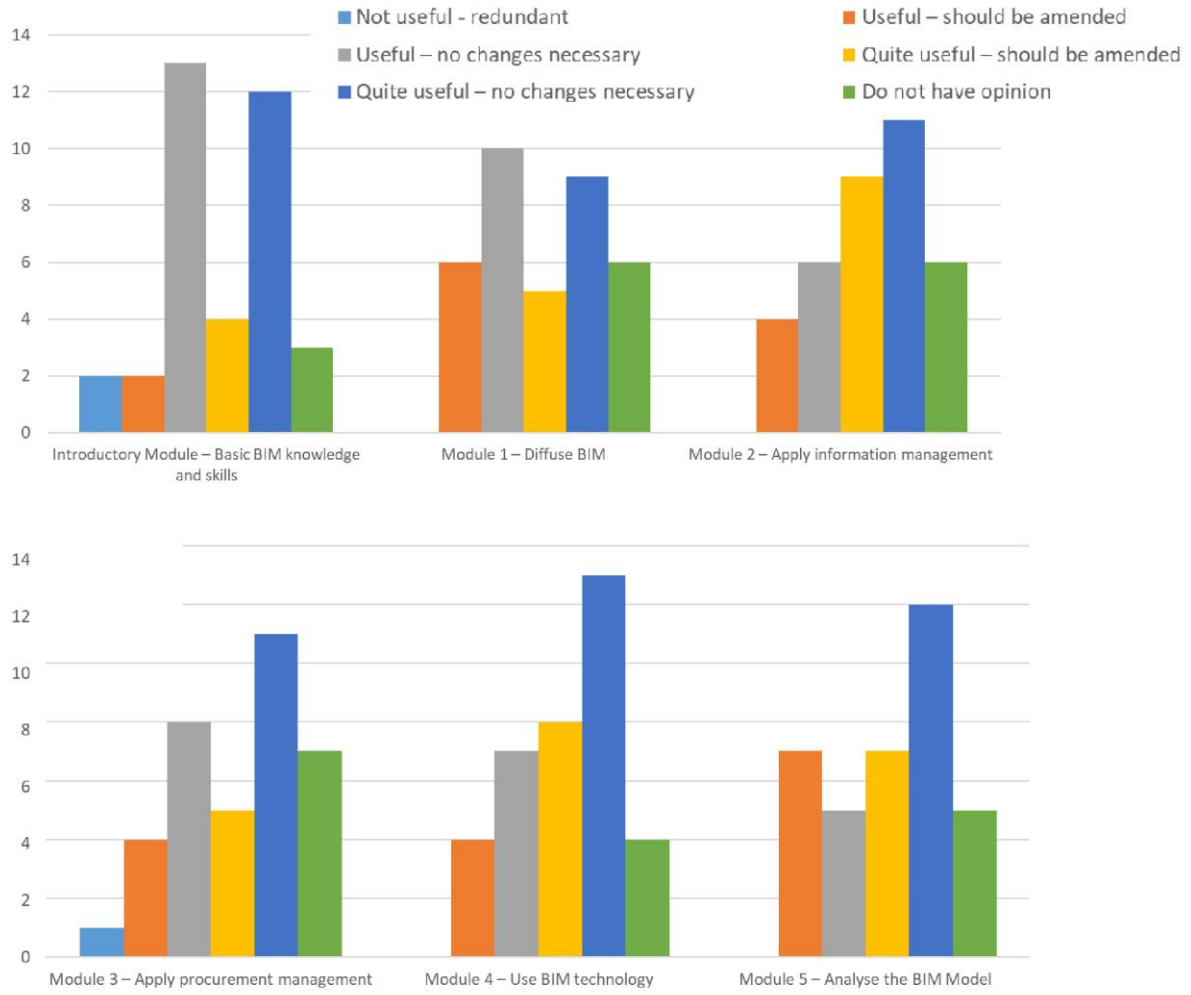

26. What do You feel, is the training material comprehensive enough? (Please mark all that apply)	a) Yes, it's adequate b) It should contain more practical examples (best experiences) c) It should contain more practical examples (existing issues in BIM) d) It should give more country specific regulatory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

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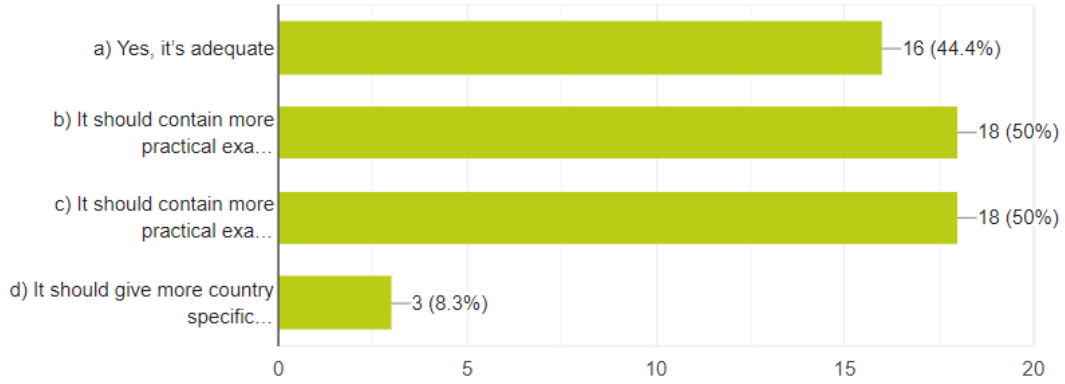
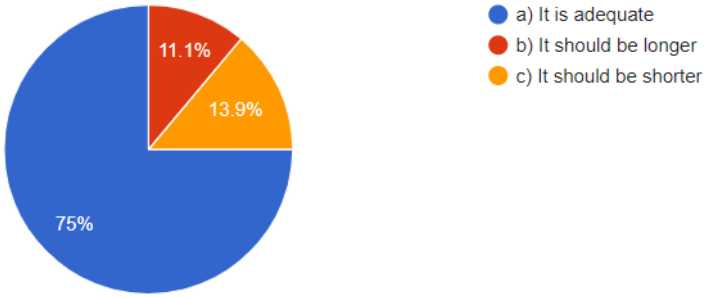
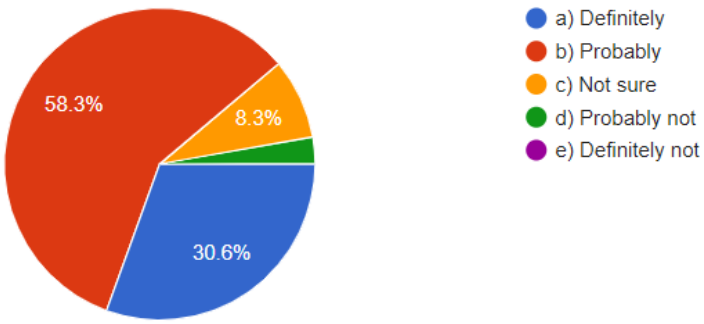


27. What do You feel about the duration of the training?	a) It is adequate b) It should be longer c) It should be shorter



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



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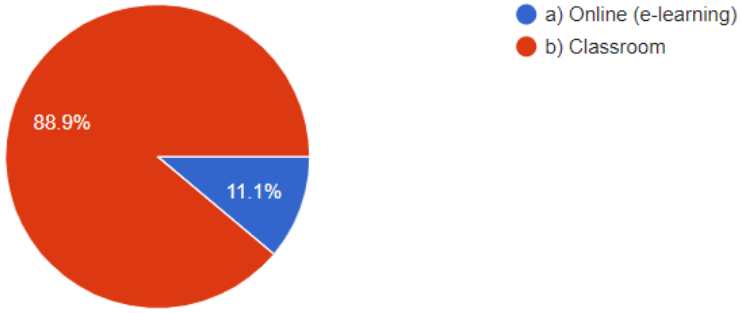
29. Would you prefer to take this course online or in the classroom?	a) Online (e-learning) b) Classroom



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

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

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

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

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

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

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

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

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2.2.2 Agenda

Hoonete energiatõhususe tagamine BIM'i abil

koolitus arhitektidele, energiatõhususe spetsialistidele ja ehitusinseneridele

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

Ajakava:

Sissejuhatus teemasse		
Kuupäev ja aeg: Kolmapäev 9.01.2019 kell 10:00 - 17:30 **Asukoht:** Tallinna Tehnikaülikool, SOC 311 (Majandusmaja)		
Aeg	Koolitaja	Teema
10:00-11:30	Targo Kalamees	**Sissejuhatus energiatõhususse** • H/A, ETA, KEK • Mida tulevik toob? • Energiatõhususe kavandamine hoone projekteerimisel • Piirdetarindite soojuskaod • Piirdetarindite projekteerimise ja ehitamise kvaliteet
11:30-11:45		**Paus 15 minutit**
11:45-13:15	Anti Hamburg	**Projekteeritud ja mõõdetud energiakasutus** • Mis on energiamärgis • Kuidas märgist lugeda? • Uushooned • Hoonete renoveerimine **Kuidas BIM mudeli ja energiamärgise info alusel kontrollida energiatõhususe suurusjärku?** • Soojuskaod ~kütteenergiakulu suhe • Soojusläbivus (soojuslikult homogeenne, soojuslikult mittehomogeenne)
13:15-14:15		**Lõuna 1 tund**
14:15-15:45	Raido Puust	**Sissejuhatus BIM-i** • Terminid, printsiibid, protsessi kirjeldus • BIM versus CAD • Mudelite erinevad staadiumid ja detailsused • BIM versus traditsiooniline projekti teostus
15:45 – 16:00		**Paus 15 minutit**

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16:00-17:30	Raido Puust	**BIM mudelite rakendamine ehitusloa ja kasutusloa väljastamisel:** • Tarkvarad, failiformaadid, info ülekandmine ühest BIMist teise • Mudelitega töötamine, • Mudelitest navigeerimine, • Mudeli ehitusteabe lugemine ja mudelist uue ehitusteabe tuletamine (pindalad, • Akna pindala, piirdetarindite pindala • Hoone osade omadused: soojusläbivus, materjalikihtide paksused, materjalide omadused

Hoone soojuskao arvutus BIMi abil		
Kuupäev ja aeg: Neljapäev 10.01.2019 kell 10:00 - 17:30 **Asukoht:** Tallinna Tehnikaülikool, IT Kolledž Raja 4, Tallinn ICT-121 ja ICT-122		
Aeg	Koolitaja	Teema
10:00-11:30	Targo Kalamees	**Õhuga kontaktis oleva piirdetarindi (katus, välissein) soojusläbivus *U*, W/(m²·K)** • Materjali soojuserijuhtivus • Soojuslikult homogeenne piirdetarind • Soojuslikult mittehomogeenne piirdetarind • Pindalad (sh. ruumide ühendamine üheks tsooniks)
	Anti Hamburg Raido Puust Targo Kalamees	• Kus on see info ja mismoodi on see esitatud BIM tarkvaras? Kuidas esitada õigesti? • Kus on see info ja mismoodi on see esitatud energiatõhususe tarkvaras? Kuidas esitada õigesti? • Andmete kandmine tabelarvutustarkvarasse
11:30-11:45		**Paus 15 minutit**
11:45-13:15	Targo Kalamees	**Pinnasega kontaktis oleva piirdetarindi (põrand, keldrisein) soojusläbivus *U*, W/(m²·K)** • Põrand pinnasel • Alt tuulutatav põrand • Köetava keldri sein • Köetava keldri põrand • Põrand kütmata keldri kohal
	Anti Hamburg Raido Puust	• Kus on see info ja mismoodi on see esitatud BIM tarkvaras? Kuidas esitada õigesti? • Kus on see info ja mismoodi on see esitatud energiatõhususe tarkvaras? Kuidas esitada õigesti?

