TRAINEE TowaRd market-based skills for sustAINable Energy Efficient construction

Acronym: TRAINEE

Grant Agreement Number 785005

HORIZON 2020

SURVEY REPORT
ON PENETRATION AND ACCEPTANCE OF
BIM PRACTICE
-FINAL-

Deliverable 3.1

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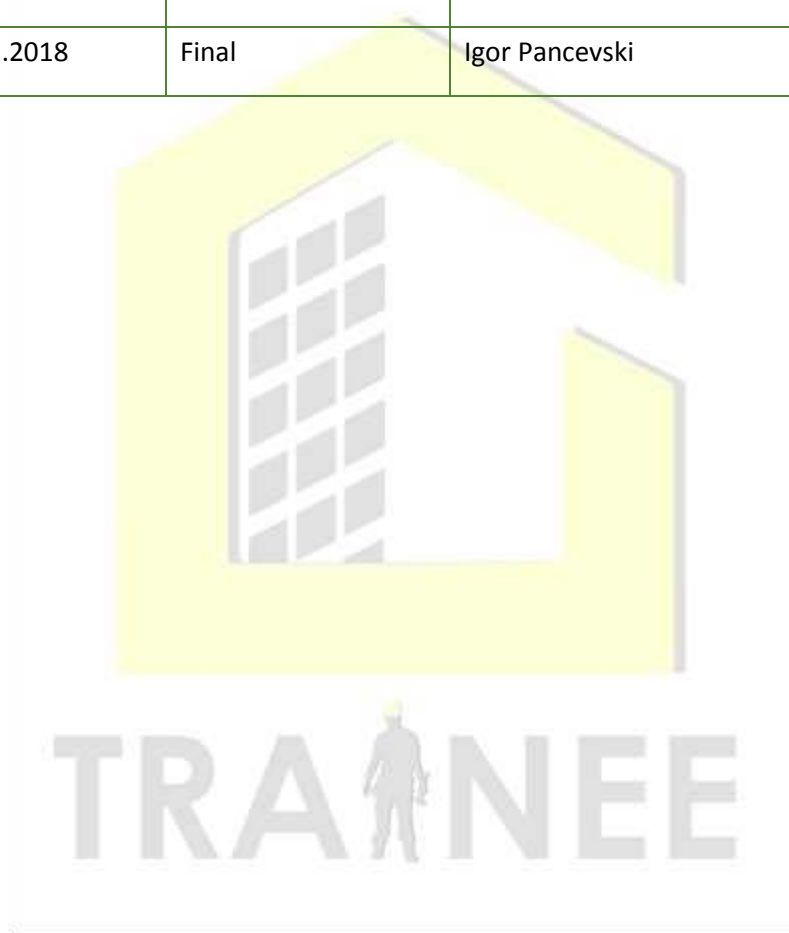
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1. Introduction

The project "TowaRd market-based skills for sustAINable Energy Efficient construction" is EU funded project under HORIZON 2020 programme, topic: Construction skills, Type of action: CSA Coordination and support action.

Overall objective is to increase the number of skilled building professionals according to recommendations from National qualification roadmap (http://buildupskills.mk /images/Publikacii/Roadmap/EN_Roadmap_BUS-MK.pdf) concerning two priorities, training of 4.500 building professionals and blue-collar workers and overcoming barriers for implementation of EE measures in operation and maintenance.

Three specific objectives are set up as:

(1) Upgrading two qualification schemes for technicians, building managers and engineers and development of large scale of training schemes for 5 blue collar qualifications and two RES occupations (designers and installers) by establishing the Knowledge Centre for support in development of sustainable EE market-based construction skills with annual capacity to replicate it to 10 training providers and 600 qualified construction workers (200 through training and 400 through recognition of previous learning);

(2) Increasing awareness of building professionals for use of Building Information Modelling (BIM) tools, in order to achieve the desired multidisciplinary approach in construction that should result with reduction in the gap between designed and actual energy performance through improved quality of construction in specific projects and to achieve measurable energy savings and improved quality of indoor environment;

(3) Improved market recognition of skills in the building sector and enhancing collaboration across different professional groups and introducing methodology for mutual recognition of skills with three EU countries (Greece, Slovenia and Croatia).

The TRAINEE consortium consists of 6 partners, 5 from Macedonia: ECM-Economic Chamber of Macedonia; ZBK Kreacija-Association of business and consultancy; UKIM Ss Cyril and Methodius University, with the Faculty of Electrical Engineering and Information Technologies; EIM-Engineering institution of Macedonia; AEC-Adult Education Centre; and 1 partner from Spain: BIM Academy-WITS Institute from Barcelona.

