NETconVET

Network for future innovation of major competences in vocational education and training in construction

project number: 2017-1-DE02-KA202-004118

project website: https://sites.google.com/site/netconvet/

Phase 5:

Existing BIM Curricula/Contents/Methods

FUNDACIÓN LABORAL DE LA CONSTRUCCIÓN

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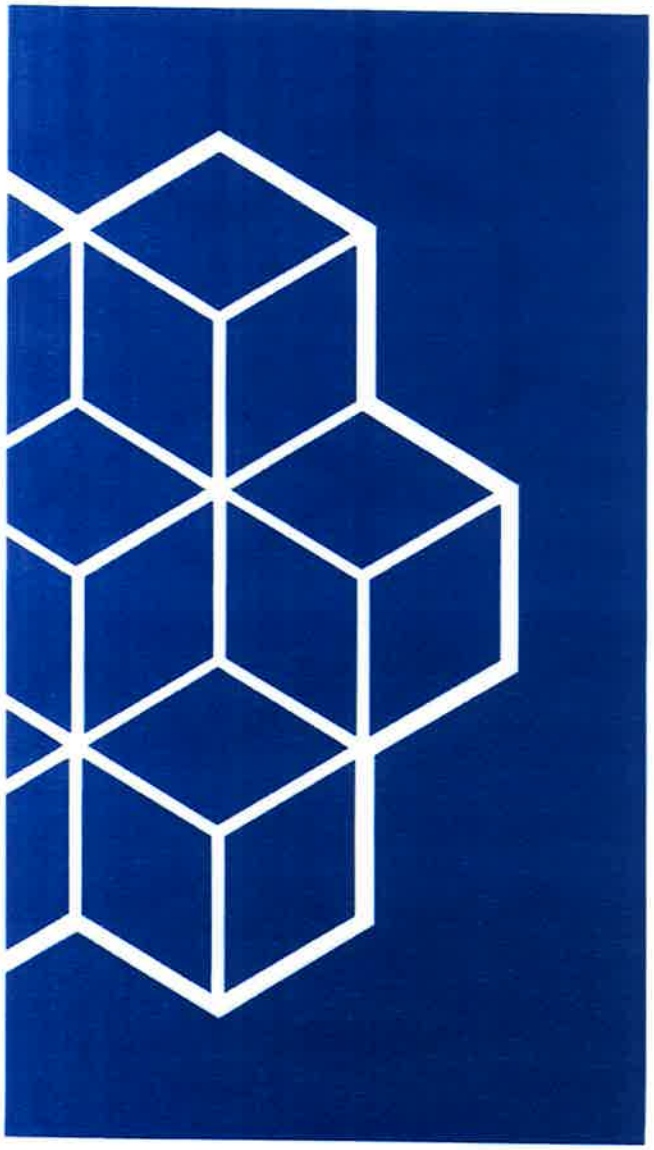
IBE

SATAEDU

BZB



BZB
Bildungszentren des Baugewerbes e.V.

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Funded by the Erasmus+ Programme of the European Union

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Questionnaire : Existing Curricula in VET related to BIM, automatisation and robotics

Aggregated results of

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Structure

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1. **BIM offers in Germany**
2. **Courses for use and control of robots on construction sites**
3. **Designs of job descriptions**

1. BIM offers in Germany

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REVIT GRAPHISOFT ARCHICAD ALLPLAN SketchUp

1.REVIT software

Developed by: Autodesk

Published in: 05 April 2000
Current version: 2020 (April 2019)
Operating system: Windows
Consists of: 2D and 3D modelling of a component-oriented building model

On the German market: since 2004

1. BIM offers in Germany

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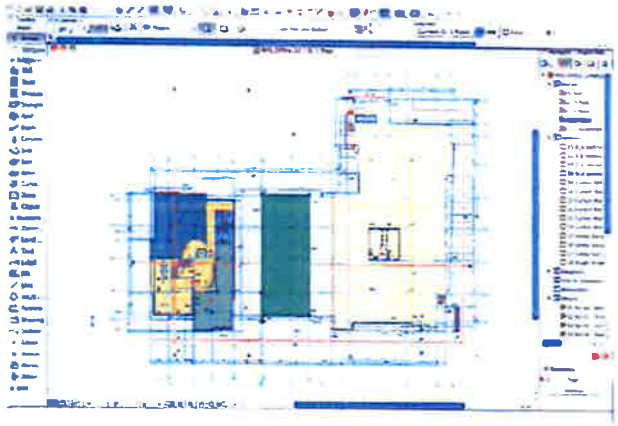
2. Archicad software

Developed by: graphisoft
Current Version: 22 (02 May 2018)
Operating system: Windows, macOS



Other programs are Juverz, BAZ7

2. Courses for use and control of robots on construction sites

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- **In the construction industry: about 46% of jobs are endangered by artificial intelligence**
- **Of a total of 2 million jobs 930,000 could be replaced by robots in the near future**
- **The construction industry in the midfield of the sectors**

3D printer for housewalls

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- **The vulkan from ICON**

Hadrian 109

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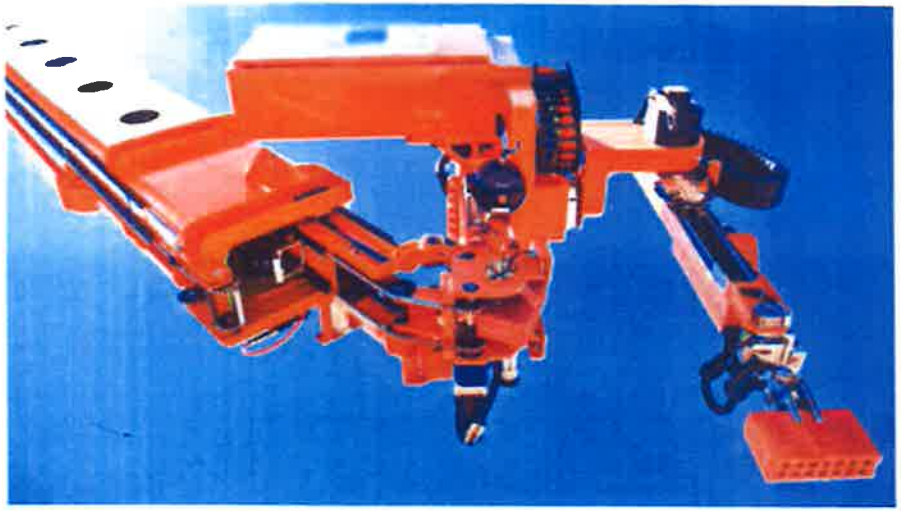
https://www.youtube.com/watch?v=264r1Bowy-g



Sam100 construction robot

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https://www.youtube.com/watch?v=tK9oBQyR9KY

3. Designs of job descriptions

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Three types of automation :

- the automation of routine tasks with low complexity, such as the retrieval of customer data in the call center
- the cognitive automation in which patterns are recognized or speech is processed.