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	Targo Kalamees	• Andmete kandmine tabelarvutustarkvarasse
13:15-14:15		**Lõuna 1 tund**
14:15-15:45	Targo Kalamees	**Piirdetarindite joonsoojusläbivus Ψ, W/(m·K) ja punktsoojusläbivus χ, W/(K)** • Arvutuspõhimõtted • Tabelväärtused **Piirdetarindite õhulekked, õhulekkearv q_{50}, $m^3/(h \cdot m^2)$** • Arvutuspõhimõtted • Tabelväärtused
	Anti Hamburg Raido Puust Targo Kalamees	• Kas ja kus on see info ja mismoodi on see esitatud BIM tarkvaras? • Kus on see info ja mismoodi on see esitatud energiatõhususe tarkvaras? Kuidas esitada õigesti? • Andmete kandmine tabelarvutustarkvarasse
15:45 – 16:00		**Paus 15 minutit**
16:00-17:30	Targo Kalamees	**Akna soojusläbivus *U*, $W/(m^2 \cdot K)$** • Klaas • Raam • Klaaspaketi serv • Orientatsiooni mõju
	Anti Hamburg Raido Puust Targo Kalamees	• Kas ja kus on see info ja mismoodi on see esitatud BIM tarkvaras? • Kus on see info ja mismoodi on see esitatud energiatõhususe tarkvaras? Kuidas esitada õigesti? • Andmete kandmine tabelarvutustarkvarasse

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BIM, energiatõhusus ja tehnosüsteemid		
Kuupäev ja aeg: Neljapäev 24.01.2019 kell 10:00 - 17:30 **Asukoht:** Tallinna Tehnikaülikool, IT Kolledž Raja 4, Tallinn ICT-121 ja ICT-122		
Aeg	Koolitaja	Teema
10:00-11:30	Anti Hamburg Ergo Pikas	**Info ülekandmine BIMist energiatõhususe tarkvarasse**
11:30-11:45		**Paus 15 minutit**
11:45-13:15	Martin Thalfeldt	**Tehnosüsteemid ja nende mõju energiatõhususele: Ventilatsioon** • Tsoonideks jaotus • Seadmete parameetrid (õhuvooluhulgad, SFP, müra) • Siirdeõhk
	Anti Hamburg Martin Thalfeldt Ergo Pikas	• Kas ja kus on see info ja mismoodi on see esitatud BIM tarkvaras? • Kus on see info ja mismoodi on see esitatud energiatõhususe tarkvaras? Kuidas esitada õigesti? • Andmete kandmine tabelarvutustarkvarasse
13:15-14:15		**Lõuna 1 tund**
14:15-15:45	Martin Thalfeldt	**Tehnosüsteemid ja nende mõju energiatõhususele: Küte** • Kütte allikad (soojuspumbad, kaugküte jm) • Radiaatorid • Põrandküte
	Anti Hamburg Martin Thalfeldt Ergo Pikas	• Kas ja kus on see info ja mismoodi on see esitatud BIM tarkvaras? • Kus on see info ja mismoodi on see esitatud energiatõhususe tarkvaras? Kuidas esitada õigesti? • Andmete kandmine tabelarvutustarkvarasse
15:45 – 16:00		**Paus 15 minutit**
16:00-17:30	Martin Thalfeldt	**Taastuvenergiaallikad ja nende mõju energiatõhususele** • Päikesepaneelid; Tootlikkus ja seda mõjutavad tegurid • Paigaldustingimused. Varjudega arvestamine.
	Anti Hamburg Martin Thalfeldt Ergo Pikas	• Kas ja kus on see info ja mismoodi on see esitatud BIM tarkvaras? • Kus on see info ja mismoodi on see esitatud energiatõhususe tarkvaras? Kuidas esitada õigesti? • Andmete kandmine tabelarvutustarkvarasse

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BIM hange, strateegia, nõuded ja hoone kulutõhusus		
Kuupäev ja aeg: Reede 25.01.2019 kell 10:00 - 17:30 **Asukoht:** Tallinna Tehnikaülikool, SOC 311 (Majandusmaja)		
Aeg	Koolitaja	Teema
10:00-10:45	Targo Kalamees	**BIM ja energiatõhusus projekteerimise ja ehitamise hankes** • Hanke hindamise kriteeriumid • Nõuded hankes mudeldamisele, lõpptulemusele • Nõuded pädevatele isikutele (kutsed) • Mudeli kontroll ja üleandmine
10:45-11:30	Ergo Pikas	**BIM Strateegia:** • BIM projekti eesmärgid ja kasutusalad, • BIM rakendamine projektis ja organisatsioonis, • Avatud BIM koostalitlusvõime põhimõtted, • BIM standardid ja juhendid
11:30-11:45		**Paus 15 minutit**
11:45-13:15	Ergo Pikas	**BIM nõuded ja praktika erinevates etappides:** • Projekteerimise eelne tegevus (n. arh. konkursid, esmased eskiisid, vajaduste kirjeldus, kontseptsiooni väljatöötamine jne) • Projekteerimine, Ehitamine, Järelevalve • Kasutus, • Lammutus • Näited parimast/halvimast teooriast ja parimast/halvimast praktikast
	Ergo Pikas	**Energiatõhususe projekteerimine kontseptsiooni staadiumis** • Lihtsad tööriistad ja nende võrdlus • Hoone variantide võrdlus
13:15-14:15		**Lõuna 1 tund**
14:15-15:45	Martin Thalfeldt Ergo Pikas	**BIM 5D: Kuluoptimaalsed lahendused ja eelarve prognoosimine**
15:45 – 16:00		**Paus 15 minutit**
16:00-17:30	Martin Thalfeldt Ergo Pikas	**BIM 5D: Kuluoptimaalsed lahendused ja eelarve prognoosimine**

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2.3 Italy

2.3.1 Course description and results

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

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

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

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

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

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

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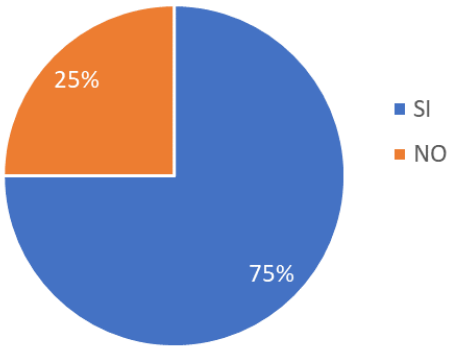
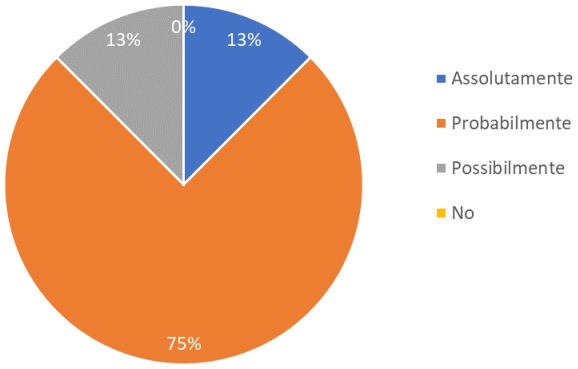
1. La sua società già lavora in ambiente BIM o intende farlo nel futuro prossimo? *



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

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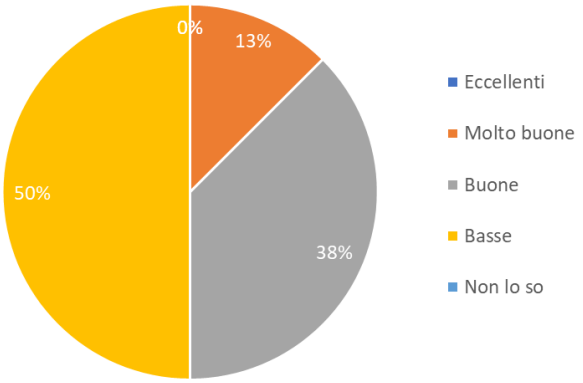
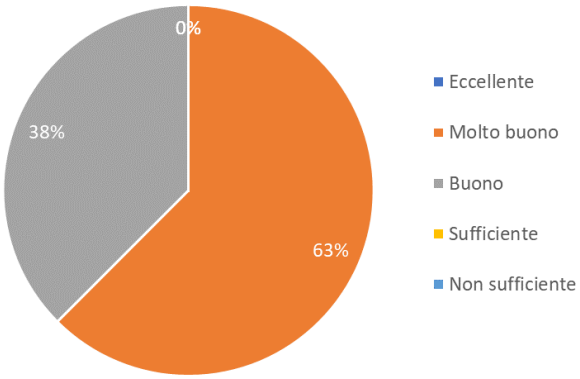
18. Come valuti le tue competenze (conoscenze, abilità, responsabilità e autonomia) prima di questo corso BIM?



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?



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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.						

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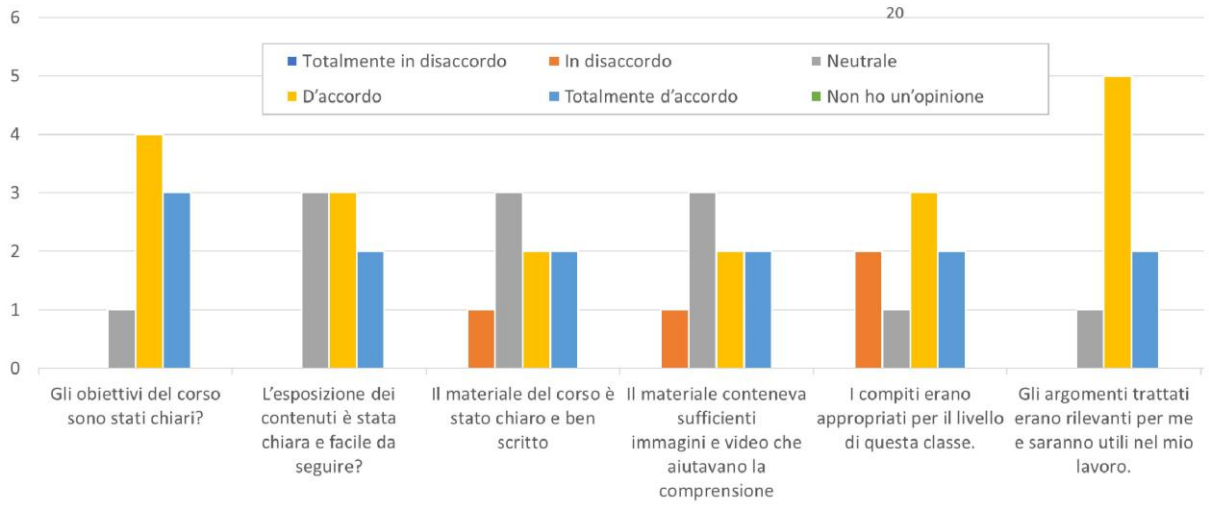

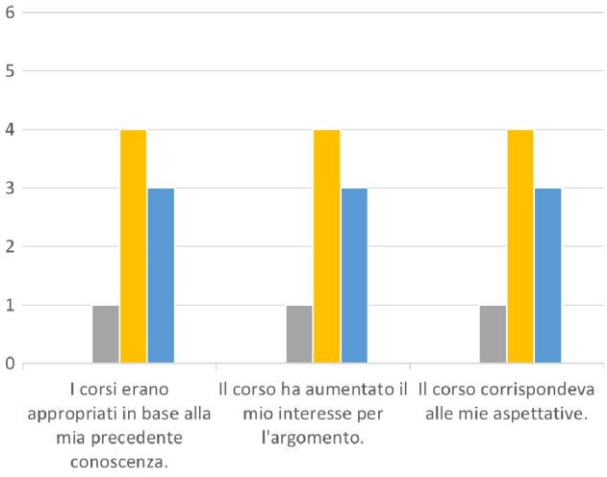

21. What overall rating would you give the trainer(s)?	a) Excellent b) Very good c) Good d) Fair e) Poor

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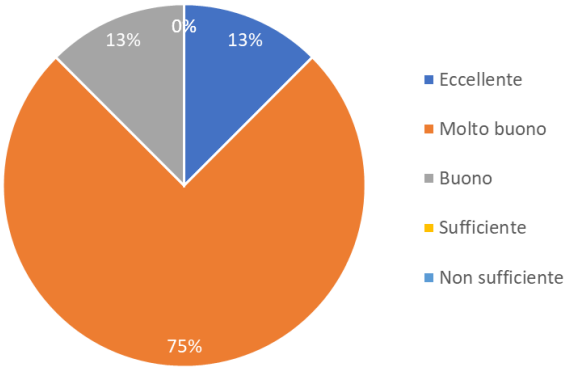
21. Quale valutazione generale daresti al / ai formatore / i?

