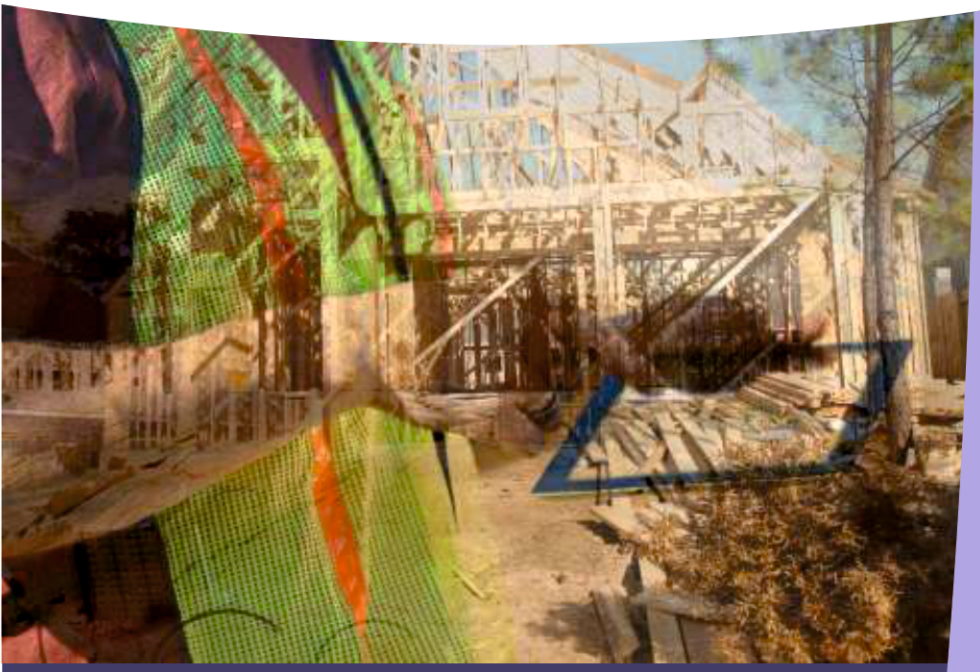
Fit For
BIM

BGZ



Guidelines for vocational training institutions on handling digital construction

Co-funded by the
Erasmus+ Programme
of the European Union

The learning units are the result of the FIT for BIM project within the framework of the Erasmus+ programme.

Projekt- Coordination

BGZ Berliner Gesellschaft
für internationale Zusammenarbeit mbH

www.bgz-berlin.de

www.fit4bim.eu

Information: Robert Peterseim, Berlin,.2019
pet@max-bill-schule.de

Berlin, 2020

CONTENT

1. Introduction

As current developments show, educational institutions need to significantly improve their IT infrastructure in order for their educational offerings to keep pace with growing digitization. In all EU countries, regulatory policy makers are called upon to actively support initiatives to increase the degree of digitization. .

The development of guidelines for teaching new skills related to BIM is a very important topic and requires many discussions with both teachers and practitioners who know important aspects of this field.
Although the knowledge and experience of countries where new technology has already been implemented is helpful, there are always local political and economic conditions that can accelerate or delay the implementation process.

The opportunities of introducing BIM teaching at various levels of education depend both on external factors at the national level (introduction of BIM standards and legal regulations) and internal factors in the educational institution (financing, equipment, staff capacities).
The key factor is teachers' willingness to improve their skills, modernize teaching methods and encourage the use of modern technologies. This makes it necessary to invest not only in hardware and software, but primarily in the training of teachers and lecturers.

For vocational training centers, the project “Fit-for-BIM” identified measures that will help transfer new competency requirements for digital construction (BIM) to training content and implement them in the teaching process. The proposed approach gives institutions the means to respond quickly to changes in the competence requirements of the specialists they train.

The aim of this guide is to encourage the formation of innovation teams in other institutions. It should help them to plan, implement and evaluate innovations according to the needs of the institution. This includes the strengthening of the involvement of other stakeholders, development of networks in this field and communication with representatives of the construction industry.