  Example: the Amazon Go Store, which automates the scanning and payment of products
- the use of robots and sensors that interact with humans, such as Sam100 (Wall)

3. Designs of job descriptions

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Three different task areas for new jobs:

- **Training**
- **Explaining**
- **Reviewing**

4. Courses on digital platforms (exemplary)

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- **Microsoft → basic courses**
- **Robot driving licences for workers**

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Phase 5:

Existing curricula/contents/methods

The situation in

SPAIN

by

Fundación Laboral de la Construcción (FLC)

Building Information Modelling – BIM

In Spain, following the Recommendation from the European Directive on public procurements (2014/24/UE), the Ministery of Public Works funded in 2015 the National Commission es.BIM, that analizes how to implement BIM at a national level. Within its Roadmap, it is foreseen to draft the academic training in Spain and to promote its inclusion in training programmes.

BuildingSMART Spanish Chapter analized in the level of implementation of BIM in Spain, in 2018. Some of the conclusions are:

- Most of the dissemination of BIM in Spain is about Technology, and more specifically about the use of modeling tools. Hence, software and technology developers and suppliers are the most active.
- The main impulse in the adoption of the BIM methodology comes from certain associations and groups of users, based mainly on voluntary actions and particular contributions of its members.
- With rare exceptions, public administrations have adopted a passive position without assuming the expected leadership.

As mentioned in NETconVET_Phase 3, in Spain there is no official certifications or regulated training, what has allowed a wide training offer. If we put the focus on the organisation that deliver the training, we find:

- Universities (public and private), by their's own means or in collaboration with a training consultancy.
- Private training centers: training centers collaborators of software companies, but also training academies that manage funded public funds and deliver BIM courses through FUNDAE.
- Fundación Laboral de la Construcción, considered as special training center, due to the characteristics of the institution.

Target group of BIM training

Because of the initial level of implementation, the main profile that address this courses are high-level cualified people (architect, engineer). Fundación Laboral de la Construcción has the aim of introducing BIM concept at lower levels, and train in how to visualize and interpretate different models.

Small work field

Since the variety of BIM training in Spain, it has been googled "Training in BIM" (in spanish language) and filtered by the results published in the last year and these are the results of the 20 first pages of links:

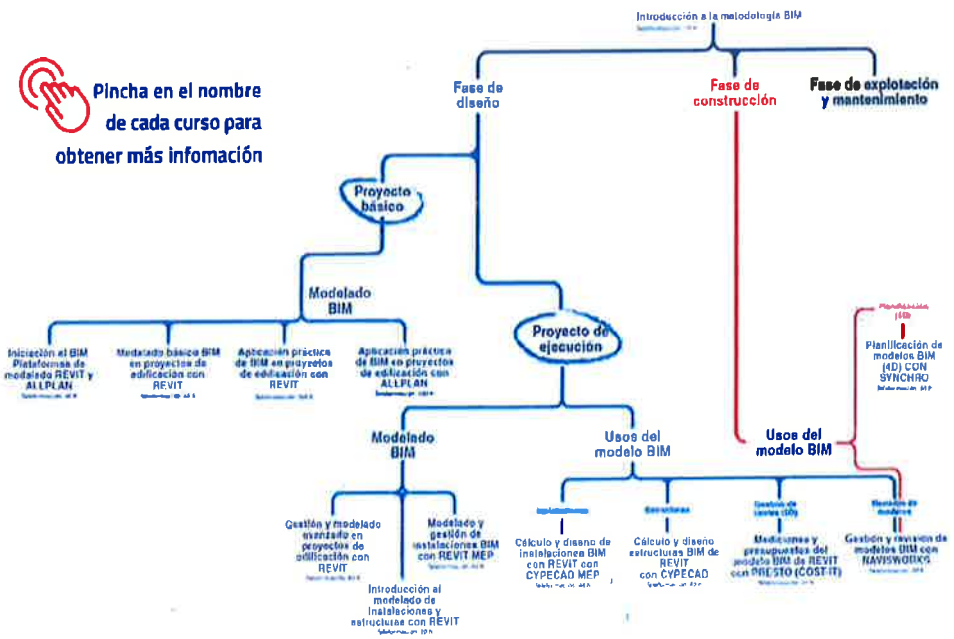
- 6 results link to blogs that advice what features to take into account in choosing a BIM training course.
- 14 results link to BIM courses:
    - Only one were managed by a (private) university.
    - Three of them were courses exclusively in presence (the one managed by the university, one-day training and a 160 hours course).
    - Three of them were courses exclusively on-line
    - Eight results offered courses that could be done both on-line and blended.
- There is a wide variety in terms of length, most of them are less than 200 hours.

BIM in Fundación Laboral de la Construcción

FLC is a paritarian institution that works for the qualification of the construction sector. In this sense, it has created a new path of work promoting BIM: "BIM environment", that offers:

- Training adapted to each profile.
- Specific training to each phase of the project.
- Training adapted to the work needs
- Solve questions through a free advice service

The training itinerary follows the next scheme:



According to 2018 data, a total of 890 students has passed through BIM training actions delivered by Fundación Laboral de la Construcción

Acciones formativas BIM en la FLC (2018)	Alumnos
Modelado básico BIM en proyectos de edificación con Revit	230
Introducción a la metodología BIM	179
Mediciones y presupuestos del modelo BIM de Revit con Presto (Cost-it)	60
Aplicación de la tecnología BIM en proyectos de edificación	60
Gestión y modelado avanzado de proyectos de edificación con Revit	46
Planificación de modelos BIM (4d) con Synchro Pro	46
Aplicación práctica de BIM en proyectos de edificación con Revit	43
Introducción a la implantación de la metodología BIM	33
Introducción práctica a la metodología BIM	30
Revisión de modelos BIM con Navisworks	26
Iniciación al BIM	19
Introducción a la metodología BIM aplicada a obra civil e infraestructuras	17
Diseño y cálculo de instalaciones BIM de Revit con Cypecad MEP	16
Aplicación práctica de BIM en proyectos de edificación con Allplan	14
Autodesk Revit MEP 2016	14
Iniciación a la metodología BIM	13
Introducción al modelado de estructuras e instalaciones con Revit	13
BIM en proyectos de edificación con Revit	10
Revit. Nivel básico	9
Gestion y revisión de modelos BIM con Navisworks	7
Diseño y cálculo de estructuras BIM de Revit con Cypecad	5
Metodología BIM con Archicad	5
Iniciación al BIM. Plataformas de modelado: Revit y Allplan	3
Modelado y gestión de instalaciones BIM con Revit MEP	2
Total alumnos BIM	890

Curricula and methods in Vocational Training

The current educational system enables students to choose the most appropriate training option, what also plays a fundamental role in the chance of finding employment. But the successful labour insertion of users does not only depend on their level of training but also on their level of professional skills. Vocational Training aims to ensure the entry in the labour market and plays a crucial role in the current situation: high unemployment figures and other inefficiencies, such as the high over qualification in some occupations.