The project will produce five categories of deliverables (products): (a) Publications (study, survey, report); (b) RPL Methodology; (c) Training programs and materials; (d) BIM software; (e) Assessment procedures.

This document is Deliverable # 3.1 and it presents the findings of the Survey report on EU good practices in developing voluntary qualification schemes

1.1 Background information

Today issue with new buildings is that they use in general as twice (*according to Carbon Trust, 2011*) as much energy and have double the carbon emissions than predicted. This energy performance gap, with its serious financial and climate change implications, has been blamed on everything from builders not installing insulation correctly to occupants leaving lights on. However, new study (The Building Performance Gap: Are Modellers Literate?, Prof. David Coley) suggests another factor is at play: the "literacy" of building modelling professionals. What is it about simulation software that has improved then? As building energy, simulation tools have developed from academic research tools to commercial analysis and design software the most obvious developments are: (i) vastly improved user interfaces, (ii) many more variations in systems and fabric features can be represented, and (iii) integration with BIM enabled tools and CAD systems have been implemented. This has made the software vastly more usable.

Building information modelling (BIM) is an information model of a building or construction project and consists of computer-based data and information such as function, materials used, economy, shape, etc. which is useful in managing and supporting all the lifecycle stages of the physical asset (McAdam, 2010).

BIM also stands for the practice of building information modelling. It is therefore a combination of computer software applications, systems and processes about work practices used by Architectural Engineering and Construction (AEC) sector professionals and clients. These tools and systems help improve the efficiency of delivering construction projects and management thereof, during and after construction (Aranda-Mena et al., 2009). The functionality and data sharing capabilities of BIM enable it to be implemented on the whole spectrum of the construction and infrastructure projects. Lean architectural, engineering and cost management practices are associated with the efficiency brought by automating the building and management of activities using BIM (Arayici, 2011).

This survey is to assess the penetration and total acceptance of BIM practice in Macedonia, so we can tailor made training programs to address this issue properly. The report's purpose is to support TRAINEE in the activities related to promotion of BIM among building professionals and activities in preparation, organization and implementation of trainings for BIM.

2. Methodology

In order to weight the penetration and acceptance of BIM practice in Macedonia, an survey method was chosen as technique of gathering data by asking questions to people who we thought to have desired information.

To specify status of construction industry in terms of BIM education and implementation, an on-line questionnaire survey was conducted. There were 1500 questionnaires distributed by e-mail among state officials, construction companies and building professionals with job experiences in AEC (architecture, engineering and construction). These professionals were selected as most active Certified Architects and Engineers from the Chamber of certified architects and certified engineers of Macedonia, on national in Macedonia. The questions were close-end and questionnaire contained two parts.

Part 1 - includes questions about respondents' geographical location, field of construction sector, number of employees, current career (architect, or engineer)

Part 2 - includes questions about the skills of respondent in drawing, CAD tools, BIM, and software.

Questions from part two were precisely addressed with survey logic jumps, depending of the answer.

The e-mail reminder was sent twice during the one-month period for which the survey was opened. There were 312 valid responses obtained, which represents 20,8% respondents' rate.

Data was gathered from Google survey tool. Questionnaire responses are analyzed using simple descriptive statistics. The analysis was carried out separately for states officials and Architects/Engineers for comparing their knowledge and skills.

3. Data analysis and Discussions

The data was analyzed statistically and described by percentages, proportions, graphs, and charts for comparing level of knowledge through AEC industry practitioners. Their knowledge divided into following segments:

1) Type of building professionals;
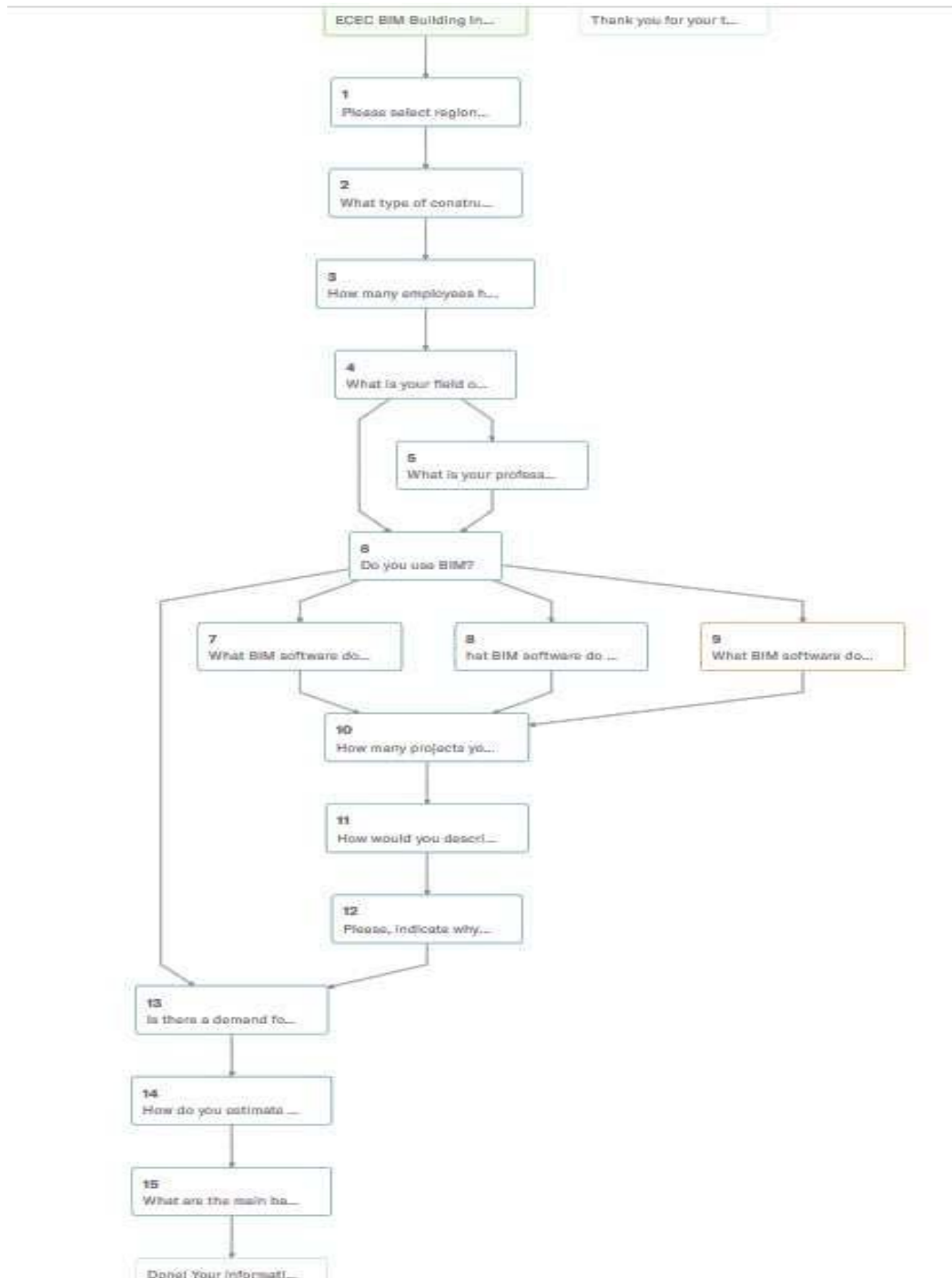2) BIM design tools and
3) BIM demand/obstacles.

Figure 1 - Survey logic jumps

3.1   Building professionals

The analysis was carried out on a national level separated on the 8 regions in Macedonia. Also the survey has separated the respondents who works in building sector from those that work in infrastructure sector. Based on the results it was clearly that almost 60% of the respondents work in Skopje region in Building sector. The result is very clear and expected because over 60% of the construction works are done in Skopje in residential sector.
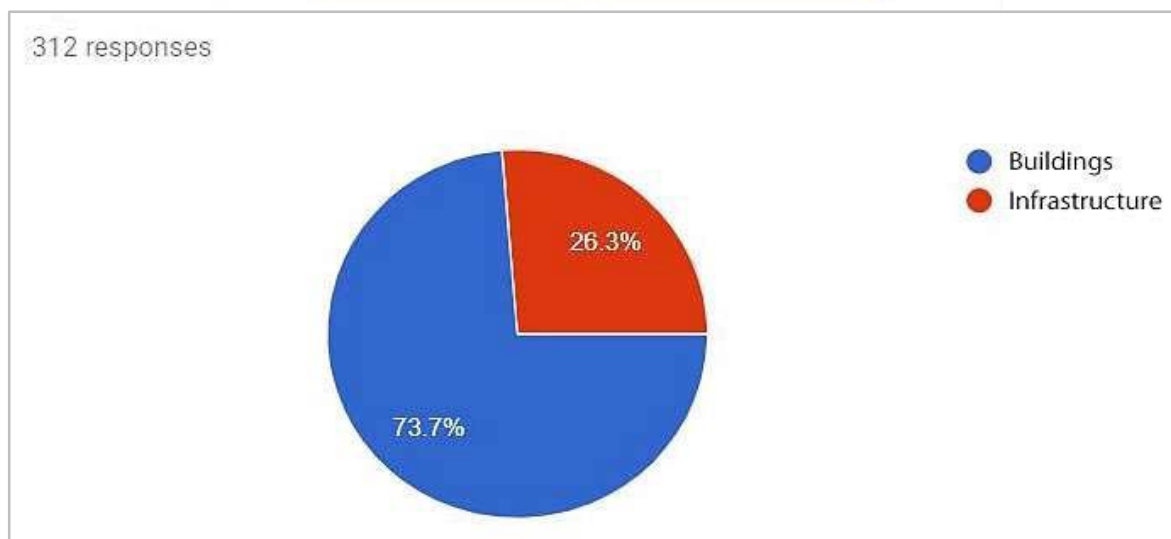