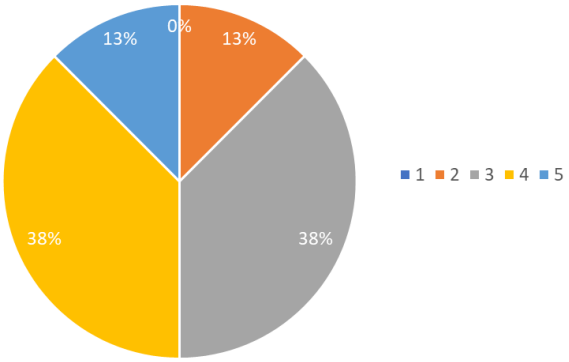


23. How much new information did you receive in the training course?

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. 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						

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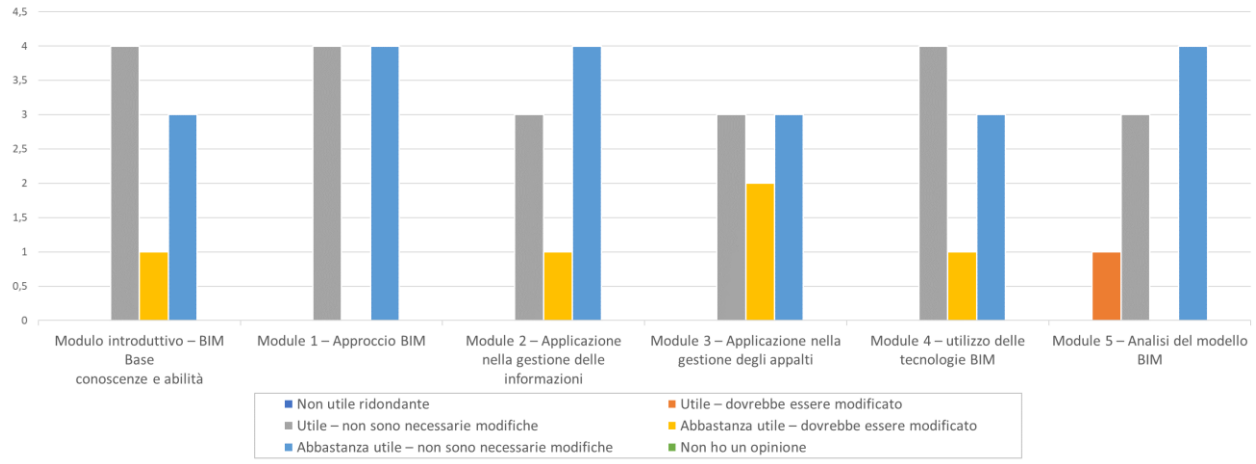
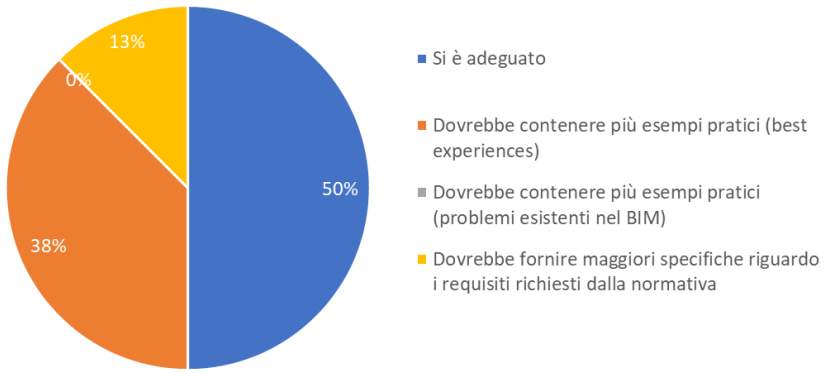


26. What do You feel, is the training material comprehensive enough? (Please mark all that apply)	a) Yes, it's adequate b) It should contain more practical examples (best experiences) c) It should contain more practical examples (existing issues in BIM) d) It should give more country specific regulatory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

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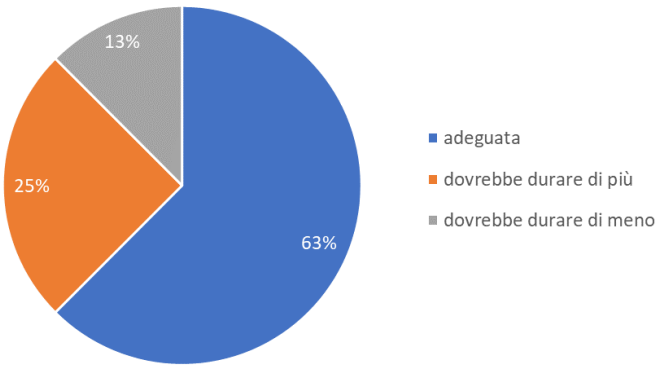
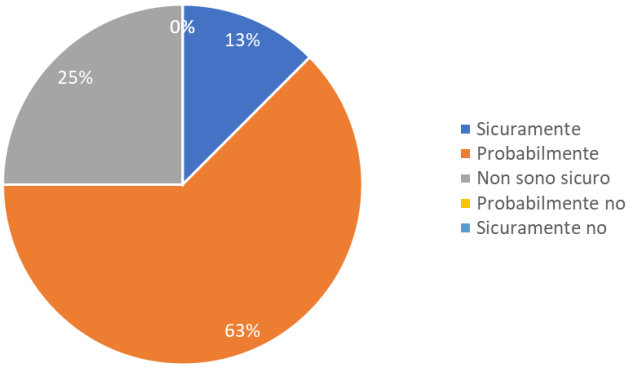
27. Che cosa ne pensi della durata del corso?



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 faro! *



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

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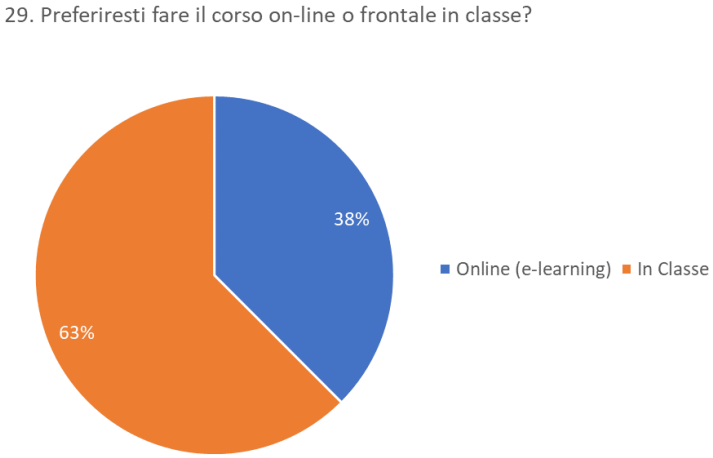

It is evident from the training validation results that 88 % of participants feel BIM certification, support or training would absolutely (13 %) or likely (75 %) be beneficial to their colleagues which is a good indication of their view about the necessity of certification courses. Additionally, after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

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

The quality of the course is best rated if training participants disseminated and recommend the course to their colleagues, friends and associates, and in the case of Italian classroom course for professionals, participants declared they would definitely (13 %) and probably (63 %) be willing to disseminate the BIM training courses among their contacts.

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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

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Il seminario ha l'obiettivo di presentare la metodologia BIM fornendo ai partecipanti una conoscenza di base del Building Information Modelling.
A seguito del nuovo DM 560/17 (Decreto BIM) e della pubblicazione delle norme UNI 11337 (2017) risulta importante conoscere il BIM e la sua applicazione e diffusione a livello nazionale ed internazionale.
Verrà presentato il progetto NET-UBIEP che ha l'obiettivo di aumentare le prestazioni energetiche degli edifici stimolando e promuovendo l'uso del BIM durante il ciclo di vita di un edificio: dalla fase di progettazione alla costruzione, gestione, manutenzione, ristrutturazione, per arrivare, infine, alla demolizione.
Per raggiungere gli obiettivi di net-UBIEP occorre che tutti professionisti siano pronti a migliorare le proprie competenze attraverso l'utilizzo del BIM (Building Information Modelling) integrato con l'introduzione dei criteri di performance energetica degli edifici per soddisfare i bisogni dei propri clienti con una migliore qualità del progetto e un costo inferiore.
L'uso del BIM si sta diffondendo sempre più in tutti i paesi del mondo chi non si adatterà in fretta al nuovo mondo digitale rischia di vedersi sostituito da professionisti di altri paesi dal momento che un progetto digitale può essere realizzato e condiviso via internet.
NET-UBIEP promuove anche la collaborazione in tutta la filiera perché è importante che tutti i professionisti e i tecnici, che partecipano alle diverse fasi della progettazione e della realizzazione, abbiano uno specifico ruolo di raccolta, gestione e memorizzazione di tutte le informazioni necessarie, durante l'intero il ciclo di vita dell'edificio. Ogni tecnico, dipendente pubblico, progettista, costruttore, gestore di strutture o fornitore, deve dunque conoscere quali informazioni possano essere utilizzate potenzialmente da qualsiasi altro attore. Non solo, tutte le informazioni dovranno essere disponibili per tutta la vita dell'edificio anche quando il processo che l'ha generato è terminato. È essenziale che tutti i diversi attori utilizzino lo stesso linguaggio, gli stessi dizionari e la stessa struttura dei dati.

A cura di:

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

ORDINE degli INGEGNERI della PROVINCIA di TERNI

NET UBIEP
Network for Using BIM to Increase the Energy Performance

www.net-ubiep.eu

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

Il ruolo dei professionisti della filiera edile per ottenere la migliore performance energetica utilizzando il BIM: il progetto NET UBIEP

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

L'Ordine degli Ingegneri della Provincia di Terni, attraverso l'attività della commissione Ambiente, il 22/02/2019 propone ai propri iscritti un seminario tecnico gratuito sul tema: "Il ruolo dei professionisti della filiera edile per ottenere la migliore performance energetica utilizzando il BIM: il progetto NET UBIEP

Programma della Giornata

Ore 14:30- 14:40
Introduzione ai lavori e saluti iniziali
Ing. Andrea Sconocchia
Presidente Commissione Ordine degli Ingegneri della Provincia di Terni

Ore 14.40 – Inizio lavori rispondendo a questionari on line http://www.net-ubiep.eu/it/self-assessments-5

1. Introduzione: Il building information modeling come strumento per la sostenibilità delle nostre città
Il BIM non è più uno strumento per la sola progettazione di edifici, ma è anche uno strumento per progettare, realizzare, gestire a manutenere meglio edifici e infrastrutture di superficie e del sottosuolo. In tale contesto l'uso dell'openBIM diventa essenziale per assicurare la gestione delle informazioni in qualsiasi ambito settoriale, geografico e temporale.
Anna Moreno, Enea

2. L'Ambiente della Condivisione dei Dati (ACDat) per la gestione del flusso informativo del processo BIM
Il clima collaborativo, alla base del BIM, deve avere un Ambiente di Condivisione dei Dati per favorire il dialogo tra tutti gli attori senza perdita d'informazioni ma anche senza ridondanze e evitando incomprensioni
Giuseppe Esposito, ACCA

3. Applicazione del BIM nei contratti di rendimento energetico e gestione degli immobili per ridurre i consumi e produrre energia da fonti rinnovabili integrate nell'edificio.
La modellazione BIM permette di avere uno strumento utile per valutare l'opportunità di una riqualificazione più o meno profonda di un edificio riuscendo a calcolare i tempi di ritorno con certezza dei risultati utilizzando gli incentivi fiscali oggi disponibili: Eco bonus e Sisma bonus.
Enrico Zoccatelli Global Power Service, Esco

4. Progettare gli impianti per il miglioramento della performance energetica utilizzando il BIM: Un'applicazione alla scuola delle energie dell'ENEA.
Per progettare e riqualificare un edificio esistente, il BIM può essere utilizzato per visualizzare i diversi interventi e scegliere quello ottimale. Il BIM, in questo caso, non solo permette di simulare le diverse soluzioni calcolando i tempi di ritorno dell'investimento, ma serve anche come strumento di comunicazione con i clienti finali essendo la visualizzazione dei modelli BIM molto più "friendly" di qualsiasi relazione tecnica.
Anna Moreno, Enea

5. Il BIM applicato al patrimonio culturale: HBIM
Nel processo di conoscenza e di intervento in contesti storici il patrimonio informativo da gestire è enorme (documenti e fotografie di archivio, rilievi, indagini diagnostiche, precedenti interventi di restauro, ecc). La metodologia BIM applicata all'analisi, gestione e intervento sul costruito storico offre una maggiore efficienza nella progettazione, migliorando l'interoperabilità d'informazioni digitali in gruppi di lavoro interdisciplinari. L'HBIM, per la sua capacità di organizzare e rendere disponibili i dati, può essere considerata come supporto alle scelte e alle decisioni mirate alla salvaguardia del bene.
Elena Gigliarelli, CNR