The situation today is an uncertain panorama: changing world regulations, constant demographic movements, rapid technological changes, continuous demand for new skills and abilities to adapt to companies and the emergence of new sources of employment. It implies the demanding a high degree of competitiveness that should not be taking into account by Vocational Training centres, offereing attractive and innovative training.

Vocational training in the construction sector

VET training for civil works and building, there are both on-site and online modalities. The last one is adjusted to the demand of this type of certifications by people attracted by the possibilities of technology and digitalization. E-Learning has been identified as one of the most successful way to offer quality training in the contents now accessible to all audiences.

This type of courses are especially aimed at those people who cannot attend Vocational Training in educational centres and during classroom hours, so that learning in this modality allows each student to decide, on their own and once the courses have been analysed, which modules they wish to enrol in depending on their personal conditions and availability. However, there are construction works that only can be learnt by the "learning-by-doing".

In the areas of civil engineering and building, users will be able to apply for digital skills such as the development of models, plans and presentations in 2D and 3D that will undoubtedly facilitate the visualization and understanding of civil engineering projects and land use planning. In this context, training in methodologies such as BIM (Building Information Modelling) are presented as necessary when starting or updating studies in the construction sector.

The BIM methodology provides all actors in a construction process with the ability to update and incorporate information online into the project, so that a change by an architect, site manager or on-site worker in the same construction is reflected in all

components, gaining a communicative and management advantage that energizes the construction process by saving costs and bringing all participants together. This type of techniques represent the cutting-edge in the construction sector, always in conjunction with technology and new ways of building, which also demand new training capabilities from users who have to adapt to the new environment towards which we are heading.

In addition, in terms of the professionalization of the sector, the proportion of workers with a basic level of education has been reduced in the last ten years in a considerable way, which represents a very positive aspect. It could be implied that, although the construction industry is increasing their activity, it is no longer considered that, as in previous times, any unskilled worker can access to the sector, rather than the requirements for working in construction are now going through professionalization.

New trends

In addition to the use of digital tools, students focus their studies on the new needs demanded by the sector. This is why **certifications in "green" or sustainable construction** have been increasing in recent years. The role that the construction sector plays within sustainability at a global level becomes part of the agendas of governments, as well as public and private entities, transforming the activities and ways of conceiving construction by the different actors involved.

For this reason, construction today shifts towards a sustainable and inclusive sector, far from the conceptions previously established. As a consequence, construction professionals will have to know the new construction techniques, the new "eco" materials, their treatment, the risks involved and the new forms of organization within the construction process.

Energy poverty, **water saving** or the **insertion of women** in the construction labour market respond to the objectives of the 2030 Agenda for sustainable development at a worldwide level, in which the construction of resilient cities is one of the keys to both local and global development.

This situation totally changes the paradigm with which vocational training moved before, focusing on the future and the long term rather than on the immediacy of projects and requiring cutting-edge skills that adjust the reality of the labour market to the training of workers.

EU-certifications

Bologna process aimed at ensuring comparability in the standards and quality of higher-education qualifications, that introduced along the European universitys a new system of credits: European Credit Transfer and Accumulation System (ECTS).

The same has been initiated for VET training, with European credit system for vocational and training (ECVET)[1], in addition to other initiatives such as the European qualification framework (EQF) and Europass. However, it could be said that there is a long way to go in terms of recognition and comparability concerning EU VET training.

Europass was created in the eighties to remove the obstacles to the mobility of workers generated by a lack of transparency in the profesional cualifications. It counts on three documents issued by education and training authorities:

- Europass Mobility records knowledge and skills acquired in another European country (e.g.work placement in a company; an academic term as part of an exchange programme),
- The Certificate Supplement, that describes the knowledge and skills acquired by holders of vocational education and training certificates.
- The Diploma Supplement, that describes the knowledge and skills acquired by holders of higher education degrees (university or high grade Vocational Training)

Thus, a student can have an attached document to his/her formal diploma that enables the understanding by employers what KSC have been acquired in formal training.

[1] Recommendation of the European Parliament and of the Council of 18 June 2009 on the establishment of a European Credit system for Vocational Education and Training (ECVET).

Just as a complementary information, it said that Spain is the first positions using Europass CV. In the following image it is shown the number of CVs completed online:

ECVs completed online (2018, Top 15 countries of residence, by age group)

Countries	Up To 20	21-25	26-30	31-35	36+ Years	Subtotal
Austria	18,050	13,296	9,331	4,723	8,236	53,636
Germany	16,257	28,656	25,457	12,443	14,524	97,337
Spain	55,141	74,255	38,836	19,009	34,221	221,462
France	18,876	13,702	7,104	4,005	10,050	53,737
United Kingdom	3,877	10,356	8,589	4,631	8,107	35,540
Greece	18,245	42,772	26,462	15,710	20,194	123,403
Croatia	12,530	34,480	29,819	13,444	16,401	106,674
Hungary	25,382	32,179	15,660	7,067	16,076	96,364
Italy	232,276	336,707	258,424	127,626	232,576	1,187,609
Malta	12,883	9,041	5,857	3,151	4,585	35,477
Poland	18,988	10,144	5,690	2,600	2,990	40,392
Portugal	114,282	162,538	105,836	69,274	128,462	580,392
Romania	60,055	83,979	40,541	18,885	36,000	239,460
Slovenia	5,240	15,630	20,108	11,109	14,972	67,059
Turkey	11,413	44,611	13,240	3,108	2,531	74,903
Subtotal	623,466	912,346	610,794	316,985	549,905	3,813,445

Countries	Up To 20	21-25	26-30	31-35	36+ Years	Subtotal
(Others)	107,614	264,751	164,827	73,758	89,687	700,637

Countries	Up To 20	21-25	26-30	31-35	36+ Years	Subtotal
Total	731,089	1,177,097	775,581	390,743	639,592	3,714,082

4º

Erasmus + programme

In Spain, according to SEPIE (Spanish Service for the internationalization of the education)[2], 9 million of people has taken part of Erasmus programme along 30 years of existence. Some figures from the report about the analysis of this programme highlights are:

- 73.100 mobilities for VET trainees.
- The participants has found early their first job and earn 25% more
- 80% of trainers use new methodologies in school and VET
- Spain has received 1.300.000 VET trainees

Memorandum of Understanding (MoU)

The MoU is a formula that Fundación Laboral de la Construción is being using years ago in its coordinated European projects. It is an agreement opened to all the interested organisations that agree the recognition of the learning outcomes described in the training developed in the project, when it has follows ECVET recommendations[3]. It provides a general framework of cooperation and networking between the partners, through which a

[2] http://sepie.es/doc/newsletter/2018/13/libro.pdf

[3] Recommendation of the European Parliament and of the Council of 18 June 2009 on the establishment of a European Credit system for Vocational Education and Training (ECVET).

climate of mutual trust is established; and assist the partners in the design of specific arrangements for credit transfer for learners.

This is not a legal document, but enable mutual understanding and trust among different countries, assuring this way the process of recognition and validation of skills by common accreditations as well as a coherent implementation at national level.