Figure 2 - Region of the respondents

Figure 3- What type of construction do you primarily focus on?

Since Building Information Modeling (BIM) aim to change the way both the public and private sector how work together in design, communicate, solving problems, and build better projects faster and at less cost. As BIM practices and technologies continue to evolve, we were asking the respondents which sector they belong and are they using BIM in practice. In general, there were 3 main sectors: AEC, Public and University. As results shown on Fig.4 most of 312 respondents belong to AEC (architecture, engineering and construction) sector with over 83%, or 261 persons. Engineers and architect working in the field of design of buildings represent over 55% of total respondents or 174 people.
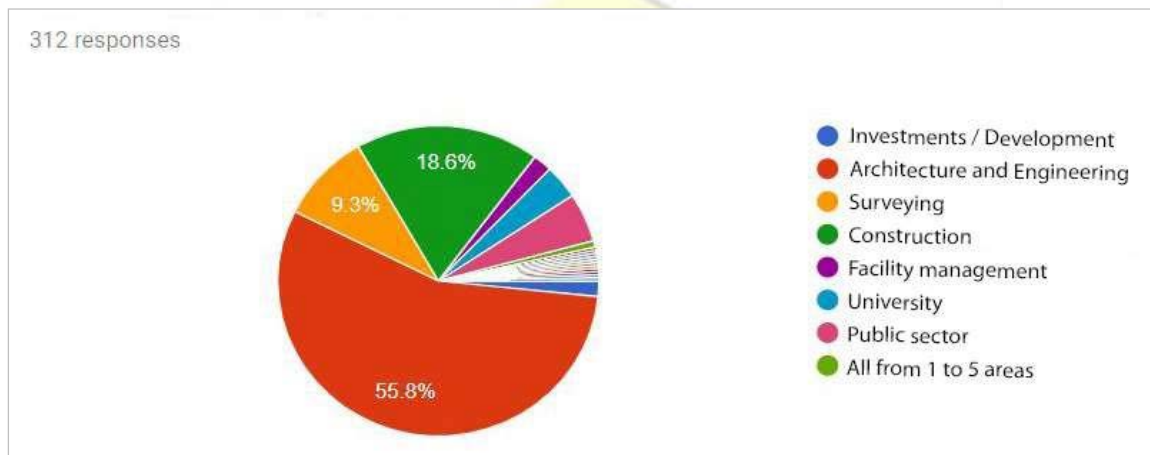

Figure 4 - Field of sector

The last question in this section for all that respond to the survey was "Do you use BIM". The results shown on Fig.5 gives that only 7.7%, or only 24 out of 312 are using BIM tools in their practice. Most of the respondents or 65%, are interested in use, but not using yet.
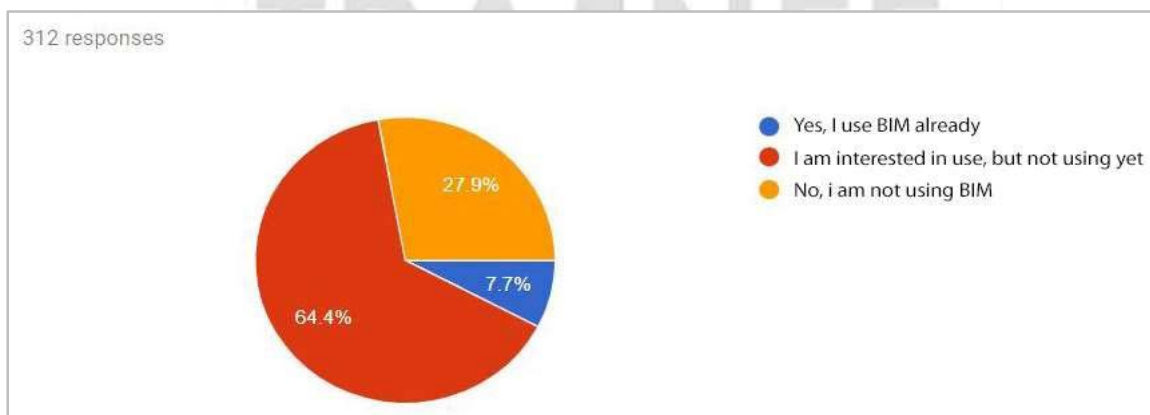