2. Recommendations for the implementation of BIM

2.1 General Comments

1. Lobbying - conducting joint activities for BIM education using modern digital forms, e.g. with the presentation of various methods. In this way, representatives of different bodies can be sensitized to the introduction of modern forms of education.
2. Mandatory introduction of elements of the BIM method to education at all levels of vocational education. This applies to the training of apprentices and masters of craftsmanship, but also to the professional development of craftsmen.
3. Introduction of an element BIM exams apprentice and master, and enlargement of the scope of examination subjects for civil engineers not only in the face ñ what has already occurred, but also in the planning and design of construction projects (Civil and Civil Engineering).
4. The inclusion of an educational material for the postgraduate courses
5. Take into account the possibly identical structure for training units
6. Choosing a priority thematic discipline (structure / systems, etc.). It should be based on a training program (teaching framework).
7. Application of financial support for the modernization of vocational education and training, and in particular for the change of the vocational training framework.

2.2 Notes on the working environment

As in any work environment, digitization requires the right tools, in particular hardware and software. Purchasing equipment and software is often a challenge.
It raises questions like:

- What do I need, how can I use it, how long can I use it?
- When choosing hardware and software to be purchased, the motto of "better to have it than to need it" should not apply. The purchase decision must always be based on specific needs identified for the vocational education.
- Each participant should be able to use his own computer station where the exercises are performed.

Recommended software required for vocational education and training:

- BIM compatible programs, e.g. Revit, Robot, Allplan, Archicad, Scia Engineer, BIMestiMate, Navisworks.
- software that allows collaboration independent of programme and discipline (engineers / architects / draftsmen) , for example. BIMvision.
- visualization software, e.g. Twinmotion.
- software for operating peripherals, e.g. VR goggles, 3D printers, 3D scanner
- office software, e.g. Spreadsheets.

In view of the technical equipment of training institutions, the recommendations are as follows:

1. Computer workstations with large monitors and minimum 27 ”16:10 or 21: 9 or workstations with two monitors . Examples of computer parameters: https://www.graphisoft.com/support/system_requirements/AC23/ https://knowledge.autodesk.com/support/revit-products/learn-explore/caas/sfdcarticles/sfdcarticles/System-requirements-for-Autodesk-Revit-2019-products.html#revitserver
2. Server - server parameters should be adjusted to the number of students who will be using it at the same time. Examples of server parameters https://www.graphisoft.com/support/system_requirements/bimcloud/ https://knowledge.autodesk.com/support/revit-products/learn-explore/caas/sfdcarticles/sfdcarticles/System-requirements-for-Autodesk-Revit-2019-products.html#revitserver
3. Internal network connected to the server on which pupils can store model files.
4. Internet access.
5. Educational versions of BIM programs
6. Students can rent laptops for independent work and in small groups.
7. Projectors or screens for presentation in s ali teaching
8. Rooms allowing to work in small groups, presentation screens and internal network as well as cabling with the possibility of connecting laptops or with computer workstations

Optional:

- tablets used during construction site practices and at meetings with customers,
- 3D scanners,
- 3D printers,
- VR goggles, AR,
- Programmable 3D computer mice.

3. Sample scenarios

3.1 Awareness raising activities

You and other colleagues at your school / university are of the opinion that IT skills must be more strongly promoted in training courses. BIM elements must be integrated into the training.

- How are you going to convince the school management to do this?
- What steps are you taking to convince other colleagues?
- How will you involve the local construction industry?
- Which decision makers do you need to convince the responsible authorities?

Task: to design a master plan
To this end, thematic working groups may be created.
Each working group has the task of developing an appropriate concept.
In addition, each working group should develop a plan of the procedure along with the actions to be taken (digital presentation / presentation of good practices from other countries, other educational institutions).

Working groups should have a representative structure. Their composition should include partners from various departments. It enables establishing a lively dialogue.
Duration: at least 4 meetings, each for 3-4 hours
The results should be documented and then presented in a plenum, e.g. at a teacher's conference.