The structure of the MoU is the following:

- *Description of the MoU objective and scope*
- *Signatures of the institutions*

SPAIN	
Procedures for the accreditation and recognition of learning outcomes: Learning outcomes would be eventually recognized by the participation of the applicant in a recognition of occupational competencies process, which have been acquired by experience or non-formal training. To do so, LO must have correspondence with competencies officially included in the National Catalogue of Qualifications.	
Name and status of the body awarding the LO: Fundación Laboral de la Construcción	**Name and status of the national/regional authority providing accreditation/recognition of the LO:** Ministry of Labour and/or competent Regional Body.
Type of certification : ☒ **Official certificate** ☐ **Non official certificate** **Describe the type of certificate:** Occupational certificate **Level of the certificate (national or international)** **European level: EQF 4**	
Legal Basis: Royal Decree 1224/2009, 17th of July, on the recognition of occupational competencies acquired by working experience.	

Example of signature of a MoU

- *Body of the Qualification covered*:
  - Title
  - General aim of the training programme / Key competence to be acquired
  - Sequencing and distribution of professional modules (Module, hours and ECVET credits)
  - Occupations involved / target groups
  - EQF level
  - Module x: Learning units, hours, ECVET points
    - Unit x: general description, learning outcomes. Outline of unit contents, Assessment

New delivering of training

Nowadays, the digitization of the society has become an essential element to take into account when rethinking the ways of understanding and acting in the world in which we live. Thanks to the growing connectivity provided by the Internet and digital media today within our reach, the present and future of vocational training are immersed in a constant process of modernization that gives us a new range of possibilities that undoubtedly represent an advance in diversity and accessibility of training.

These new trends go hand in hand with technology, digital resources and both public and private platforms that are gradually directing their efforts towards the creation of online training, what make it more accessible and better accepted by the general public.

Emerging technologies

The construction sector today is experiencing the deficits of a productive system rooted in the years. However, new forms of construction and new professional profiles demand the use of digital tools as the present and future dynamism of the sector.

In this context, methodologies such as virtual reality (VR) or augmented reality (AR) allow the user who receives the training an in situ experience in which he can develop tasks and solve problems that arise in a practical and dynamic way, giving the value that experience brings to the student. In addition, they can be used to create 3D representations of buildings before they are built, allowing the user to move around the building, while augmented reality superimposes additional information on the user's view of the real world.

A clear example of the irruption of these techniques can be seen in the European **AR-key project**, funded by the EU Lifelong Learning Programme, which used AR to improve key skills in mathematics, science and technology for unskilled construction workers by creating an application that can be used on a tablet or smartphone to view a building.

Accessibility in training

The Internet has revolutionized the space in which users can develop professionally. Far from serving as a mere channel of information, today it is possible to take qualified training courses from your own home, so that accessibility and the possibility of conducting a wide variety of courses professionalizes and specializes professional training both in construction, as in other economic and social sectors.

Platforms such as Linked-In or Google Activate are currently betting on the opening of certified courses in different subjects through the development of video-tutorials, direct

contact between trainer-student through video calls, online test evaluations and MOOC (Massive Open Online Course) with didactic material available to the general public.

The change in the lifestyle of today's society together with the problems of reconciliation of work and family has highlighted the advantages of this type of technique and its attractiveness to the user and, undoubtedly, represent a challenge for those centers that have continued with a traditional style or the use of providing training. Faced with this situation, training centres have to compete with this type of methodology in order to provide quality training adapted to the new needs of the training market.

In Spain, the acting Minister of Education and Vocational Training, Isabel Celaá, has announced the implementation of a Digitalisation Strategy in Education and Vocational Training and the development of a new VET law, which is undoubtedly a response to the current need to meet the challenges demanded by companies and professionals today. This makes it clear that public institutions are at the forefront of the e-Learning modality, which is the most innovative and allows all citizens to access all information on this type of education, in which the Ministry itself incorporates a portal which collects the offer of distance vocational training of the Ministry of Education of the different Autonomous Communities.

Conclusion

In the digital age we find that the ways of providing training are clearly different from the methods used until now. The advances in training with digital tools allow the user some advantages that were not available before. Public and private institutions return their efforts in this type of techniques and technologies with the aim of forming a training accessible to everyone, dynamic and adjusted to the reality of present and future challenges.

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The situation in
LITHUANIA
by
Viešoji įstaiga Vilniaus statybininkų rengimo centras / Lithuania

Background

The rapid development of digital construction in the world started several years ago - the majority of construction companies achieved the second digital design level (out of three), i.e. electronic document exchange-based collaboration in developing element libraries and creating drawings using BIM solutions. The Lithuanian construction sector is not an exception - many companies have successfully launched and continue to implement digital design software packages to achieve the last level of building information modeling. In the last level, along with the entire building modeling, collaboration with electronic data exchange platforms (BIM, GIS, GEOBIM, etc.) is also included. On the other hand, one of the most important aspects of implementing the principles of digital construction into construction projects is teaching and upskilling professionals which can be achived by improving current training programs and developing new ones.

Existing BIM training in Higher education

- Vilnius Gediminas Technical University is the only higher education institution in Lithuania which has a Master's programme called "Building Information Modeling". The programme is aimed for structural and civil engineers aspiring to become BIM specialists.
    1. Aim of the programme: to provide knowledge of BIM and develop special engineering skills necessary for successful project, applying the recent calculation and construction principles, modern technologies and BIM programs.
    2. Content of the programme: most attention is given to modeling the whole life-cycle of the building. The students are taught to integrate engineering networks and individual parts of the building into the project, also, basics of preparing the documentation, regulation of all the processes during periods of designing and construction, quality supervision.
    3. Methods of teaching: one-third of studies is for theory, the remaining part of studies – for writing Master's thesis and practical courses. Practical lessons consist of learning to use BIM programs (Autodesk Revit, Aecosim ect.) and applying theoretical knowledge for preparation of the documentation, modeling the building, planning the construction schedules and calculations of economic and technological resources.

- Kaunas University of Technology does not have a study programme related to BIM, but organizes specialized courses called "Basics of Building Information Modeling" and "Building Information Management".

1. Curricula of the course: digital construction, architecture and engineering, proper distribution of work among team members in a BIM project, modeling of engineering systems, legal aspects of BIM application and regulation.
2. Another course called "Building Information Management", is closely related to the "Basics of BIM" course, focusing more on BIM deployment strategy, development of planning and organization skills.

- Vilnius College of Technologies and Design offers a course called "BIM Modeler Trainings".
    1. Aim of the course: to prepare BIM modelers by providing them with the necessary knowledge and skills needed to create a three-dimensional building information model.
    2. Curricula of the course: the course is focused on how to work effectively with BIM's automated drawing and design programs. Participants are trained to create a graphical-information model of a structure, to generate drawings and other information from a modeled building, as well as perform simulations and analyze their data.
    3. Methods of teaching: 60 hours of theoretical and practical exercises.

- Panevezys University of Applied Sciences and Kaunas University of Applied Sciences both have a study programme in Civil Engineering. In these universities, students are provided with the opportunity to learn how to work with specialized BIM programs.