Figure 5 - Do you use BIM

Summarizing this section, we can say that most of the respondents come from Skopje region and they are focused in building sector. More than 50% them are architects and engineers which have heard about BIM, they are interested but still not using in practice. In total we have 188 respondents from region of Skopje and 112 of them are architect and engineers.

3.2   BIM Design tools

The data was analyzed to discover skills of respondents and their used method in design among Architects and Engineers. For this reason, respondents were asked about their skills in design tools by three simple questions: "What BIM software do you use?"; "How many projects you deliver using BIM?" and "BIM experience and skills?".

The results show that only 24 respondents (7,7%) are using BIM design tools. The two commercial tools are most popular, as Graphisoft ArchiCAD with 37,5%, and Autodesk Revit with 29,2% representation. Timble Tekla is third tools but lucks in term of popularity with 8.3% between the engineers.

However, only 33,3% (8 people) of those who are using BIM tools, deliver 100% of their designs in BIM and almost 30% are delivering between 1 and 25%. The Fig.7 gives interesting information that even if respondents familiar with BIM, 17% (4 people) of them do not deliver their design in BIM at all.
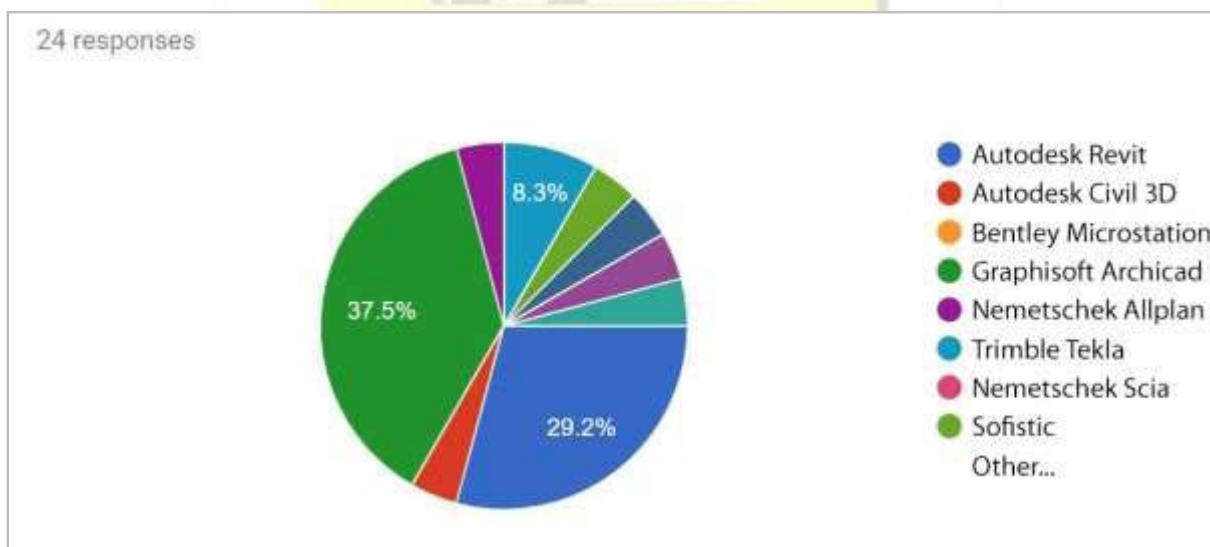