3.2 Establishment of an advisory team

Imagine that you were instructed by the school management to introduce BIM in other faculties / other courses / training centers. Take the role of an advisory team and advise your colleagues on introducing BIM and promoting work-related IT skills.

Task: create a team
Make an invitation and offer workshops on the subject. The workshop should start by asking for expectations so that participants can become permanent members of the advisory team.
The aim is to sensitize all participants to understand their own contribution to the development of the school and to strengthen their own IT skills.

The principle of interest and voluntariness is crucial.
The recruitment process should be balanced, e.g. experienced and young teachers, experts in several related professions, people with very good and average IT skills.
As good instrument can be described below desired floor model so. "team watch". This model was developed by Bruce W. Tuckman, an American psychologist, organizational consultant and university lecturer [https://translate.google.pl/translate?sl=pl&tl=en&u=https%3A%2F%2Fannakolm.pl%2F494%2Fbudowanie-zespolu-fazy-wg-tuckman%2F]
The model outlines four stages of team development: forming, storming, norming, performing.
Any change in the team - eg. When team members leave or join the team, or when the team is facing new challenges, in the ideal case clock begins again, " tick " during training.
This graphic model is also used to regularly check where the team is currently located.

3.3 Advice for an educational institution

Another school or training institution refers to you as an innovation expert.
Best wishes: The institution would like to participate in your school development.
This means taking on the role of an advisory team and advising on the introduction of BIM and the promotion of IT skills related to the work of the relevant university / school management.
Goal: Organizing the principles of permanent cooperation with the school / university to exchange knowledge and experience

Task: Please assume the following role: on behalf of the school / university you take part in a series of meetings to determine the principles of cooperation. The school / university offers theoretical knowledge and training base , and the institution offers the organization of apprenticeships for teachers / lecturers and pupils / students especially in the field of practical application of BIM .
Cooperation can be long-term (systematic) or occasional (e.g. BIM Day). It should be possible for student organizations to join in the cooperation. Scientific Circles may conduct additional trips to construction sites and accept practical tasks proposed by the Institution to perform.
Within the framework of cooperation, the Institution may also participate in working groups and advise on planning changes in the study programme.
Benefits for the Institution are graduates who are better acquainted with the practical aspect of the profession.

3.4 Creating a network

Objective: Strengthening the promotion of work-related information skills .
More and more teachers, trainers and managers of vocational schools in your region come to the conclusion that the BIM-methods has to be increasingly involved and in vocational education and training.
The result: a network is created.

Please take over the following role: You go to a network meeting with two or three innovative colleagues.
Task: To determine steps, formulate arguments in advance to convince other network activists.
The introduction of BIM elements to the training of another institution or organization is a kind of role. Close cooperation with SMEs is very important when developing the network. It should not be limited to participation in seminars, conferences, etc., but should take the form of permanent cooperation. This can be done very well in the form of accompanying working groups.
The number of members of the working group is not decisive; it is rather important that small and medium-sized enterprises participate in the working group, that they are open to innovationbring in relevant expertise and are able to implement the project.

4. Guidelines for the qualifications of teachers / lecturers

4.1 Competence Requirements

Different teacher competences are required for different teaching activities within educational units. Especially in the last semesters of teaching, several teachers with some experience in applying BIM in practice will be needed to be able to give advice based on understanding best practices to other teachers and students.
One of the teachers should have practical experience in the industry and not only conduct classes for students, but also train other teachers to increase the number of competent teachers.

In addition, teachers should participate, for example, in:

- Software support courses (online and / or in person)
- Postgraduate studies
- Additional studies (extramural or evening)

as well as

- Improve their skills through self-study using tutorials provided by software and book producers
- Participate in cooperation with enterprises to learn the practical application of knowledge
- Attend thematic conferences where they can exchange experiences and supplement knowledge.