Existing BIM training in Vocational education and training

Up until now, BIM topic was covered in VET curricula to a very limited extent. The main reason for that being shortage of knowledge and skills of VET trainers and teachers in digital construction. Nevertheless, the first steps can already be seen: recently the Ministry of Education has approved a totally new VET training programme for Computer design operator that will be launched in several construction schools of Lithuania starting from September 2019.

1. Aim of the programme: to train a qualified specialist (EQF Level 4) who is able to work in information and communication technology sector businesses and other sector organizations that provide computer design and engineering graphics objects design services.
2. Content of the programme: design of simple computer and engineering graphics objects, their components, including application of information and publishing technologies, design and editing of engineering drawings, two-dimensional and three-dimensional computer graphics objects and their projections, depiction and compilation of 3D objects with computer graphics programs, application of graphic design means of expression , modeling of object visualizations, drawing of mechanical constructions, drawings and construction details of wooden structures, furniture and interior details, creation and editing of raster images, design of spatial bodies in virtual environment, creation of websites using flexible methods and tools of teamwork.
3. Methods of teaching: 60% of theory training + 40% of practical taining (in-company training).

Other existing BIM training opportunities

- The public institution "Skaitmeninė statyba" ("Digital Construction") was established in 2014 with the aim of coordinating the digital process of construction on the national level. This institution organizes various projects related to BIM, conferences, events, and conducts qualification trainings called "Modeling of building information in BIM". The course consists of three different modules - BIM I, BIM II, BIM III.
    1. Aim of the modules: to provide the necessary general knowledge about the digital construction and BIM methodology in construction processes, to apply gained skills in practice and to develop abilities to use special knowledge and technologies of information modeling in construction.
    2. Methods of teaching: theoretical and practical exercises.
    3. Curricula of the modules: module BIM I is focused on the proper use of model information, data management in construction processes, working with visual and graphic digital data, mastering the principles of planning and implementation of technical, technological and economic indicators of a building. Module BIM II is designed to deepen the knowledge gained in the BIM I module. Module BIM III consists only of theoretical course and exercises. The participants learn about data exchange principles, a project data management, roles and responsibilities of project participants.

- JSC "InfoEra" is an organization that sales BIM software and customizes it according to clients' needs. The agency organizes specialized training courses for BIM professionals. The purpose of these courses is to provide professionals and project managers with the necessary knowledge and skills for digital modeling of a building.
    1. Methods of teaching: theoretical and practical exercises. The basic principles of BIM, documentation, market trends, innovations are discussed in the theoretical part. Practical exercises consist of using BIM applications (Autodesk Revit, Infraworks, and FormitPro) to form models and drawings, to connect and interface models with other BIM programs, teach correct file placement in the cloud.

JSC "InfoEra" is also organizing software tool training courses. These courses are also closely related to BIM – 3D modeling, engineering network design and modeling, integrating these modeled products into a common project.

- JSC "AgaCad" – design software developer and exporter, CAD and BIM technology expert. The company is engaged in the implementation of BIM projects, software development and sales and professional BIM consulting. There are different types of BIM training courses organized - basic, advanced, management, maintenance and control. The courses are for specialists in various design and construction companies: project managers, real estate developers, BIM managers, BIM coordinators, estimators, project quality control specialists.

1. Curricula of the courses: the participants are provided with knowledge about BIM processes, project organization and management, what information is required to prepare a successful BIM project.
2. Methods of teaching: theoretical and practical exercises.

- "Net-Ubiep" is an ongoing project organized to increase the energy efficiency of buildings by promoting the use of BIM in the life-cycle of buildings. The number of participants is not limited and many Lithuanian construction and science companies have already joined the project.
    1. Aim of the project: to create a network of BIM competencies contributing to energy conservation with the participation of businesses and research institutions.
    2. Main objectives of the project: the initial stage is to identify professions that are related to the zero-energy buildings sector and to describe the specific competences of the BIM needed by these professions.
    3. Methods of teaching: theory-based work and courses on digital modeling. These courses are intended for professionals in the construction industry and the purpose is to create an integrated network of energy efficiency and BIM competencies to increase energy efficiency, to effectively design and build and use energy-efficient, sustainable buildings.

- JSC "Intelligent BIM Solutions" is a company that works with design, construction companies and customers and provides them with consulting services and software packages. The company has a BIM training academy and specialized BIM management training for companies. Internal trainings and special trainings are organized for project promoters, project managers, BIM managers and BIM coordinators.

- Centre of Excellence for BIM Advancement in the Baltics is a collaboration agreement between Vilnius Gediminas Technical University, Riga University of Technology and Tallinn University of Technology. The activities of the Centre of Excellence for BIM Advancement in the Baltics will focus on the training of qualified and high-skilled BIM specialists by establishing a special Baltic Knowledge Foundation that will enable the sharing of existing human and technical resources of the three universities, the development and implementation of new study programs, the development of methodologies and the sharing of research results.

CONCLUSIONS ON EXISTING BIM TRAINING

There are quite a few private trainings organized for companies' employees to improve their skills and competences. There is also a growing number of companies selling various software that organize specialized courses to maximize and accelerate the integration of the construction sector into the digital space. On the other hand, there are very few specialized study programs in higher education institutions - the students of civil engineering are only introduced to BIM technologies but do not have the opportunity to learn to use them. As a whole new study program takes a long time to create, existing building engineering and management programs could be improved by promoting

the use of modern BIM programs throughout the learning process. Vocational schools could also integrate more theoretical and practical activities, emphasizing the importance of BIM throughout the life-cycle of a building.

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The situation in
NETHERLANDS
by
Open Universiteit / Netherlands

Innovations in training and curricula

When looking at innovation in the field of construction in the Netherlands, one can see that it is at most project-orientated. The fractured knowledge infrastructure in this important sector is somewhat fragmented, whilst there is a growing need for a construction-wide scope. It can be seen that there is a real need for better connections between contractors and clients in the Netherland's construction industry, the government and the scientific knowledge institutions.

Via the Building Agenda (the Bouwagenda), a national innovation programme designed for the whole construction sector, the government, knowledge institutes, the business community and clients, have come together to address and solve a number of extremely urgent social issues. The changes in our world brought about by climate change, energy transition, the depletion of important raw materials, sustainability, the ageing population, urbanisation and digitalisation are large and complex tasks and a new approach is needed to address the major task of replacement, to which disruptive solutions may need to be sought. With themes such as 'human capital' and 'digitalisation and computerisation', the Building Agenda is there to provide the necessary innovation and resulting productivity boost. Consider an industrial building prefabricated off-site (e.g. in a factory) and then the installation of plug & play upon its arrival onto the building location. Home automation and Smart ICT also contribute to longer and more comfortable living in that important home environment and new training courses in the field of construction, and the application of the newly-gained knowledge, will bring about the successful innovation needed in this rapidly moving new world. In concrete terms: focusing on the new training and education in this demand-driven approach will encourage the development of new competencies and bring about highly successful investment in the production and resulting quality of newly-learnt craftsmanship.