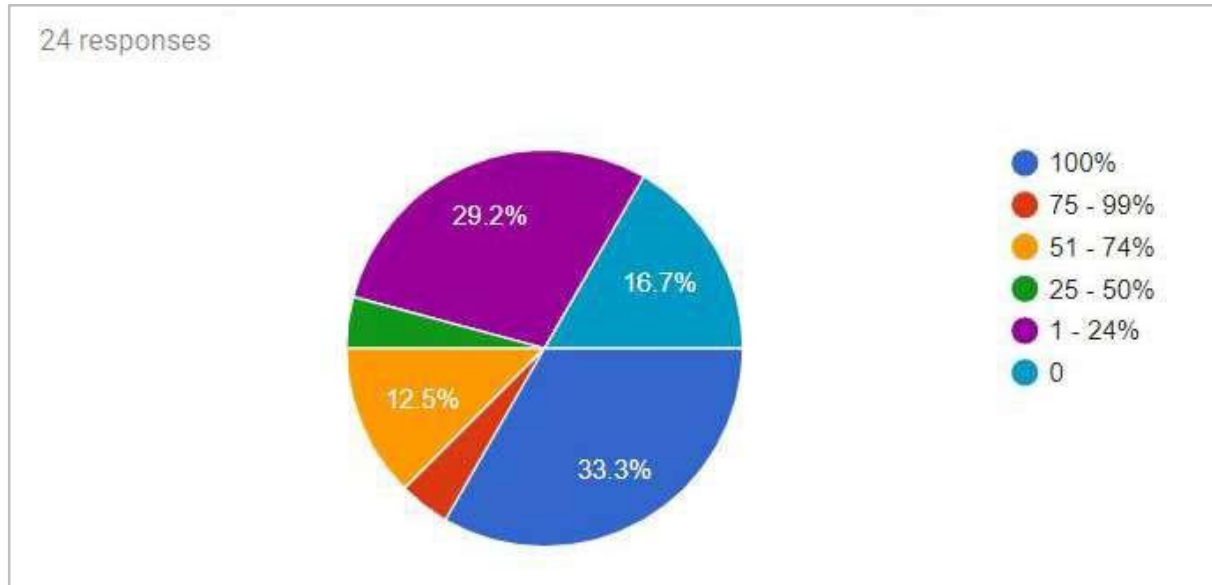*Figure 6 - What BIM software do you use?*

Figure 7 - How many projects you deliver using BIM?

Three Levels of knowledge about BIM software programs (Autodesk Revit, Graphisoft ArchiCAD, and Tekla Structure) was evaluated by the following question, where Beginner level was represented by 9 respondents out of 24 (that use BIM), and advanced were 10. Familiar with BIM up to expert level were 5 respondents. This means that in total only **15 out of 312** (4,8%) of ALL respondents have sufficient knowledge to work in BIM software tools.
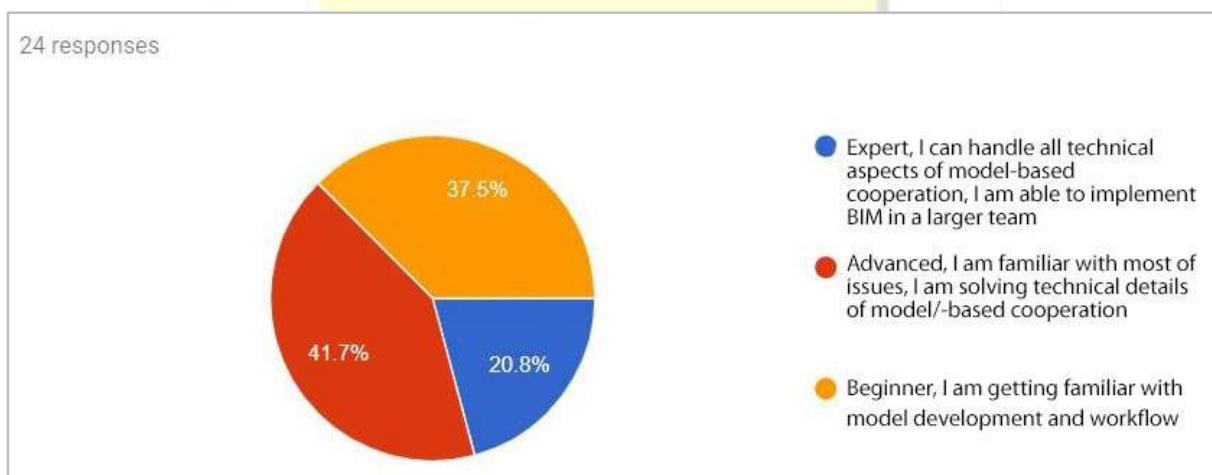