The teacher should::

- know the appropriate software - have a good overview and understand the structure and hierarchy of data and geometry in the BIM model
- have basic modeling skills: walls, openings, floor, roof, installations
- have knowledge about documenting construction projects in 2D and setting the appropriate sheets in the software
- have basic knowledge of the level of development (LOD) in theory and its practical application.

4.2 Acquiring new IT competences in relation to BIM

The method of cooperation and self-education, in addition to the possibility of self-education and exchange of experience, gives teachers the opportunity to create new solutions based on partnership and reciprocity .
Students learn information processing, communication, content creation, network security and problem solving.

The educational goal of the training should be to provide practical knowledge and skills in the area of investment process management and information technologies, consisting of the BIM methodology.
Students should get to know as soon as possible the transition from the theoretical basics to the independent use of the most important advantages of using BIM.

The training program should be based on practical examples and analysis of actual application cases in order to build a set of competencies to allow for:

- optimal choice of IT tools of BIM environment,
- Identification of the required documents and basic stages of the BIM project,
- defining rules for managing project information in accordance with the BIM methodology,

- understanding of the business context and success criteria of a project based on the BIM methodology,
- defining the responsibilities of each of the participants in the BIM project,
- Preparation of a plan to implement the BIM methodology in a team or company.

Competences to be acquired through courses

The teacher should be able to use the program efficiently, find out what mistakes students make most often and how to correct them. Particularly the group of questions requires a teacher to have much greater skill in using the model. In addition, it requires the presence of BIM models, which are somewhat exemplary in relation to the topics discussed.

At a higher level (Units B1 and B2), the teacher should have:

B1 training unit :

- Knowledge of the potential benefits of BIM compared to traditional methods
- Skills to use the appropriate software tools interface
- Ability to read, create and edit simple BIM models in a given field (architecture, installations, construction and / or geodesy)

B2 training unit :

- Ability to introduce the scope of analysis with BIM on simple practical examples
- Knowledge about collaboration using combined models and collision control
- Skills in creating BIM objects (Families) in the relevant field

Examples of training:

https://translate.google.pl/translate?sl=pl&tl=en&u=http%3A%2F%2Fwww.wst.com.pl%2Fkursy%2Fbim

https://translate.google.pl/translate?sl=pl&tl=en&u=https%3A%2F%2Ftu.kielce.pl%2Fstart%2Fuczelnia%2Fprojekty-ue%2Fpower-3-5%2Fnowoczesna-uczelnia%2Fzadanie6%2F

Resultss

The method of cooperation and self-study gives the teachers the opportunity to exchange experiences and to create new solutions.

Students can process information, communicate, create content, ensure network security and solve problems independently.

5. Exemplary scheme for vocational schools

5.1 Cycle of complete action

The following principles for the acquisition of digital competences have been taken into account:

1. Transmission of information
   To this end, digital transfer of learning and working tasks must take place or made available: digital access to necessary information outside via the Internet, selected on their own network, and digital media for learning as support.
2. Planning - providing digitally editable "planning tasks"
3. Making a decision: What, how, with what, with whom, with what time (digital documentation)
4. Implementation: In most cases, the work is done by craftsmen
   - Support by the use of 'digital devices', for example measuring instruments
   - Support for AR technology (Augmented Reality) can now be relatively costly
5. Control: Verification of services performed using digital measuring instruments
6. As appropriate, using AR technology
7. Verification of compliance with the planned process steps
8. Document the results and communicate them to the instructor
9. Evaluation: The assessment of planning tasks can be automated and the results can be directly reflected.

5.2 Task for learners: Develop a construction project

Trainees / students should develop their own construction project - based on a pre-defined model (2D template and previously created digital survey).

Project team members should work on the same model at the same time, but tasks should be divided.

The existing skills and competences in the cooperation of each person should be taken into account. Observe the heterogeneous composition (learning from yourself and with yourself).

Depending on the purpose of the learning effect - the size of the student team may vary, but teams of 2-4 students are recommended.