Developments in VET

For example, the agenda in the all-important construction field has begun the process of establishing cooperation between the government, the business community and also senior secondary vocational education (MBO), with the objective of establishing a variety of training courses working towards energy transition.

For example, on 30 January 2019, thirteen organisations from the arenas of government, the business community and the MBO, signed the Covenant on Climate Technology for the MBO (MBO-supply), with the desire of creating a range of MBO training courses which will adjust with the changes in circularity, energy transition and climate change. These covenant agreements are mirroring the recent draft climate agreement and indicate the responses from the business community and the MBO, as to the demand from the market for such specialised professionals. The initiators expect that, in this way, newly-designed MBO courses will become highly attractive to side entrants, to state an example.

With regard to the MBO covenant, each signatory will contribute to efficient implementation in their own way. The construction and technology sector demonstrates how the professions in construction are changing and supplies supportive information to the SBB (Samenwerkingsorganisatie Beroepsonderwijs-Bedrijfsleven). SBB keeps diploma requirements in

qualification dossiers up to date with both education and the business community and, in conjunction with companies and schools, it provides suitable work placements and apprenticeships. With support from the MBO Council, MBO schools and training companies in the region translate the necessary changes into appropriate education. Schools which are affiliated to NRTO (the Netherlands Council for Training and Education) will develop and customise courses for lateral entrants. Via construction and installation companies, new specialised craftsmen and women are offered work guarantees.

Higher Vocational Education

In HBO (the Dutch Higher Vocational Education), there are commercial training institutes and several universities of applied sciences that offer specialisation courses, and also training, in important fields, of which BIM is an example. The length of these courses can vary from one day introductory courses to the longer, and more involved, postgraduate courses.

Examples

BIM Basic course - Cadix
"During the BIM Basic Course you will learn about the BIM (Building Information Model) process and the opportunities that this new way of working offers. Collaboration during the design and construction process is an important theme in the implementation of BIM and is therefore extensively discussed. You will also get a clear picture of the additional exchange possibilities with chain partners. The BIM Basic Course provides tools to determine the strategic significance of BIM for your company."

Postgraduate BIM Engineer - Avans University of Applied Sciences
"With the increase in BIM projects, the need for demonstrably qualified BIM engineers is also increasing. They are the creators or designers of a BIM and are the connecting factors between disciplines. It is very important to both the client and the contractor that they have access to BIM professionals in order to be able to realise innovative and complex projects in which the quality of the end product is paramount and risks are manageable.

The transition from traditional building to BIM demands a lot from the professionals involved. How does BIM work? What does it mean for the engineer and for his working environment? How can we achieve more benefits with BIM? How can projects run more efficiently? The BIM engineer course provides answers to these questions and provides insight into working with and according to BIM.

The postgraduate BIM engineer programme is unique both nationally and internationally. In a group of different stakeholders, you will learn how to build virtually with a view to realisation, operation and circular construction."

Scientific Education

In the Netherlands, there are two universities which offer architecture courses at scientific level: these are the Eindhoven University of Technology (TU/e) and the Delft University of Technology (TUD). The bachelor's programme in architecture takes three years. After successful completion, you can carry the title of Bachelor of Science (BSc) and then enter the labour market. However, in order to obtain a full university degree, you need to also complete a master's degree, a route most students take. This takes either one or two years and carries the title of Master of Science (MSc). Both of the aforementioned universities offer the master's track, which focuses on new innovative technology.

Building Technology van de TUD

"The Building Technology track encompasses a broad spectrum of engineering and architectural design skills that lead to one of the dominant professions of the future: the sustainable designer. The emphasis of this programme is on the design of innovative and sustainable building components and their integration into the built environment.

Through focusing on structural, façade and climate design, students learn how to contribute to smart buildings that are sustainable, comfortable and environmentally intelligent. This programme stands out internationally because of its integration of architectural design with technical disciplines, filling the niche between architecture and engineering. Rather than focusing on one or two specialisations, students investigate the whole breadth of building technology, looking at climate design, façade & product design, structural design and design informatics, producing designers that know how engineers work.

Prospective students must show both technical and architectural skills, interest and understanding. The programme is well suited to architectural graduates looking to strengthen their technical qualifications and those with a technical background who want to strengthen their design abilities."

Building Physics and Services van de TU/e

"The Building Physics and Services (BPS) programme is about acquiring new knowledge and about integrating and developing design methods that lead to a sustainable, healthy, comfortable and productive indoor and outdoor environment. The programme comprises a wide range of interdisciplinary research themes, with a focus on physical aspects and processes such as heat and mass transfer in building structures, indoor air quality, lighting, acoustics, heating, ventilation, air conditioning and materials."

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POLAND

Report prepared by The Educational Research Institute, Poland

The aim of this report is to present how Building Information Modelling (BIM) is taught in Poland. We present providers from formal and nonformal education as well as methods that are used and programmes that are available.

Introduction – using BIM in Poland

Research conducted two years ago[1] showed that awareness and recognition of BIM methodology in Poland is at a high level. 80% of respondents have heard or had contact with this topic. Percentage distribution of familiarity is characteristic of the methodologies just entering on market - a small percentage of specialists (8%) and people in a practical moving way on BIM issues (6%). Every fourth respondent is referred to as the theorist of methodology. 20% of respondents did not hear and did not come across the concept of BIM.

12% of those who are familiar with the BIM methodology use it in their daily work. On average, every fifth researched company uses the BIM methodology. Companies use various functionalities. It is both partial use - visualization, 3D models; as well as more advanced possibilities - collision detection, use from the schedules or the optimization and organization of the information provided interprofessional. Every tenth company decided to implement the methodology due to preferences of customers or tender requirements. Employers require more and more often from contractors of new tools and methods of operation, allowing for cheaper, more effective or compatible with the implementation of projects.[2]

BIM is used in Poland mostly by big national companies and Polish branches of international corporations (Scanska, Budimex). Polish design offices are rarely using BIM as they are rather small and usually they act as subcontractors for bigger offices. There is an opinion among some experts that BIM is not much popular among small and medium-sized enterprises (SMEs) due to the legal reasons – it is not legally adopted (and therefore recognized) into the public procurement law. As a consequence there is a pressure for selecting offers mainly based on their prices, not their quality. And that quality might be assured by using BIM.

The research conducted four years ago[3] showed that the most frequently mentioned barrier in relation to the implementation of BIM by Polish companies were too low prices of projects, which did not allow for investment in various elements necessary for the introduction of BIM. Competence shortages were also mentioned (no BIM specialists) or the fact that there was no type of universally applicable standard around BIM. On further places there were barriers in the form of internal dispositions of stakeholders: unwillingness to change or lack of openness to new solutions.

The study confirmed that in order to increase the use of BIM in Poland, technologies at the national level should be promoted - by developing Polish standards, updating laws, as well as building awareness at the local level - in laboratories, at construction sites or universities. Increasing awareness will eventually increase the number of BIM specialists who are currently missing not only in Poland.[4]

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[1] *Rozwój Building Information Modeling w Polsce* [*Development of Building Information Modeling in Poland*] (Antal, 2017). Report developed by company Antal: https://antal.pl/trendy/raporty-rynku-pracy/1557-rozwoj-building-information-modeling-w-polsce

[2] Ibidem.