6. Gli oggetti BIM e i voucher per la costruzione di "cataloghi regionali"
Per una progettazione eco-sostenibile è opportuno promuovere la realizzazione di cataloghi BIM dei prodotti locali in modo che progettisti e costruttori possano progettare e realizzare edifici con prodotti a chilometro zero e i proprietari possano più facilmente provvedere alla gestione e alla manutenzione degli impianti degli edifici. L'oggetto BIM, infatti, se opportunamente integrato nel modello BIM, permette l'accessibilità a schede tecniche e libretti di manutenzione di quanto inserito nell'edificio con l'uso di un tablet e qualche click.
Colacem, Clivet

Ore 18:00
Somministrazione questionario finale da compilare on line http://www.net-ubiep.eu/it/assessments-5
Dibattito Finale

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2.4 Lithuania

2.4.1 Course description and results

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

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

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

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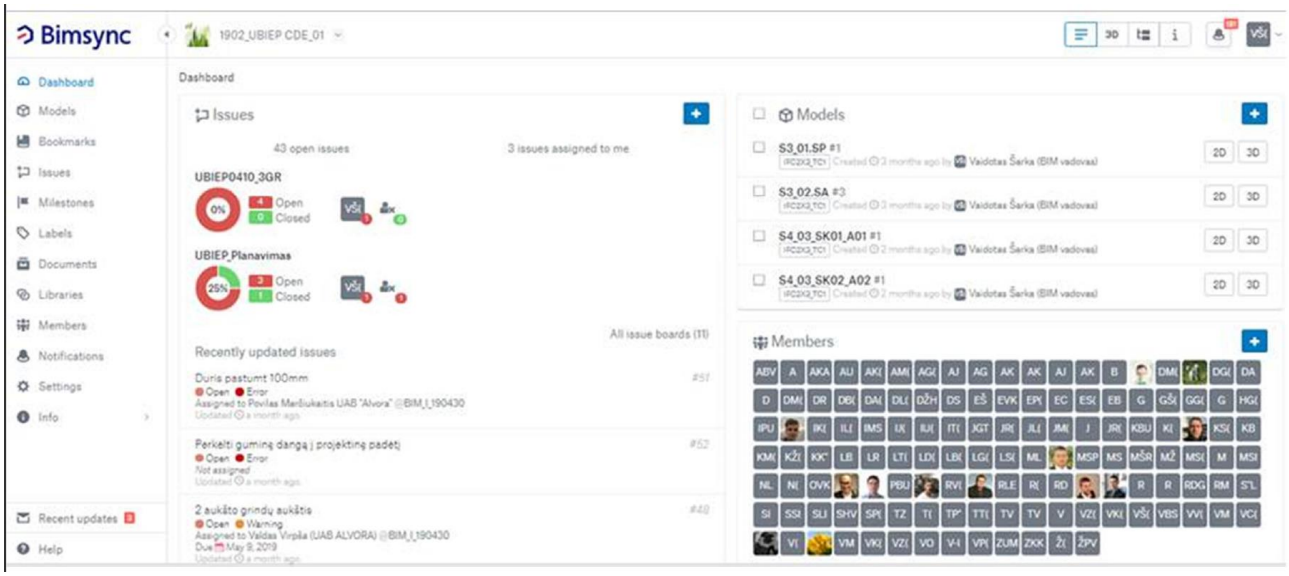
BIMSync platform for Common Data Environment (CDE) provided by Catena (Norway) was used during classroom courses in Lithuania. Project Dashboard (summary) within the BIMSync platform is shown in the figure below.



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.

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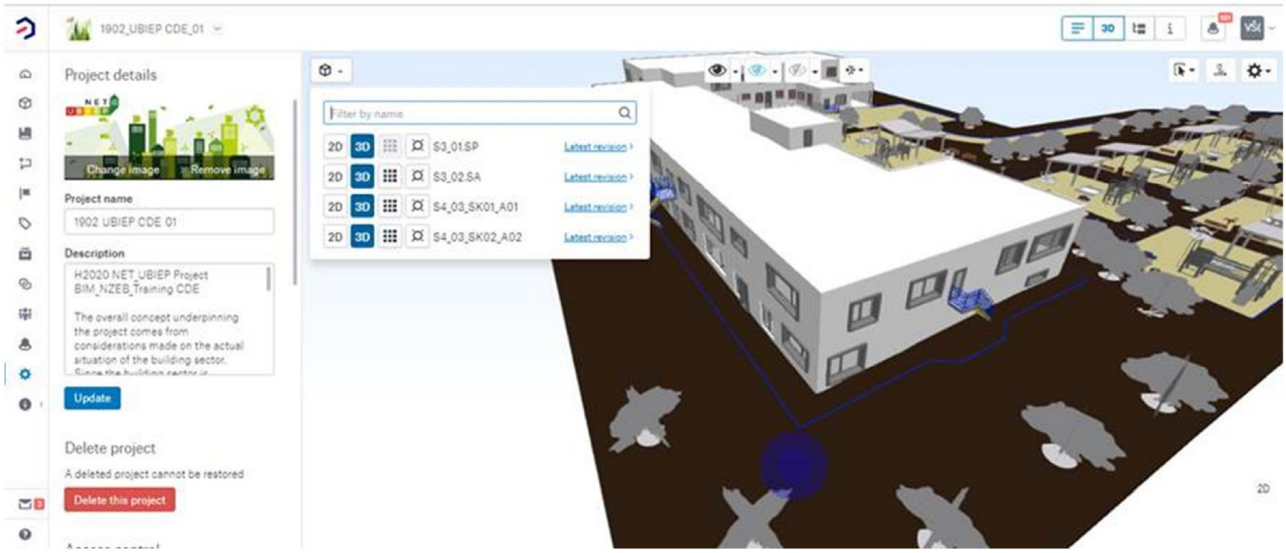
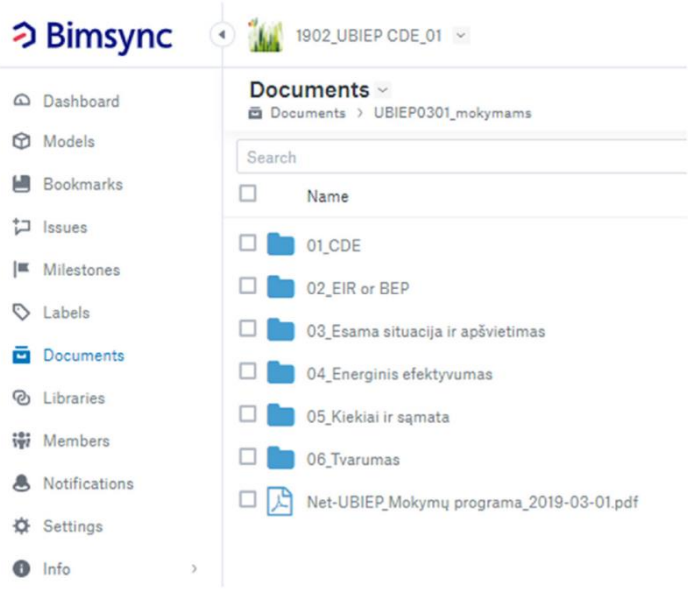


Training documents developed for the purpose of classroom course within the Net-UBIEP project was shared among participants using BIMSync platform, as shown in figure below.



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

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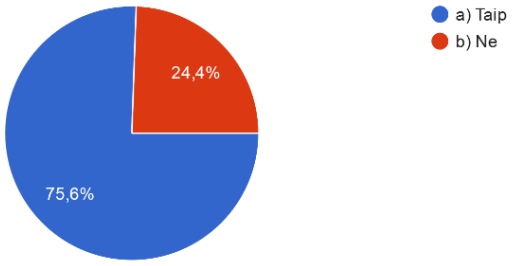
On the other hand, Post-training questionnaire is available at this link: https://docs.google.com/forms/d/e/1FAIpQLSdGyTylhqzf7DoEsl-y0YghAbpA1ZzmKrqr7RBXyaZzm_RdsQ/viewform , while the responses to the Post-training questionnaire are available at this link: https://docs.google.com/forms/d/1limow7zJEoEQkZfhQaqxP0vQ_OdyfoeKR4aNsDbJ8pg/edit#responses

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 jūsų įmonė/organizacija šiuo metu taiko BIM (bet kokiu lygmeniu), ar ketina artimiausiu metu taikyti?

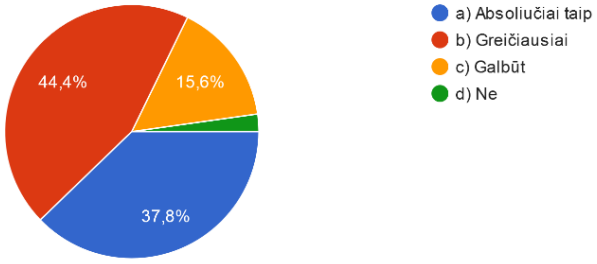
45 odgovora



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

15. Ar BIM kompetencijų sertifikavimas ar mokymas bus naudingas jūsų kolegoms?

45 odgovora



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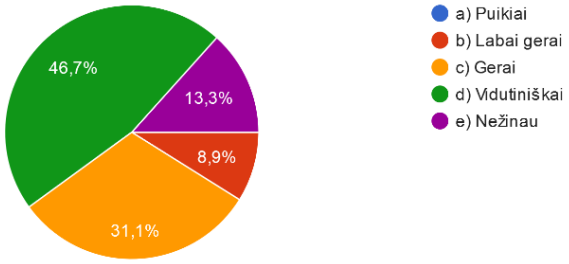
18. In retrospective, how do You rate Your competences (knowledge, skills, responsibility and autonomy) before this BIM course?	a) Excellent b) Very good c) Good d) Little e) I don't know

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

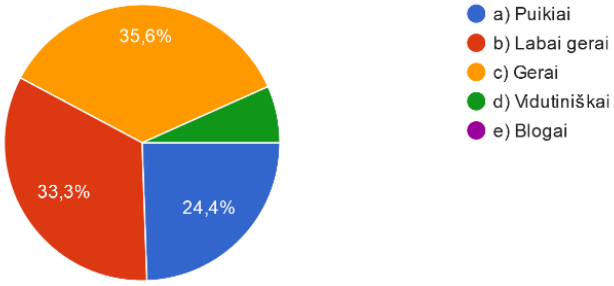
45 odgovora



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



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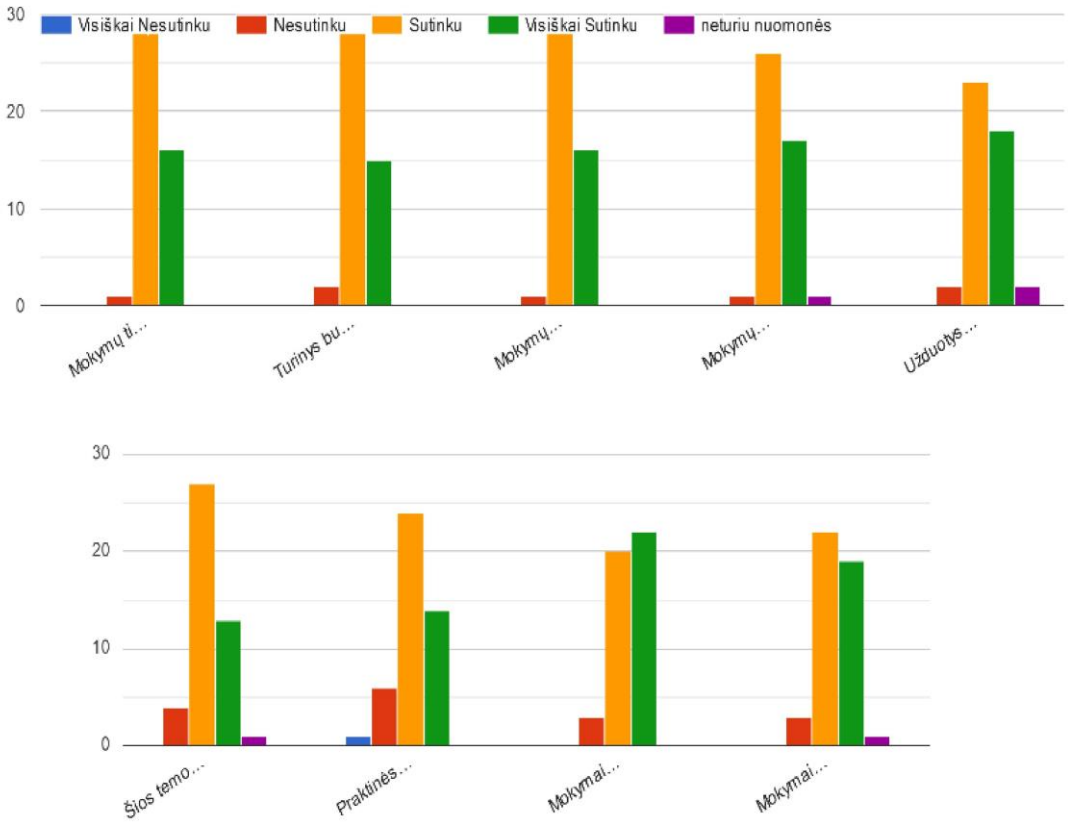
20. Please indicate your level of agreement with the following statements:

	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:



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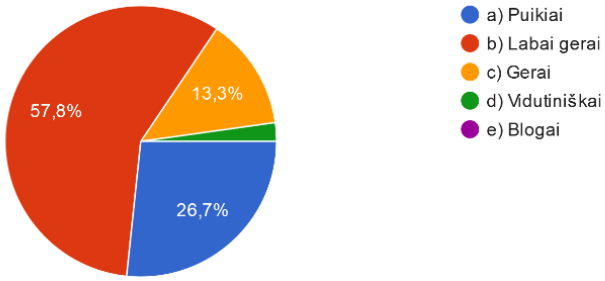
21. What overall rating would you give the trainer(s)?	a) Excellent b) Very good c) Good d) Fair e) Poor

21. Kaip vertinate mokytojus?

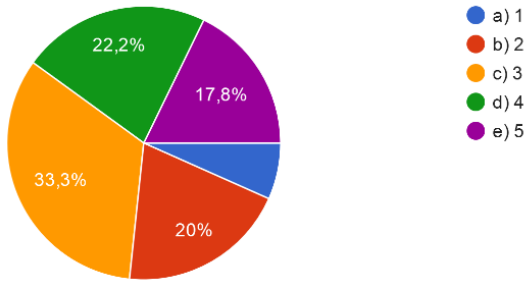
45 odgovora



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



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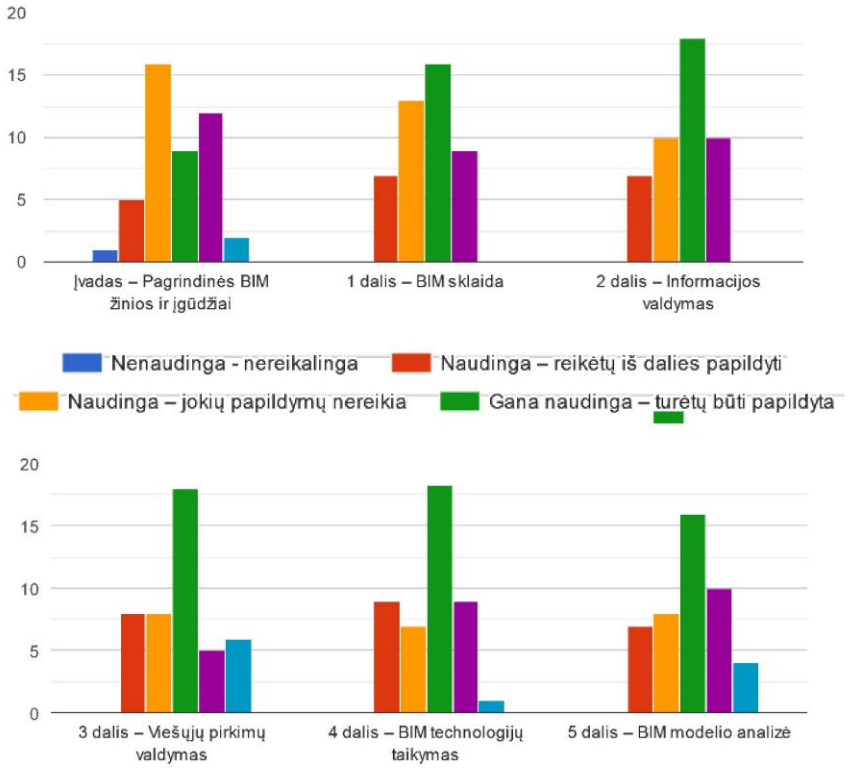
25. Please rate the following BIM course modules based on how they are useful and interesting to You.

	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

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

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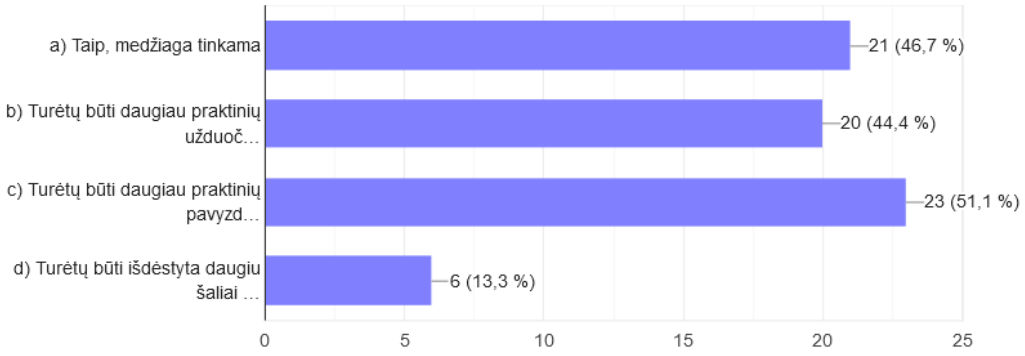
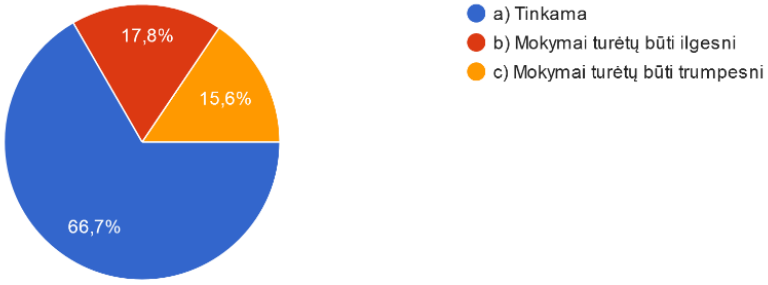


27. What do You feel about the duration of the training?	a) It is adequate b) It should be longer c) It should be shorter

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

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

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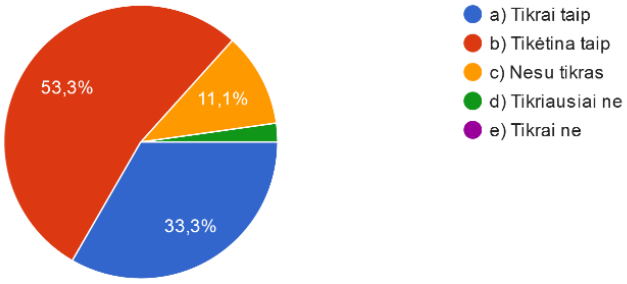
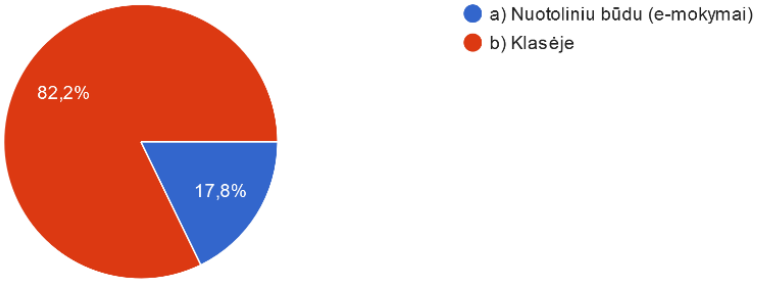


29.	Would you prefer to take this course online or in the classroom?	a) Online (e-learning) b) Classroom

29. Ar šiuos mokymus jums būtų patogiau išklausyti 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

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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.

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- 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

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Skaitmeninė Statyba | VILNIAUS GEDIMINO TECHNIKOS UNIVERSITETAS | NET UBIEP | Co-funded by the Horizon 2020 programme of the European Union

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

Net-UBIEP 1-ieji mokymai statybos profesionalams (WP4)

Data: 2019-03-01, 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)
Praktinė dalis		
9:50-10:20	Susipažinimas su mokymų dalyviais. *Praktinė užduotis:* Statybos projektų problematikos identifikavimas	Vaidotas Šarka (VšĮ „Skaitmeninė statyba“)
10:20-10:50	*Praktinė užduotis:* 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 / Komunikavimas*	
11.10-11:30	Kas yra EIR ir BEP? Kodėl svarbu parengti racionalų EIR?	Arvydas Kiaulakis (VšĮ „Skaitmeninė statyba“)
11:30-12:00	*Praktinė užduotis:* Projekto BIM tikslų nustatymas	Tatjana Vilutienė, Edita Šarkienė (Vilniaus Gedimino technikos universitetas)
12:00-12:30	*Praktinė užduotis:* Kokius BIM taikymo būdus naudosime projekte?	Tatjana Vilutienė, Edita Šarkienė (Vilniaus Gedimino technikos universitetas)
12:30-13:15	*Pietūs*	
13:15-14:00	*Demonstravimas:* Esamos situacijos modeliavimas ir apšvietimo analizė *Praktinė užduotis:* Užduočių pasirinktam BIM taikymo būdui formulavimas. Informacijos pateikimo plano (IPP) rengimas. Rezultatų aptarimas.	Violeta Motuzienė (Vilniaus Gedimino technikos universitetas) Marius Žygaitis (Architektų Sąjunga)
14:00-14:45	*Demonstravimas:* Energinio naudingumo modeliavimas *Praktinė užduotis:* Užduočių pasirinktam BIM taikymo būdui formulavimas. Informacijos pateikimo plano (IPP) rengimas. Rezultatų aptarimas.	Rasa Džiūgaitė-Tumėnienė (Vilniaus Gedimino technikos universitetas)

Net-UBIEP: D21-D4.1 First classroom courses for Professionals (Lithuania).
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MOKYMŲ PROGRAMA		
Laikas	Tema	Pranešėjas
14:45-15:00	*Kavos pertraukėlė / Komunikavimas*	
15:00-15:45	*Demonstravimas*: Kiekių analizė ir sąmatų rengimas. *Praktinė užduotis:* Užduočių pasirinktam BIM taikymo būdui formulavimas. Informacijos pateikimo plano (IPP) rengimas. Rezultatų aptarimas.	Albinas Vaitkevičius (UAB „SISTELA") Vaidotas Šarka (VšĮ „Skaitmeninė statyba")
15:45-16:30	*Demonstravimas:* Tvarumo analizė *Praktinė užduotis:* Užduočių pasirinktam BIM taikymo būdui formulavimas. Informacijos pateikimo plano (IPP) rengimas. Rezultatų aptarimas.	Rūta Mikučionienė (Vilniaus Gedimino technikos universitetas)
16:30-17:00	*Klausimai / Diskusija / Mokymų refleksija / Klausimynas*	
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.skaitmeninestatyba.lt
3. Apie statybų sektoriaus e-kompetencijų registrą: www.statreg.lt
4. Apie A, A+, A++ ir NZEB pastatų statybos technologijas: www.statybostaisykles.lt statybos taisyklių ir ENERGOTRAIN skiltis

Renginio organizatoriai:

Renginio partneriai

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

2.5.1 Course description and results

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

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

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

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

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

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

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

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

The key objectives of the seminar were:

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

Particular objectives of the seminar were set as follows:

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

The following main topics were discussed in detail:

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

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

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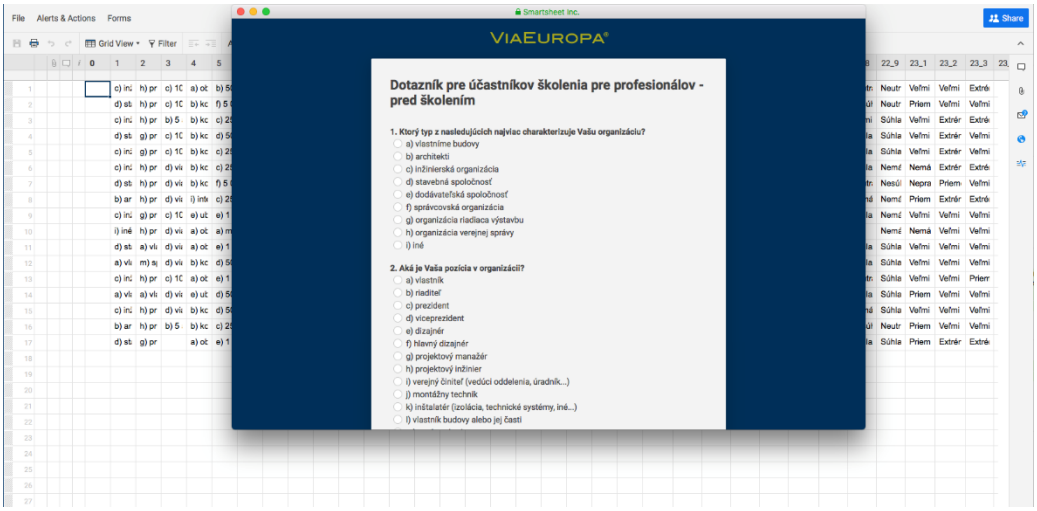