Learners can be together in a team or be physically separated (temporarily) using digital communication tools that support BIM

Most of the time should be spent on collaborating in the project team around the project

It should help ensure that associated with that party educator s.

Teachers should rather support a systematic approach to research (eg. By documenting the result of that).

5.3 Task for learners: Create a 3D-Model

Steps to create a 3D model

1. The individual steps are explained and presented by the teacher using the sample project

2. The basis is a file with a given browser structure and basic families / library elements. (see training unit ...)

3. Students receive a template in the form of 2D sketches.

4. The basis is a pre-prepared digital test

5. Students reproduce step by step what they have learned before.

6. Parameters (properties) are entered into the database when modeling the 3D model.

7. Depending on the pace of work, some students draw up a written working report.

8. During the whole modeling process, it is possible to exchange with other students and the teacher.

6. Exemplary Scheme for Higher Education

6.1 Methods of knowledge transfer

Presentation or introductory lecture consisting of:

- A short theory on the following instruction - its meaning in relation to both software and design practice in general
- Overview of procedures to facilitate information search
- Basic themes and concepts (in relation to BIM or specific software) relevant to the topic
- Illustrations from the software interface
- Step by step software manual

Group question hour (students asking questions, teacher answering) with practical instruction on the functionality of the software and the teacher's workflow in real time can be a powerful teaching tool as they allow you to focus on specific topics immediately at the student's request.

Acquisition of practical skills by students:

- working independently on the basis of instructions,
- the design method,
- working in a group.

Teacher and class of students / group of students - about 30 people.
Size of small group of students: from two to four.

6.2 Learning in groups with the project method using instructions (3 stages)

Workplace configuration

- Stage 1. Teaching room with places for the whole class equipped with a projector or screen and computers connected in an internal network with the server and the Internet, individual computer stations arranged, e.g. four in one group, work tables with printed documentation in the middle of the room notes during the teacher's lecture, a separate computer station for consultation with the teacher

- Stage 2 and 3. Teaching room with places for the whole class equipped with a projector or screen and a computer for presentations, as well as small rooms with equipment prepared for work of small groups equipped with a screen capable of working on their own laptops or equipped with computers; access to the room for groups on registration.

Stage 1 (Unit A)
Individual work combined with group work

There is a division into working groups - preferably drawn randomly, groups can change every single class or every few classes, so that each student learns to work with each

The teacher gives an introduction to the class and discusses what will be the subject of the given stage
The teacher shows the method of completing the task and the goal to which students should reach, provides instructions
The teacher gives which points of instructions, which instructions are helpful to achieve the goal

The students work alone - everyone does the same task, if the student does not know how to perform an action, he asks the people in his group, if no one in the group knows the answer and cannot be found on the basis of the instruction, you can possibly ask another group trying not to interrupt work other people talking too loudly, if no one knows the answer, the question is entered on the consultation platform

On the consultation platform, students enter questions, all students see the questions of others and do not have to ask the same questions, they only vote for the given question and those questions that have the most votes are explained by the teacher in the group forum at the beginning of the next class, and individual questions are explained individually for a given group
After a certain number of tasks, the teacher checks the correctness of the task and assesses the student's work or the models in the peer-to-peer format are checked - in the middle of the semester. The teacher assesses the final model at the end of the semester.

Stage 2. (Unit B1) Working on the project in a group

There is a division into working groups and determining the leader for a certain period or for the duration of the entire project, the leader may change during the semester, but before the change there should be a presentation of the completed stage (responsibility of the leader for a given stage of work)

The teacher assigns a project to be carried out and discusses the tasks to be carried out and the goal to which students should reach, provides instructions

As part of their group, students share tasks (work-sharing), work is supervised by the leader. Students decide the order and time by which individual stages should be completed (scheduling should be supervised by the teacher)
Access to the server on which the shared project will be stored is set

Students work independently on their tasks and meet from time to time to work together during which they control the progress of work (leader) and adjust the schedule if necessary. The leader takes care of documenting the findings.
Students can consult the teacher if needed to clarify doubts.