[3] *BIM – polska perspektywa* [*BIM – Polish perspective*] (Autodesk, 2015). Report from a study commissioned for Autodesk by MillwardBrown: http://damassets.autodesk.net/content/dam/autodesk/www/campaigns/bim-event/BIM_raport_final.pdf

[4] Ibidem.

Formal education

BIM is not included in the core curriculum and educational programmes within VET. Only within higher education topic of BIM might be found in the programmes within the engineering studies. Most of the public and private technical universities already have BIM classes. However, there is no uniform program basis in this area.

According to some experts, the introduction of BIM technologies and methodologies to the curricula is an extremely difficult challenge for the education system and is associated with the need to rebuild the scope and methodology of educating future engineers: "BIM is not a candidate for yet another subject in the educational offer, but for its in-depth reconstruction, digitization of methodology education, "over-subject" and "over-sectoral" perception of curricular content previously treated separately, integral and simultaneous development of professional and personality competences of candidates for the profession of an architectural engineer or a civil engineer".[5]

Duration and thematic scope are diverse among the BIM-related education - from single classes to postgraduate studies. We present below the several examples.

BIM as specialisation

BIM as a specialization (special learning pathway within master studies) has been launched for the first time in the field of Civil Engineering at the Cracow University of Technology.[6]

BIM as an interdisciplinary project within studies

The BIM interdisciplinary project is an educational project of Warsaw University of Technology, in which representatives of five industries are involved: architects, structural engineers, construction installation engineers, water engineering and security environment, electrical installation engineers and management representatives.

In addition to the project team, the classes involve coordinators and simulated partners in the investment process, partners in the area of implementation, substantive reviewers. The basic objective of the currently implemented project is preparation of multi-branch concepts, technical projects and documentation, and developing a methodology for the work of interdisciplinary teams.[7]

Postgraduate studies

"BIM Manager - modern management of construction investments" at the WSB Universities (Wyższa Szkoła Bankowa) which is private university. Duration: 2 semesters (158 hours). Programme: https://www.wsb.pl/warszawa/studia-i-szkolenia/studia-podyplomowe/kierunki/bim-manager-nowoczesne-zarzadzanie-inwestycjami-budowlanymi/program-studiow. Price: 6350 PLN.

"Operation and modernization of residential buildings with BIM elements" at the Częstochowa University of Technology (Politechnika Częstochowska). Duration: 2 semesters (220 hours). Programme: https://uslugirozwojowe.parp.gov.pl/uslugi/view?id=355540 Price: 3000 PLN.

"Postgraduate studies on BIM – Digital technologies in architecture and construction" at the Faculty of Architecture at the Cracow University of Technology. Duration: 2 semesters (158 hours). Programme: http://bim.pk.edu.pl/ Price: 4950 PLN.

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[5] http://buildercorp.pl/2018/04/18/ii-sympozjum-bim-w-edukacji/

[6] http://www.wil.pk.edu.pl/index.php?option=com_content&view=article&id=85:kierunek-budownictwo-studia-stacjonarne&catid=44&lang=pl-pl&Itemid=146

[7] http://kolegia.sgh.waw.pl/pl/KZiF/czasopisma/zeszyty_naukowe_studia_i_prace_kzif/Documents/117_III_14_Waszkiewicz.pdf

Nonformal education

There are many trainings and courses related to BIM available in the Polish market. They are provided by companies from construction sector, training companies or universities[8]. Duration and thematic scope are diverse. Additionally, it is difficult to access their quality – also their prices vary significantly. We present below the several examples to show the diversity among those trainings:

Example 1

Training: BIM Manager

Provider: M.A.D. Engineers

Duration: 2 days, 9:00-16:30 (in total: 15 hours)

Price: 2070 PLN

Included:

- Training materials in printed version
- Sets of practical original exercises using Trimble Connect, BIMplus, Tekla BIMsight and BIM Vision together with BIM models in the field of building construction for the architectural, construction and installation industries
- BEP template (editable version)
  Certificate of completion of the training [which suggests that there is no validation process]
- Post-training substantive support for a period of 30 days from the date of completion of the course

Methods:

- Workshops are organized in the form of practical exercises on computers and live shows. They are made, among others, on models of such investments as: Renovation market (revitalization of the main market in Jaworzno), Construction of the Faculty of Sculpture of the Academy of Fine Arts in Warsaw, Lower Silesian Sports Center in Jakuszyce. All practical issues are implemented on programs supporting BIM processes, including BIM Vision, Tekla BIMsight, Trimble Connect, Solibri Model Checker.

Programme covers:

- Introduction: Basic information, IFC classification,
- BIM project: definitions, basic rules for creating BIM models, Cooperation using IFC - principles, rules, good practices
- Project organisation: BIM Execution Plan
- BIM 4D, 5D: BIM on the construction site, BIM in management

More information: https://www.bimblog.pl/szkolenia/bim-dla-menadzerow/

Example 2

The BIM Summer School

Provider: bim.edu.pl

[8] http://www.wst.com.pl/kursy/BIM

Duration: Classes are held during the summer from April to October. The whole in a selected two months. 6 weekends from Friday to Sunday for 20 class hours each, a total of 120 teaching hours. Between 3 and 4 weekend break for independent project work.

Price: 2999 PLN

Included:

- 8 hours online consultations during independent work
- workbook
- knowledge from practitioners
- digital libraries of families, components and buildings
- Certificate of the BIM Summer School confirming the acquired skills
- Certificate of Autodesk Training Termination with Revit
- Certificate of Autodesk Training Completion with Navisworks
- Certificate of Autodesk Project Completion for an independent project.

Methods:

- "Digital libraries - You will receive libraries of families and components that will help you execute your projects more efficiently. You will receive ready-made partitions created according to manufacturer's guidelines, labels for descriptions and digital locations for future projects."
- "Case study - In addition to the models that you will create with us during the exercises you will receive sample projects on which you will learn other building solutions. We will show you how you can use prefabricated elements, steel structure and other unusual solutions."

Programme covers:

Participants will create 5 projects: information point, construction project BIM 3D single-family house, multi-branch design of multi-family building architecture + structures + installations, own project during independent work and project simulation of the construction process.

"The prepared exercises are the result of cooperation of the whole team and are fully coordinated with various industries. The tasks will not only concern the creation of the model in 3D. We will teach you how to coordinate a project in a team and how to make right decisions quickly thanks to analyses."