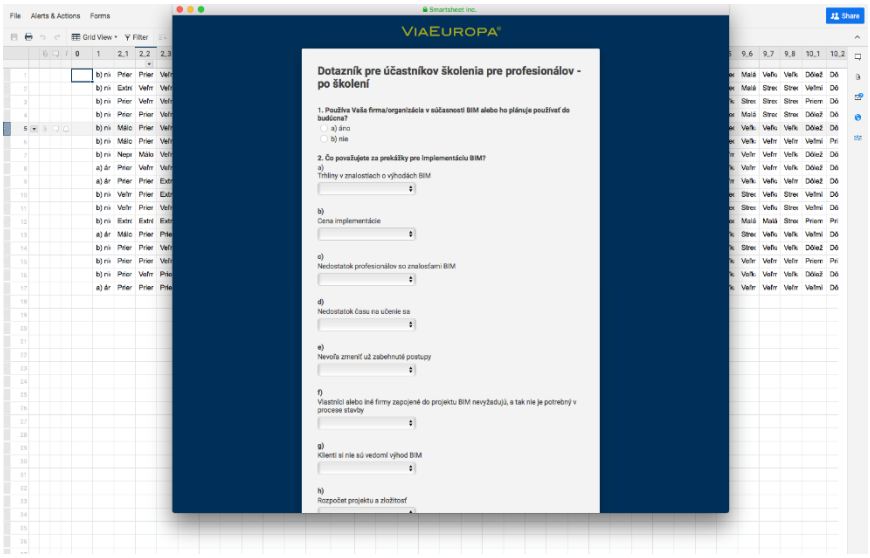

Few general conclusions from the classroom course validation from the participants in Slovakia is given below, while the entire questionnaire analysis is performed in deliverable *D27-D4.7 Survey and or interview among all different Targets*. Due to the fact that validation was performed in partners'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

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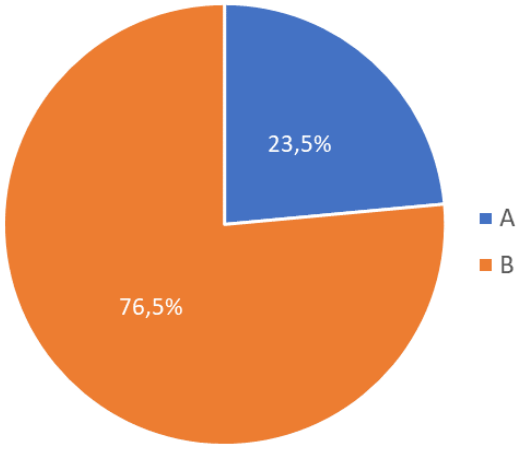
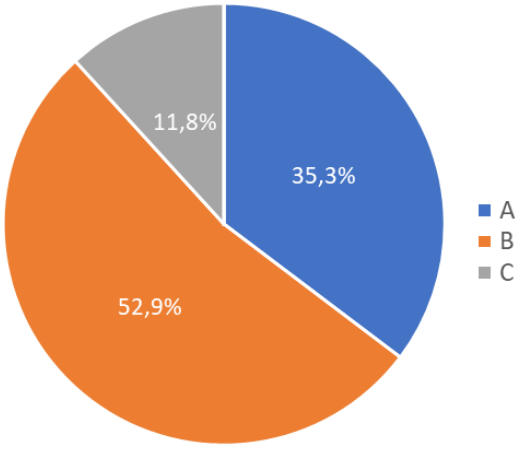


15. Would BIM certification, support or training, benefit Your colleagues?	a) Absolutely b) Likely c) Possibly d) No



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

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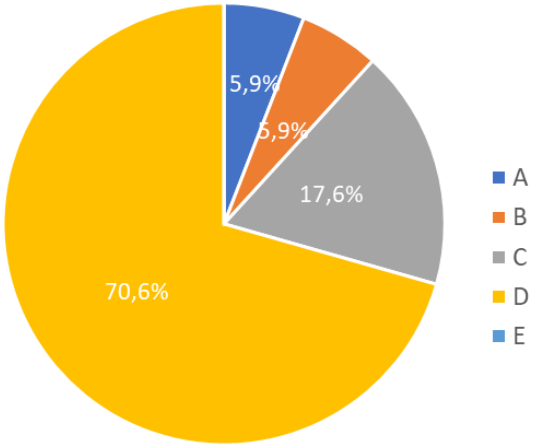
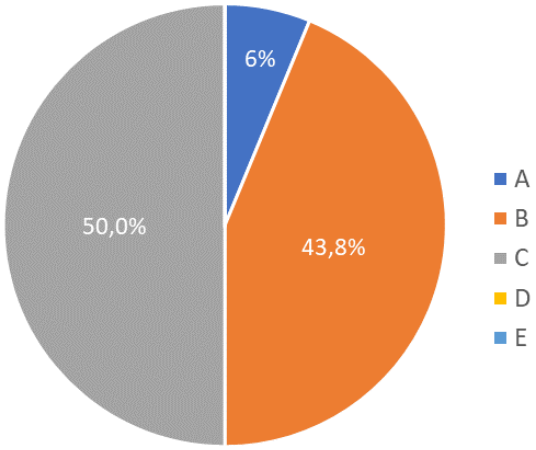


19. What overall rating would You give the course?	a) Excellent b) Very good c) Good d) Fair e) Poor



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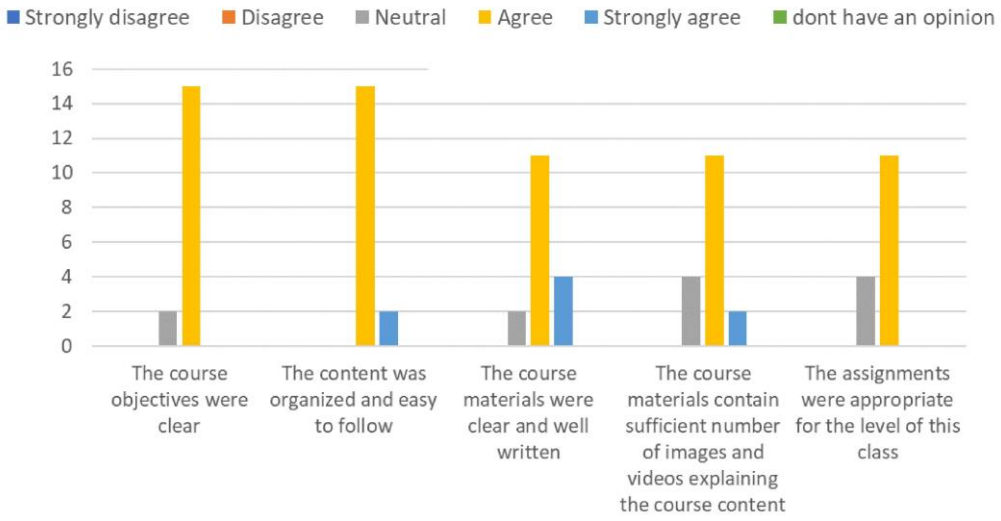
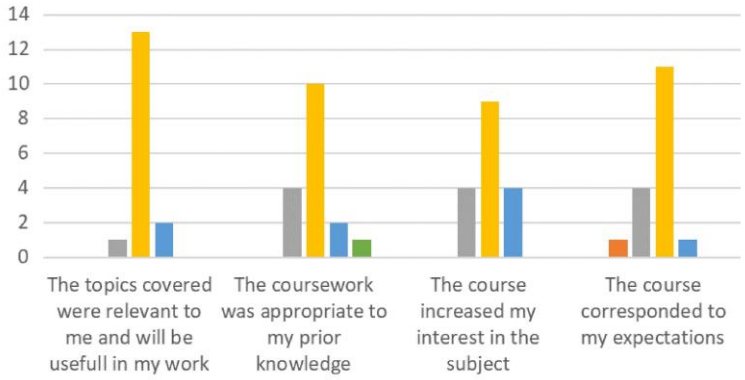
20. Please indicate your level of agreement with the following statements:

	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.						





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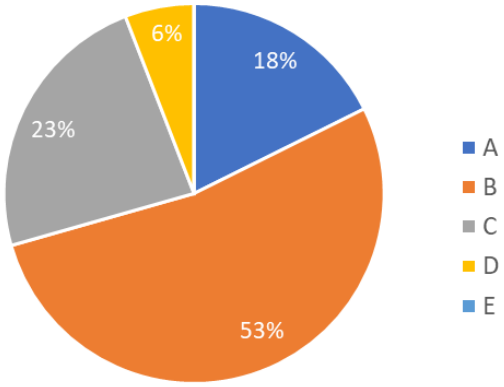
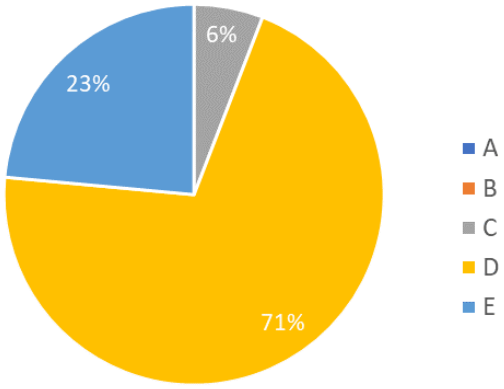
21. What overall rating would you give the trainer(s)?	a) Excellent b) Very good c) Good d) Fair e) Poor



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



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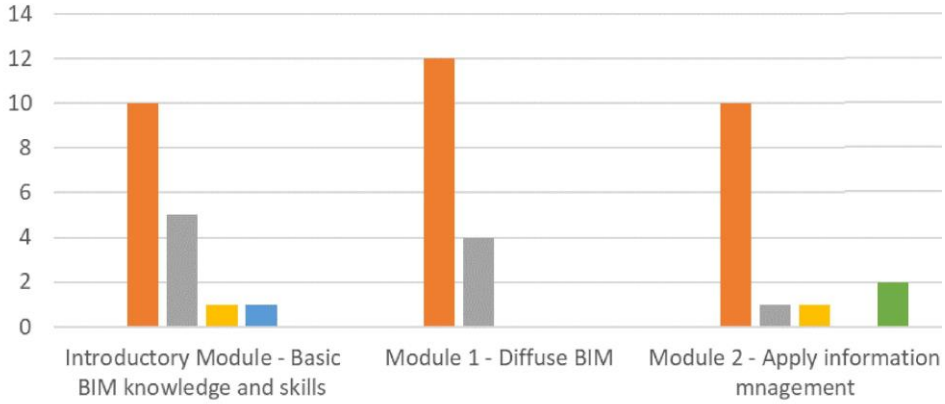
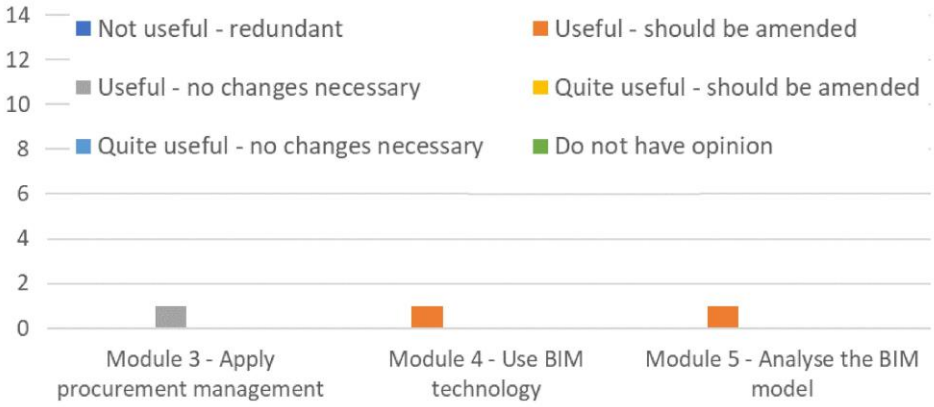
25. Please rate the following BIM course modules based on how they are useful and interesting to You.