After completing the project, students prepare a digital presentation - a slideshow or similar presentation and / or presentation directly from the software tools used, which they present in the classroom forum.

The leader presents the entire project and indicates who was responsible for which stage. Everyone presents their stage of the task they performed.
The presentation of each team should focus on the team's work process, functionality achieved in the case project planning process, and learning outcomes of each student. The teacher issues a grade for the project (set and quality), for meeting the deadline and individually for involvement in group work.

Stage 3 (Unit B2)
Working on the project in a group

Execution of an order by a client (the client can be taken over by the teacher), this stage can be implemented as part of the internship in the design office

- There is a division into working groups and determining the leader for a certain period or for the duration of the entire project.
- The leader may change during the semester, but before the change there should be a presentation of the completed stage (responsibility of the leader for a given stage of work)
- The teacher connects the client with the group and the client presents the idea for the project to be performed. Elements of digital planning are agreed with the client.
- The task of the design team is to implement this in the project.
- Design teams must analyze and select methods for optimizing information flow, work routines and / or quality assessment supported by BIM in a construction project.
- Students develop an initial concept based on the client's idea and present it to him at the meeting. The customer accepts or makes corrections to the concept.
- Students divide the project into tasks (supervised by the leader) and separate tasks between themselves. Students set the order and time by which individual stages should be completed (scheduling can be supervised by the teacher)
- Access to the server on which the shared project will be stored is set
- Students work independently using instructions (previously used)
- Students work independently on their tasks and meet from time to time to work together during which they control the progress of work (leader) and adjust the schedule if necessary.
- The leader takes care of documenting the findings.
- Students can consult the client if needed to clarify doubts.

After completing the project, students prepare a project presentation that they present to the client (and teacher). The leader presents the entire project and indicates who was responsible for which stage. Everyone presents their stage of the task they performed. The teacher issues a grade for the project (set and quality), for meeting the deadline and individually for involvement in group work.

The ability to work in a group on a project taking into account the needs of the client can be used when preparing the thesis . Final works for pupils and students have different scope of activities, but the method can be similar.
The diploma thesis may be performed by a group of three (or two) students in the fields of Architecture, Construction and Environmental Engineering (possibly only Architecture and Construction or Architecture and Environmental Engineering or Environmental Engineering and Construction). They are working on a joint project on behalf of the client. Each student works on his industry by consulting his activities with the other graduates. They are working on a joint project stored in the cloud. Promoters from individual faculties are support for students. Consultations may take place in the form of meetings with promoters.

The result of the work is a joint multi-branch project presented on the joint defense of work - everyone presents their part of the work and is evaluated for it.

Instructions:

- Books
- Case and task description
- Functional instructions (Dalton Education)
- Step-by-step tutorial videos supporting the development of BIM modeling and the ability to use models while modeling a small building
- Built models at various stages of development (e.g. from BIMbogen.com)

Rules for preparing functional instructions (element of Dalton education):

The manual is prepared for each stage / task. The manual should be on one page and should include 4 to 6 steps, of which:

- The first one contains a list of materials and tools needed to perform the task (in the case of a task performed in a computer program, the material may be the final result of the previous task and the tools may be the program's functions),
- The next steps to get there,
- The last should show the goal - the effect to be achieved.

The instruction can be descriptive with pictorial elements (e.g. screenshots of individual stages of the task).

The manual can be general so that it can be used for different tasks, e.g. modification of the door and window element settings is similar, so the manual can be common and only the input data: doors or windows are changed.

The principle of working with the manual is to work independently. The student should have unrestricted access to the instruction (Internet cloud available for students, book, library of instructions in a shared room with the possibility of lending - number of pieces adjusted to the size of the classroom).

The presentation of each team should focus on the team's work process, functionality achieved in the case project planning process, and learning outcomes of each student.

The correctness of model performance is assessed, as well as timeliness and involvement in group cooperation.