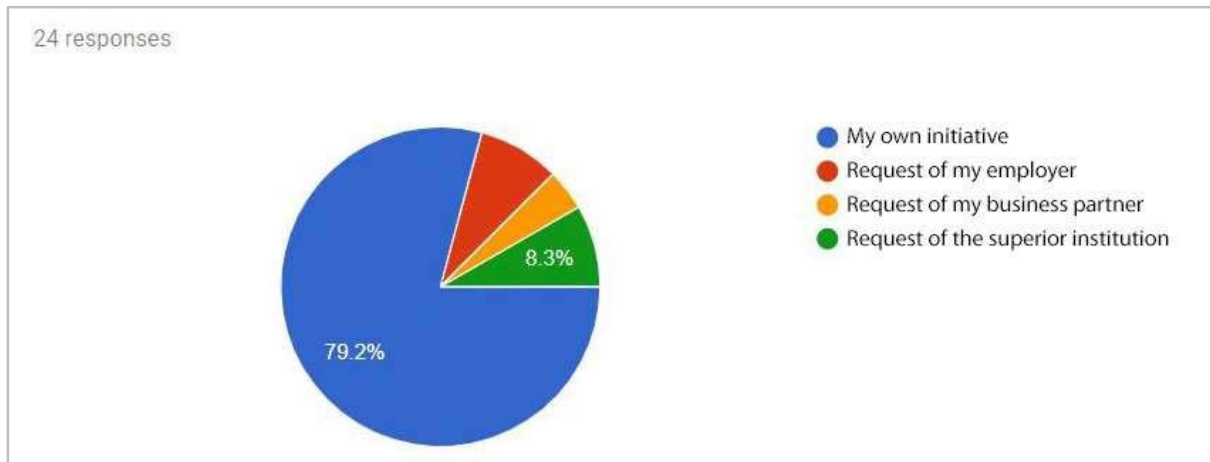*Figure 8 - How would you describe your BIM experience and skills?*
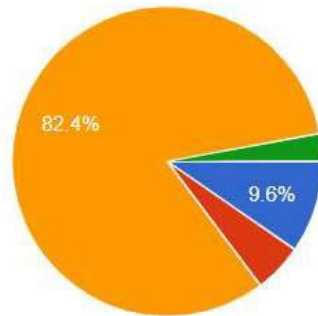
Figure 9- Why you are dealing with BIM?

Summarizing this section, we can say that 24 out of 312 respondents are using BIM software and most of them (over 50%) are focused on Graphisoft ArchiCAD and Autodesk Revit. However, only 33,3% (8 people) of those who are using BIM tools, deliver 100% of their design and 20% are self-evaluated as experts. Almost 80% of those who started with BIM tools, have stated that it was on their own initiative.

3.3   BIM demand/obstacles

People related barriers include, the reluctance to change, but most of them pointed to lack of BIM trainings, **very low demand** from the market for BIM design of the projects, lack of skilled professionals, high initial cost of implementing BIM standards and specifications. This includes the cost of down time within the organization in order to change the current design workflow. It also includes the cost of continually educating and training employees in terms of the implementation of BIM standards and specifications, keeping in mind that there will be a learning curve involved for even the most proficient BIM user. This further will have effect on the team formation and its related organizational structure. There are very limited courses taught BIM standards and specifications in Macedonia where BIM is still in the premature level of adoption. However, these trainings are mostly commercial from **one Authorized training provider of Autodesk**, regarding the REVIT. Still the low or nonexisting demand results in BIM trainers themselves to be resistant and reluctant to learn new tools and work flows as they perceive this as a waste of time and a hindrance to their productivity. Fig. 11 shows that they have hope in the next 1 or 2 years BIM will be used in their organization.
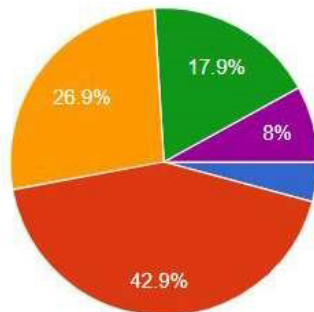
Figure 10 - Demand for BIM when doing your business

Figure 11 - Future use of BIM in your organization

Figure 12 - Main barriers to start using BIM on projects

Summarizing this section, we can say that biggest challenge will be the low-demand of the delivering the designs in BIM. This follows with very limited training providers only for commercial software where the BIM as process/methodology is taken into account during the training. On the other hand, brain-drain process of high skilled professional engineers with expertise in BIM causing significant gap for those few companies that work on international level with BIM software tools to continue and develop themselves.