	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						





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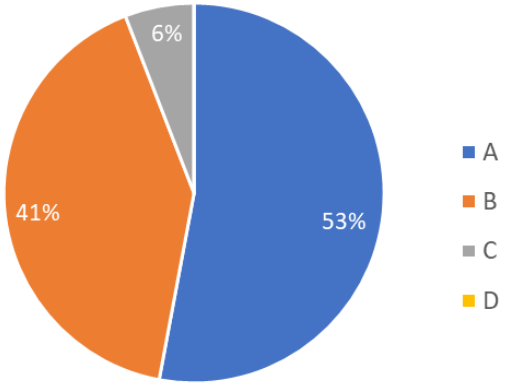
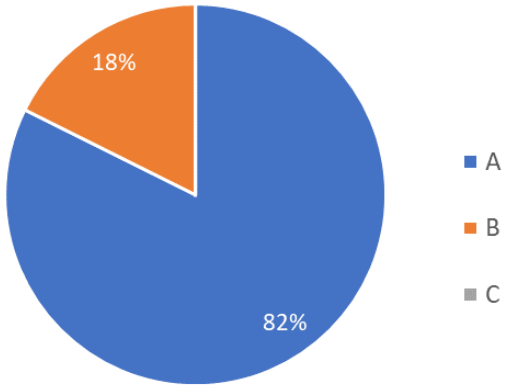
26. What do You feel, is the training material comprehensive enough? (Please mark all that apply)	a) Yes, it's adequate b) It should contain more practical examples (best experiences) c) It should contain more practical examples (existing issues in BIM) d) It should give more country specific regulatory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

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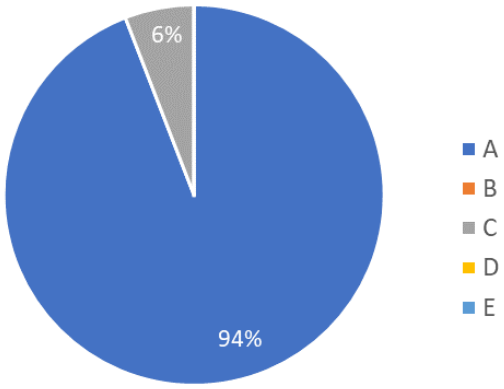
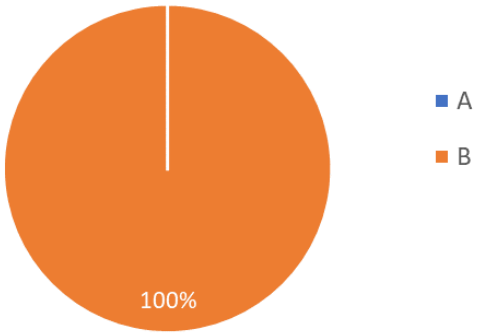


29.	Would you prefer to take this course online or in the classroom?	a) Online (e-learning) b) Classroom



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.

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

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

2.5.2 Agenda

4.1 Module MP1: Introduction to BIM

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

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

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

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2.6 Spain

2.6.1 Course description and results

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

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

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

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

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

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

2.6.2 Agenda

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

Taller formativo en BIM y nZEB, dirigido a ingenieros y arquitectos

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

Madrid, 25 de abril de 2019
Horario: De 10:00 a 14:00 horas
Lugar: Instituto de Ciencias de la Construcción Eduardo Torroja (IETCC-CSIC)
C/ Serrano Galvache, 4. 28033 Madrid

Programa

10:00 **Bienvenida**
Ángel Castillo, director del Instituto Ciencias de la Construcción Eduardo Torroja (IETCC-CSIC)

10:15 **Presentación de los proyectos europeos del programa Horizonte 2020: Construye 2020+ y Net-Ubiep**
Javier González, responsable de Proyectos Internacionales de la Fundación Laboral de la Construcción
José Antonio Tenorio, científico Titular del Instituto Ciencias de la Construcción Eduardo Torroja (IETCC-CSIC)

10:45 **Building Information Modelling (BIM). Fundamentos prácticos**
David Rodríguez, asesor técnico de BIM de la Fundación Laboral de la Construcción

11:30 **Edificios de energía casi nula (nZEB)**
Rafael Villar, Unidad de Calidad en la Construcción del Instituto Ciencias de la Construcción Eduardo Torroja (IETCC-CSIC)

12:15 **Café**

12:40 **Herramientas oficiales: HULC y Visor XML**
Marta Sorribes, Unidad de Calidad en la Construcción del Instituto Ciencias de la Construcción Eduardo Torroja (IETCC-CSIC)

13:20 **Herramientas BIM**
Benjamín González, director de Desarrollo Corporativo de Cype Ingenieros

14:00 **Clausura**

Taller formativo en BIM y nZEB

Iniciativa conjunta de dos proyectos europeos pertenecientes al programa Horizonte 2020: Construye 2020+ y Net-Ubiep

Presentación

El Taller formativo en BIM y nZEB es una iniciativa conjunta de dos proyectos europeos del programa Horizonte 2020: Construye 2020+ y Net-Ubiep.

Con el **proyecto Construye 2020+** se pretende dar un paso más en la transición hacia una industria de la construcción eficiente, en el uso de la energía sostenible y competitiva, mediante la definición y el desarrollo de un esquema actualizado de capacitación y acreditación de profesionales en competencias 'verdes'. Este esquema abordará las barreras profesionales, de mercado y de clientes, que se interponen para la consolidación de la Eficiencia Energética, los Sistemas de Energía Renovable y los Edificios de Energía Casi Nula.

www.construye2020plus.eu

El **proyecto Net-Ubiep** tiene como objetivo incrementar el rendimiento energético de los edificios al estimular y aumentar el uso de BIM durante el ciclo de vida de la construcción. El uso de BIM permitirá simular el comportamiento energético de los edificios utilizando diferentes materiales y componentes, tanto en proyectos de obra nueva como de rehabilitación.

www.net-ubiep.eu/es

Organizan:

CSIC · FUNDACIÓN LABORAL DE LA CONSTRUCCIÓN

A quién se dirige

El taller se dirige especialmente a ingenieros y arquitectos, representantes de:

- Empresas de la construcción y asociaciones empresariales.
- Organismos y Administraciones públicas.
- Centros de Educación y Formación Profesional y formadores del sector.
- Asociaciones profesionales de eficiencia energética.
- Técnicos, consultores y especialistas en EE, SER y nZEB.
- Investigadores especializados en EE, SER y nZEB, metodología BIM y Lean Construction, etc.

Inscripciones

La participación es gratuita, previa **inscripción** hasta completar el aforo.*

* Los asistentes tendrán la oportunidad de cumplimentar un cuestionario online de evaluación de la jornada. Aquellos que lo cumplimenten y proporcionen su correo electrónico, recibirán acceso gratuito a un curso de 8 horas sobre BIM.

@Construye2020EU
@net_ubiep
#GreenSkills #BIM

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

2.7 The Netherlands

2.7.1 Course description and results

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

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

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

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

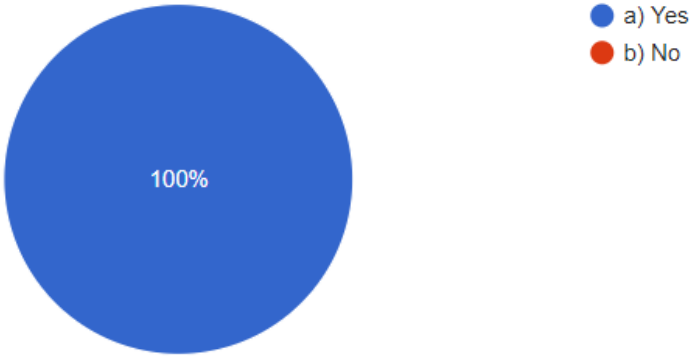
In other words, things are going slower than expected. However, Dutch partners are trying to disseminate the results and the education material with professional educators who expressed interest. So they think the results and materials will be used by these professional educators, but this is a slow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

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

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

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

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



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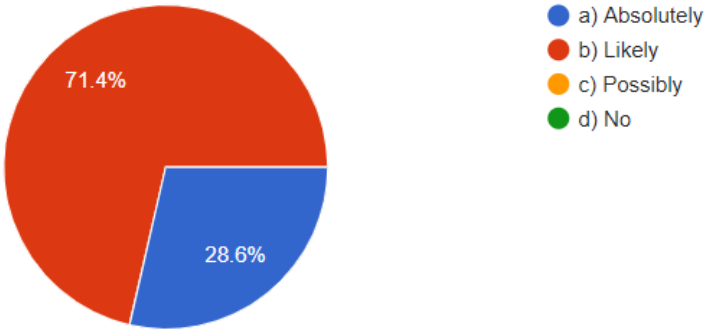
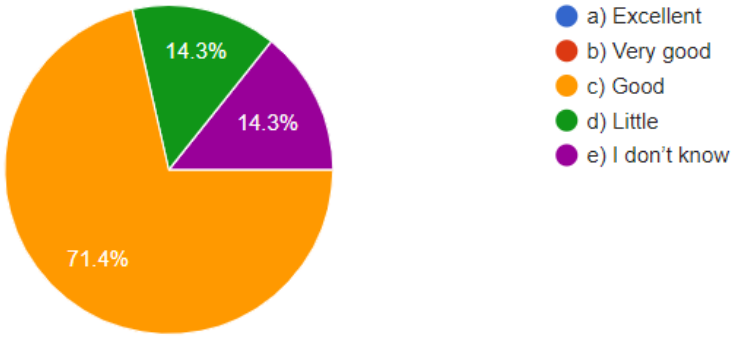
15. Would BIM certification, support or training, benefit Your colleagues?	a) Absolutely b) Likely c) Possibly d) No



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

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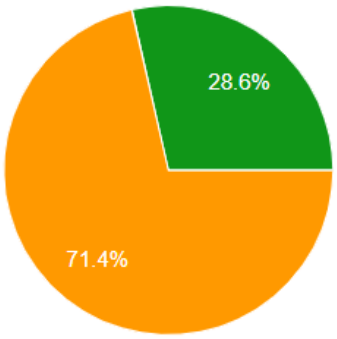

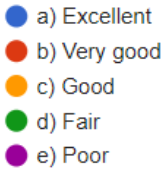

20. Please indicate your level of agreement with the following statements:

	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.						

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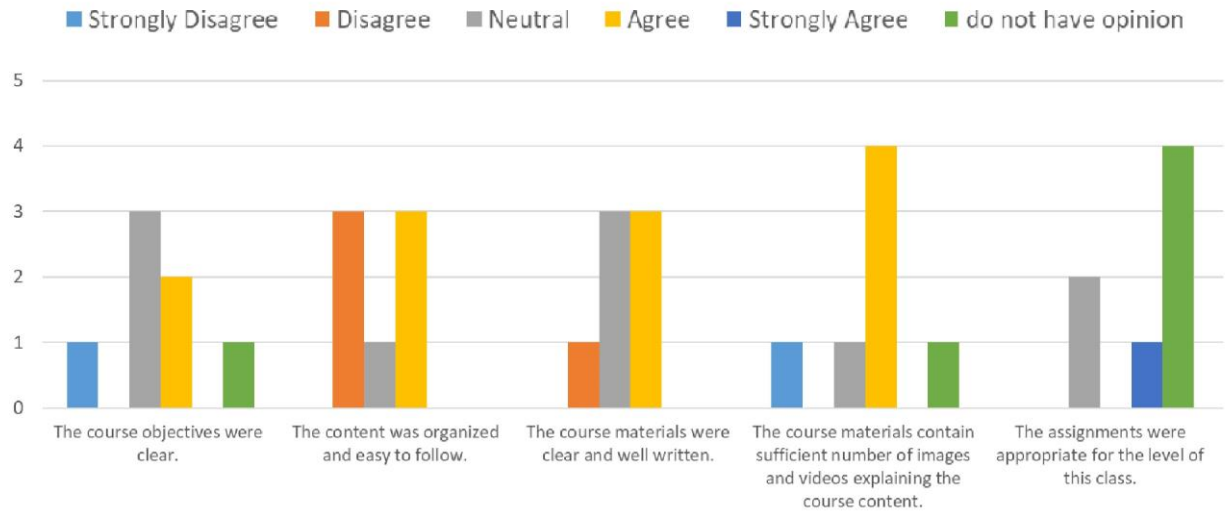
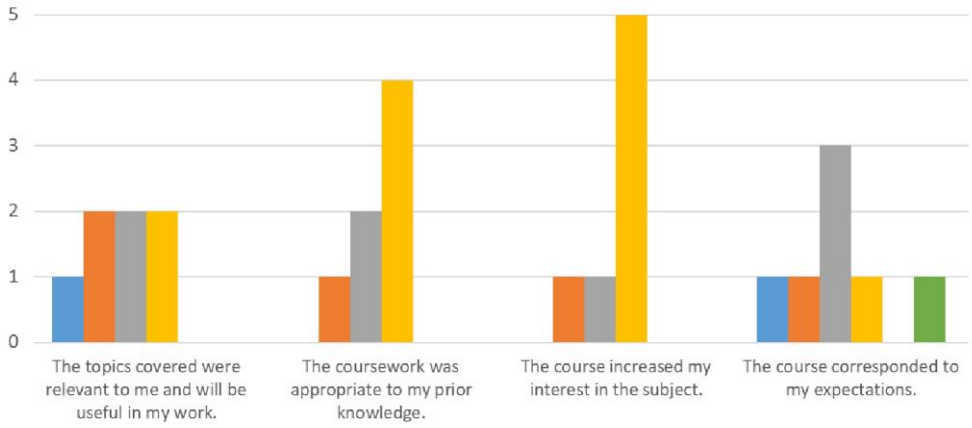
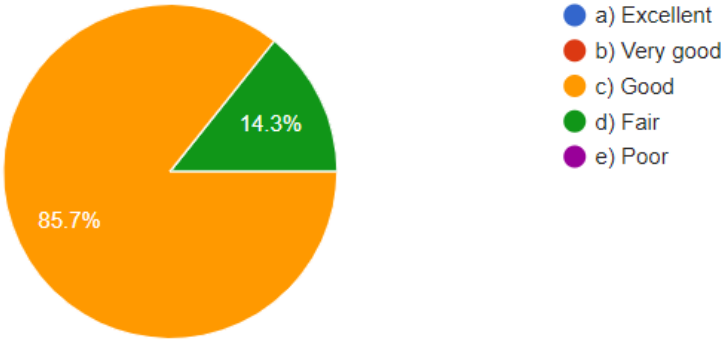