7. Cooperation with Enterprises

Cooperation with enterprises may include:

- internships at the construction site and in design offices for pupils / students and teachers / lecturers
- study visits in companies
- joint thematic workshops (small projects, short tasks)
- Naukowe scientific and technical symposia, trainings, e.g. Budimex Academy, etc.
- cooperation with magazines, e.g. Builder, competitions for students, graduates, etc
- NCBiR project platform, EU, e.g. professional time, https://translate.google.pl/translate?sl=pl&tl=en&u=https%3A%2F%2Fzawodowcy.org%2F

The benefit of introducing the so-called the third mission of the university is, among others stimulating the country's economic growth and regional development, as well as increasing innovation in the economy.
The problems in establishing cooperation are complicated procedures and bureaucracy as well as conflicts of interest and obligations.
https://translate.google.pl/translate?sl=pl&tl=en&u=https%3A%2F%2Frepozytorium.amu.edu.pl%2Fbitstream%2F10593%2F12779%2F1%2FSE%2520nr%252031_2014%2520Pawel_Bryla.pdf

Forms of cooperation

Forms of cooperation between the university and business can be analyzed using a matrix covering individual and institutional elements of relationships [Source: Responsible Partnering, Joining forces in a word of open innovation. A guide to better practices for collaborative research between science and industry, European Commission - EIRMA - EUA - EARTO - ProTon Europe]

<table>
<tr><td rowspan="2">universities</td><td>Institutional forms</td><td>Visiting professors
Studies / internships
Participation in scientific councils
Additional employment</td><td>Cooperation Agreements
Research consortia
Joint research programs (external financing)
Recommended research projects</td></tr>
<tr><td>Individual forms</td><td>Personal contacts
Taking part in conferences
Guest lectures
Participation in research / design teams</td><td>Apprenticeships and student internships
Internships / doctoral studies
consultancy
Additional employment</td></tr>
<tr><td colspan="2"></td><td>Individual forms</td><td>Institutional forms</td></tr>
<tr><td colspan="2"></td><td colspan="2">Binzes</td></tr>
</table>

The most common form of cooperation between the university and the company is: organization of apprenticeships and professional internships as well as presentation of the company and the specific industry represented - whose task is to inform students and graduates about the possibility of taking up a job (e.g. during organized job fairs).

Benefits of entrepreneurs and universities resulting from cooperation:

- safeguarding junior staff
- raising the qualifications of current employees
- Acquiring and educating new employees
- uilding a good image among current and potential employees

8. Conclusion

1. Processes to be mapped should be identified.

2. The necessary equipment must be defined and installed, taking into account the appropriate technical administration and regular updating.

3. Training staff must be qualified

4. Specialized staff must be involved.

5. Only then is it possible to develop teaching and learning tasks and integrate them into technical systems as well as test them.

Glossary

BIM- The term Building Information Modeling (BIM) describes a method of networked planning, execution and management of buildings and other structures using software. All relevant building data are digitally modelled, combined and recorded. The building is also geometrically visualized as a virtual model (computer model). Building Information Modeling is used in the building industry for construction planning and execution (architecture, engineering, building services, civil engineering, urban development, railway construction, road construction, hydraulic engineering, geotechnics) as well as in facility management.

The method is mainly concerned with processes. The BIM applications are mainly related to communication, coordination and teamwork. Software, hardware and cloud solutions are required for BIM implementation.

Open-BIM

With Open-BIM, dataisexchangedwith open informationmodels. An open information model is based on a disclosed schema. The most widely used schemas are those of buildingSMART (including IFC, BCF). With an Open-BIM approach, the software used should be able to import or export data according to the open information model agreed upon in the project. Software from different manufacturerscanbeused.

Closed-BIM

In Closed-BIM, data is exchanged and integrated according to a proprietary information model of a software manufacturer. A proprietary information model is based on a schema of the software vendor whose structure is not disclosed ("closed"). In a Closed-BIM approach, the software to be used should be tailored to several planning disciplines and the project team should be composed in such a way that as many planning disciplines as possible can work with this software.