4. Conclusions

The survey about penetration and acceptance of BIM practice shows that most concerned about BIM software tools are architect and engineers for their design purpose. Buildings as sector for introduction of BIM tools is most appropriate because over 70% of respondents belong to this sector. Half of the respondents have heard for BIM software tools but only 2,5% are fully focused to deliver all their designs in BIM. Most of these architect and engineers have educated them self on their own initiative for generally two commercial software tools Graphisoft ArchiCAD and Autodesk Revit. No openBIM tools or other alternatives were known to the most of the respondents. Basics of BIM process and methodology, BIM benefits for all phases are not present in the only one training curriculum that exist in Macedonia. Biggest challenge if bigger diversity of BIM options, creation of bigger demand-side which will lead to higher penetration of BIM in private sector which can easily lead to its implementation in public sector and national legislation.

4.1   Recommendations

Survey results gives clear pictures where we should put our focus, in order to make successful introduction and acceptance of BIM practice.

Three major barriers that were detected through the survey are:

1) Lack of BIM trainings (33% or 103 respondents)
2) Insufficient requests from the clients (no demand for BIM design) (21,2% or 66 respondents)
3) Missing standards and guidelines; (15,4% or 48 respondents)

In order to overcome these barriers this report gives measures and recommendations how the project should provide the needed support:

1) Project will promote BIM and its trainings as free-of-charge during the project life time, training content for different target groups and BIM software that will be used; These activities will be prepared mostly from BIM Academy project partner.

2) Promotion of the BIM among the companies and investors with real case studies where BIM had influence in lowering the energy performance gap, lower the project costs in different phases and has increased the quality; This aims to increase the demand of designs to be delivered in BIM software tool.

3) During the project life time, set of guidelines for implementation of BIM as well as a Roadmap will be developed in order to set out clear path for bigger acceptance of BIM in shorter time period. Knowledge Center will be used as sustainable tool which will continue to improve the documents and guidelines for the engineers, architects and managers.

ANNEX

BIM (Building Information Modeling) IMPLEMENTATION SURVEY

This survey is anonymous with aim to investigate the implementation status of BIM in Macedonia.

1. Please select region, where you are based

Please select only one region (*will need to be adjusted country to country)

− Eastern
− Norhteastern
− Pelagonia
− Polog
− Skopje
− Southeastern
− Southwestern
− Vardar

2. What type of construction do you primarily focus on?

If the organization you are working for deals with both, choose the option that is the dominant for you as a person.

− Buildings
− Infrastructure

3. How many employees have the organization you work for?

− over 100
− 50 - 99
− 21 - 49
− 11 - 20
− 5 - 10
− 1 − 4

4. What is your field of construction sector?

− Investments / Development
− Architecture and Engineering
− Surveying
− Construction
− Facility management
− University
− Public sector

5. What is your profession?
– Architect
– Civil engineer
– Electrical engineer
– HVAC engineer
– Sanitary/ Plumbing engineer
– Fire protection engineer
– Structural engineer
– Quantity surveyior

6. Do you use BIM?
– Yes, I use BIM already
– I am interested in use, but not using yet
– No, i am not using BIM

7. What BIM software do you use?
– Autodesk Revit
– Autodesk Civil 3D
– Bentley Microstation
– Graphisoft Archicad
– Nemetschek Allplan
– Trimble Tekla
– Other...

8. What BIM software do you use?
– Autodesk Revit
– Nemetschek Scia
– Sofistik
– Trimble Tekla
– Advance Steel
– Dlubal
– Other...

9. What BIM software do you use?

List one or more softwares that you use to work with BIM

– Write here the names...

10. How many projects you deliver using BIM?

Please estimate the percentage ratio.

- 100%
- 75 - 99%
- 51 - 74%
- 25 - 50%
- 1 - 24%
- 0

11. How would you describe your BIM experience and skills?
- Expert, I can handle all technical aspects of model-based cooperation, I am able to implement BIM in a larger team
- Advanced, I am familiar with most of issues, I am solving technical details of model/-based cooperation
- Beginner, I am getting familiar with model development and workflow

12. Please, indicate why you are dealing with BIM
- My own initiative
- Request of my employer
- Request of my business partner
- Request of the superior institution

13. Is there a demand for BIM when doing your business?
- We are receiving request for using BIM
- We require using BIM from our suppliers / business parners
- We have not receivedy request for BIM use by now
- We do not demand using BIM from our suppliers / business parners

14. How do you estimate the future use of BIM in your organization?
- We already use BIM
- We assume the implementation of BIM within 1 year
- We assume the implementation of BIM within 2 years
- We assume the implementation of BIM within 5 years
- We do not expect to ever use BIM

15. What are the main barriers to start using BIM on projects?

- The lack of skilled professions engineers
- Insufficient request from the client
- Price
- The lack of time
- The lack of BIM trainings
- Missing standards and guidelines

Thank you for your time and for contrbuting to this survey!