21. What overall rating would you give the trainer(s)?

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



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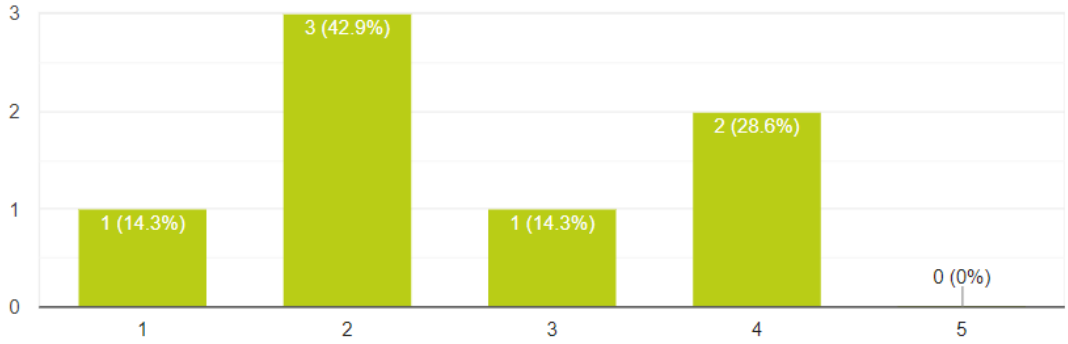
23. How much new information did you receive in the training course? Rate on the scale from: 1 (none) to 5 (a lot of new information)	a) 1 b) 2 c) 3 d) 4 e) 5

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						

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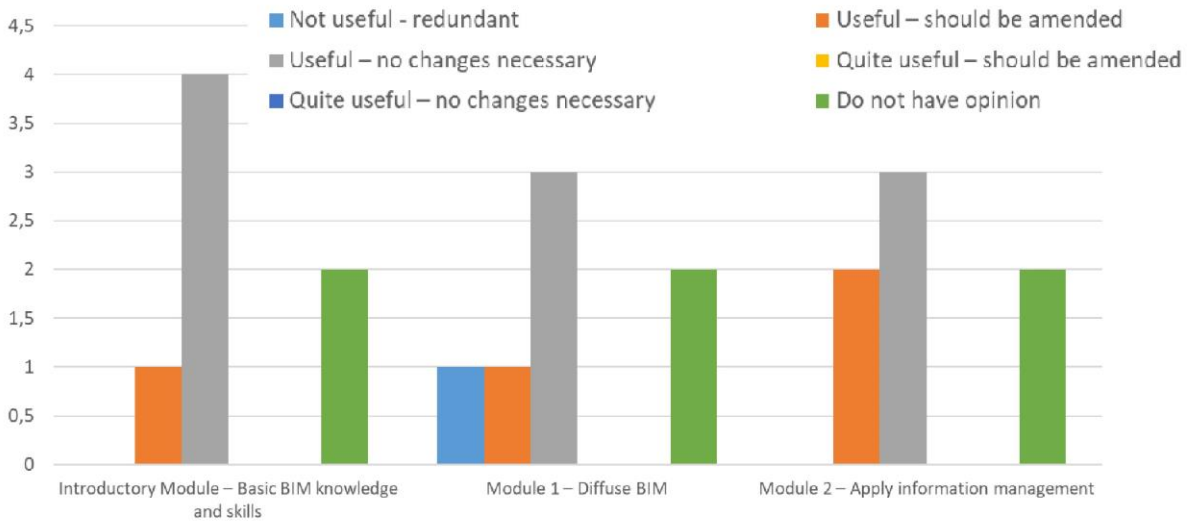

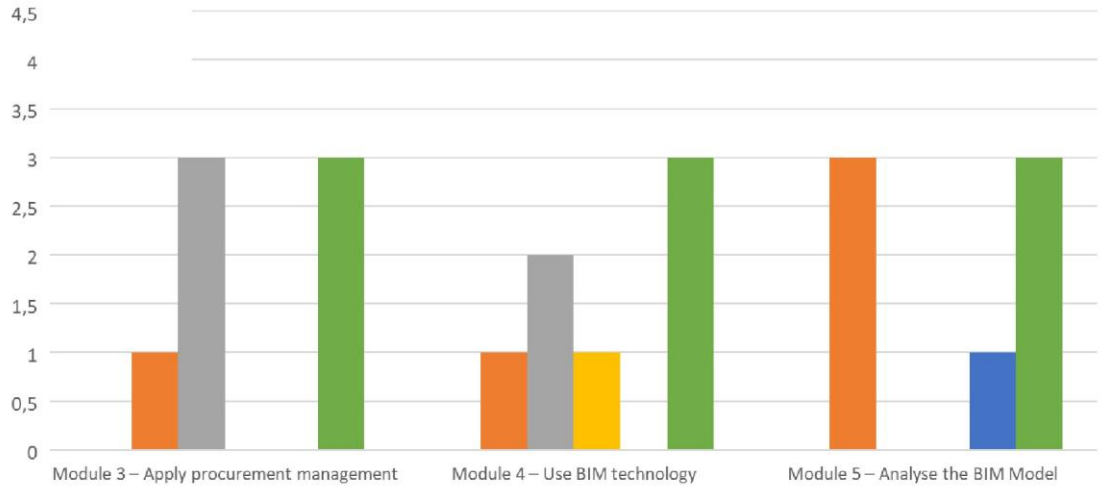

26. What do You feel, is the training material comprehensive enough? (Please mark all that apply)	a) Yes, it's adequate b) It should contain more practical examples (best experiences) c) It should contain more practical examples (existing issues in BIM) d) It should give more country specific regulatory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

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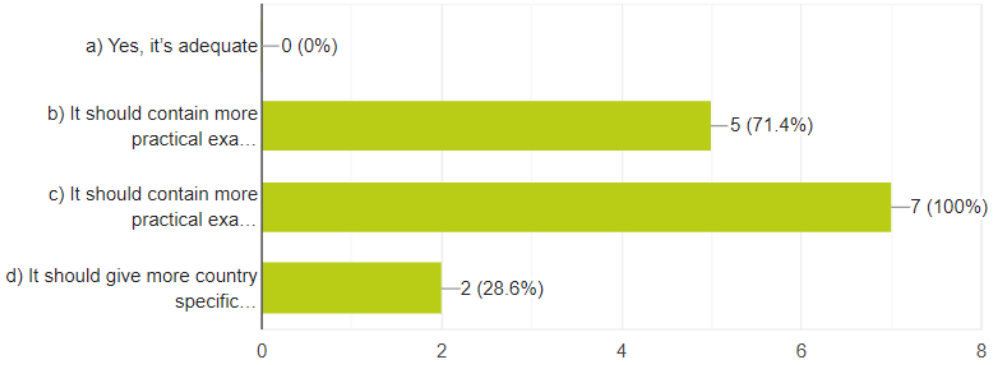
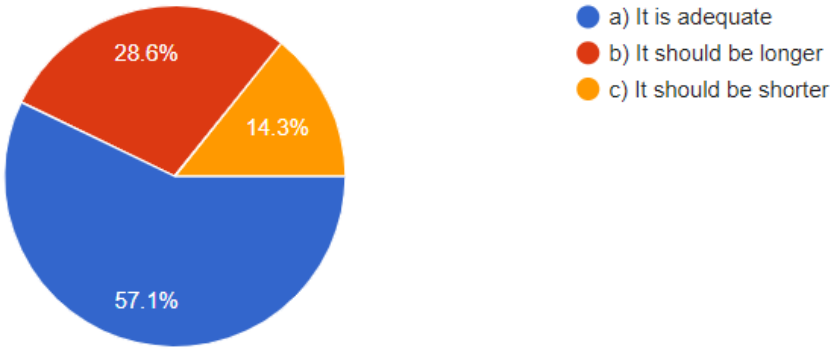
7 responses



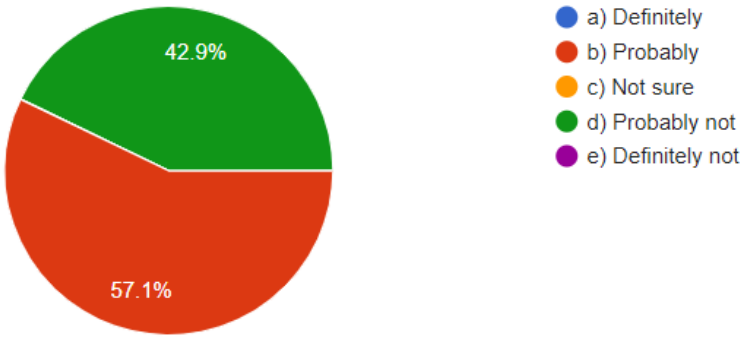
27. What do You feel about the duration of the training?

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



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

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



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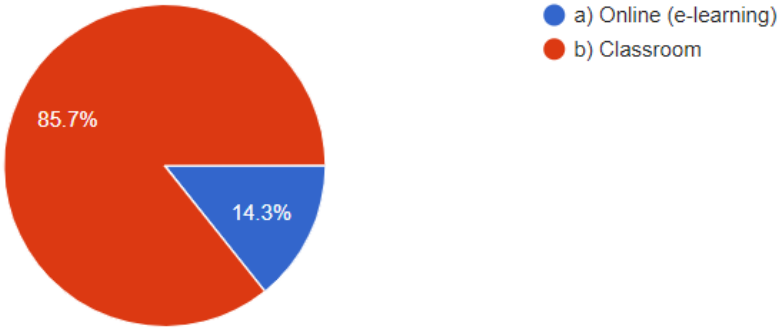
29.	Would you prefer to take this course online or in the classroom?	a) Online (e-learning) b) Classroom



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

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

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

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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.

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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

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, bepalingsmethode 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)

LEED evaluatie en certificatiesysteem waarmee de duurzaamheidsprestaties van gebouwen bepaald kunnen
BREEAM is een beoordelingsmethode om de duurzaamheidprestatie 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 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 uitvoeringspla
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 ontwerpen Nieuwbouw tot LOD 300 (BIM voor engineers and architects)
BIM voor BENG denken in systemen / gebouwbegrenzing
Bepaling warmte en koude behoefte
Transmissie

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

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

BIM voor BENG onderhouden en beheren LOD 500 (BIM voor eigenaren / facility managers)
Validatie handoverdossier as built en de werkelijkheid
Duurzaam onderhoud asset management m.b.v. BIM voor BENG / conditiemeting
Conditie meting / Meerjaren onderhoudsplanning / 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 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 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.

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

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