BIM models: from 3D-4D to 5D-6D-7D

3D model - The term 3D is mainly used in the trigonometric calculation and production of spatial volume models (coordinates: length-width-height). In the following ones, additional dimensions are added (4D-hyperspace-hyperspace body simulation-rotation)

BuildingSMART International is an international non-governmental non-profit organization. It defines the Industry Foundation Classes (IFC) exchange format for BIM data exchange in the construction industry. https://www.buildingsmart.org

BIM software -

These include: Software for creating models, test programs, simulation programs and data exchange platforms for models

BIM guidelines and standards

In DE - VDI Guideline 2552 https://www.vdi.de/richtlinien/unsere-richtlinien-highlights/vdi-2552

Blended learning

Blended Learning is a combination of different methods and media, which integrates as a universal learning organisation all methodological, media-didactic and media-pedagogical as well as learning theoretical orientations.

CAD (computer-aided design)

Computer aided design refers to the support of design tasks by means of EDP for the manufacture of a product (e.g. buildings).

CAGD - Computer-Aided Geometric Design

refers to the computer-aided description of the shape of geometric objects. It deals with the description of two-dimensional curves as well as three-dimensional surfaces and bodies.

CAM= Computer-aided manufacturing

CIM- Computer Integrated Manufacturing/Building

The CIM method also deals with data use. In contrast to BIM, planning data is directly transferred digitally to production (e.g. in timber and precast concrete construction).

Digital construction document

An electronic construction file with which all internal and construction processes can be depicted and completely documented. For construction projects it is important to be able to query the current status at any time. Documents can be controlled and logged in an electronic archive and edited.

Digital twin

A digital twin is a digital representation of a tangible or intangible object or process from the real world in the digital world. It is irrelevant whether the counterpart already exists in the real world or will exist in the future.

EU BIMTG

EU-BIM Working Group

http://www.eubim.eu/wp-content/uploads/2018/02/GROW-2017-01356-00-00-DE-TRA-00-1.pdf

HOAI

Fee schedule for architects and engineers (Germany)

LMS - means Learning Management System MS, also used is the term Learning Management Software. It is a platform that combines various functions.

As a complex content management system (CMS), the system enables to support teaching and learning processes, to manage learning materials and user data as well as to control the execution of courses including test procedures.There is a need for schools to use a system to have an overview of their students' progress and grades.

LOD

Degree of finalization, defines the necessary information content and level of detail of the digital building models.

A large number of 400 terms (in German and English) are available at

https://www.baunetzwissen.de/glossar/a?thema=bim

https://bimdictionary.com

SOURCES /Other recommended links

https://group.thinkproject.com/de/ressourcen/bim-glossar

https://www.dbz.de/dbz-newsletter_3275088.html

https://de.wikipedia.org

https://www.computer-spezial.de/artikel/baustelle-4-0_3265917.html

https://www.easy-lms.com/de/wissenscenter/wissenscenter-lms/was-ist-ein-lms/item10182

https://www.baunetzwissen.de/bim/fachwissen/grundlagen

Contact to the partnership

Germany

BGZ Berliner Gesellschaft für internationale Zusammenarbeit mbH
Pohlstraße 67
DE – 10785 Berlin
Telefon: +49 (30) 80 99 41 11
Telefax: +49 (30) 80 99 41 20
info@bgz-berlin.de
www.bgz-berlin.de
www.fit4bim.eu

Hochschule für Technik und Wirtschaft Berlin
University of Applied Sciences

www.htw -berlin.de

Max-Bill-Schule
OSZ Planen | Bauen | Gestalten

www.max-bill -schule.net

Belgium

ROBERT-SCHUMAN-INSTITUT

www.rsi-eupen.be

www.weiter - mit - bildung.be

Denmark

AARHUS TECH

www.aarhustech.dk

VIA University College

www.via.dk

Poland

poznan university of technology
institute of structural engineering

www.put.poznan.pl

ZSB POZNAŃ Zespół Szkół Budowlanych

www.zsb.com.pl