More information: https://bim.edu.pl/szkolenia/szkola-letnia-bim/

Other examples of trainings from this provider:

- BIM | Revit level 1 and 2 (price: 799 – 1299 PLN)
- BIM | Instalations | Revit MEP level 1 (599 – 999 PLN)
- BIM | Automatisation | Dynamo level 1 (1599 PLN)
- BIM | Revit + Robot level 1 (999 – 1599 PLN)

Other examples:

- https://www.graitec.pl/szkolenia-cad/szkolenia-bim
- https://projektowaniebim.pl/szkolenia-bim/
- https://www.mum.pl/szkolenia/bim/
- http://www.aecdesign.pl/technologia-bim-szkolenia/

- https://oditk.pl/szkolenie-bim-introduction-oditk-otwarte/
- http://eccbim.org/szkolenia-i-certyfikacje/szkolenia/
- http://www.archicad.pl/aktualnosci/wydarzenia/489-szkolenie-bim-manager

BIM and the Integrated Qualifications System

The Integrated Qualifications System has been launched in Poland in January 2017. One of the key pillars of the IQS is Polish Qualifications Framework. The Sectoral Qualifications Frameworks detail the PQF and support describing sectoral qualifications in a consistent way. One of the already developed SQF is devoted to construction sector. The BIM is mentioned within its descriptors for level 6 (category D. Development tendencies and innovative technologies in construction*): knows and understands the principles of design using the 3D building information modeling (BIM).*

It is also important that the application for inclusion of the new market qualification into the Integrated Qualifications System has been submitted some months ago – this qualification is related to managing BIM. As soon as the qualification description become public, we will be able to discuss its content and designed validation process.

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Desk research in Finland by Sataedu

BIM implementation phase in Finland per 1/2019

Short background

BIM implementation started in Finland with some national level research and development projects supported by the construction industry and implemented by national research institute VTT in the beginning of millennium. The first projects were "Pro IT" project http://virtual.vtt.fi/virtual/proj6/proit_eng/indexe.htm where the goal was to create a common practice for modelling for everyone and to ensure that product models could be used for design, quantity surveying and cost estimating, and other applications. For these purposes, specific product modelling guidelines were created for both architectural and structural design.

Lot of research and development work was done between construction industry and research institutes and universities to understand the possibilities of exploitation BIM and the importance of standardization of data processing. These projects were mostly adding the knowledge at university level where also training were given.

National level BIM development and cooperation among stakeholders led to the creation of a community called bSF – Building Smart Finland. Building Smart Finland is a collaboration forum founded by Finnish Property Owners, A/E Consultans, Software Vendors and Construction Companies. Currently the community has ca 120 active members including also universities and couple of universities of applied science (higher education). The Forum aims to disseminate information on BIM and support its member companies for implementing the BIM-based processes. The goal is to help the member companies to recognize the benefits of BIM, and help them to develop and implement BIM-based business. Another aim is to promote the dialogue between the software vendors and end users. bSF has both local and international activities. See more https://buildingsmart.fi/en/home/

Training in Universities of Applied Sciences

Some Universities of Applied Sciences are nowadays offering BIM courses for construction designers to improve their skills in different levels and needs of whole design process.
BIM Basics course (example of higher education)
https://www.metropolia.fi/koulutukset/taydennyskoulutus/tekniikka/bim-perusteet-5-op-verkko-opinnot/
Advantage of the possibilities of data models in a construction project. The basics of data modeling. BIM Basics Network Training gives the basics and utilization of knowledge modeling.

Contents

- introduction to information modeling of built environment
- information modeling requirements and instructions
- YTV2012 (General Data Model Requirements 2012)
- YIV2015 (General Infrastructure Requirements 2015)
- data modeling technology and process
- creation of information content in design programs (ArchiCAD and Tekla Structures)
- data model based data transfer (IFC)
- Basics of Coordinating Software Usage (Trimble Connect, Solibri Model Viewer, and Solibri Model Checker)
- Basics of Information Recovery (ITO)

Target group

Training is suitable for basic training in information modeling for all building construction professionals. No previous data model experience is required.

Overall

Universities are offering their training services as a further education for engineers and designers who will need BIM skills in their occupation or are interested in developing their skills otherwise. There isn't any advanced option for specialization in BIM in higher

education. Still training is available for a wide range of needs. Most of the trainers come from the national bSF network.

Secondary vocational education

In practice, upper secondary vocational education does not provide BIM training. The curriculum does not include studies that would deal with BIM in any way.

Some observations

Some interviews was conducted among the teachers of vocational education. The general opinion is that exploiting the BIM into basic education will probably take place within 10 to 15 years. BIM skills needed in practical construction work of course may be necessary sooner. This means increasing need somehow to take those skills into account in the curriculum of either basic studies or at least further studies.

The key issue at the moment is teachers competence. There is a huge need of training for teachers of vocational education also for BIM among other competences of new technologies. Only after teachers´ training we are ready to implement a curriculum including applied BIM skills for students. It will be challenging to provide further education also because of the fundamental basis of low digital skills of the older workers.

The desk research showed that there is some advanced teachers also in vocational education but they are more or less self-trained. BIM is not in the demands of their professionalism. The desk research also showed that first BIM related courses are available also for teachers of upper secondary vocational schools. The inclusion of skills in the curriculum is very likely to come, but take some time, as stated above.

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The situation in

Wallonia

by

Centre IFAPME LHV

The aim of this report is to explain how Building Information Modelling (BIM) is taught in Wallonia and to present the existing curricula, methods and contents.

BIM trainings offered by VET providers

1) Training for BIM Modeller / BIM Coordinator

Since September 2018, the IFAPME network of VET centres offers a 2-year training of BIM Modeler (year 1) and BIM Coordinator (year 2). This training is organized in 3 IFAPME training centres across Wallonia (Centre IFAPME Liège-Huy-Verviers, Centre IFAPME Namur/Brabant Wallon and Centre IFAPME Mons-Borinage Centre).

Admission

The training is open to adults (participants must be 18 years old on December 31st of the year of enrolment) who hold a relevant prior diploma (i.a. diploma for vocational entrepreneurship training in the construction sector or bachelor's degree in Architecture or Construction) or certificate (certificate of qualification delivered at the end of a technical training in high school related to site supervision, measurements and estimates or computer-aided design for construction). People who do not hold such a diploma or certificate could be admitted to the courses, subject to the agreement of the IFAPME Pedagogical Adviser. Access to this training could be granted to holders of official titles of competence validated or acquired in training (e.g. certificate of competence acquired in training, certificate of specific professional training, titles of validation of competence) and who justify a professional experience of at least 3 years, in a profession related to the training. In order to be taken into consideration, the professional activity must have been carried out during the ten years preceding the application for enrolment in the courses.

Technical prerequisites are required for entry to the training course. Participants must master a drawing software (ARCHICAD and/or REVIT) and the elementary notions of technical drawing (taking readings using the appropriate equipment, identifying the different architectural, structural and technical elements, identifying the architectural, technical and landscape constraints, identifying reference elements on a surveyor's and/or layout plan, making sketches and knowing the standards of technical drawing). Participants must also have a basic knowledge of operating systems

(create, move, rename, delete files/folders) and be able to use a tree structure for data storage.

Curriculum

Year 1 – BIM Modeler

The BIM Modeler is the person who masters a BIM modelling software and who draws the building project in 3D. To do so, he or she must respect the rules established in the BIM project protocol.

The first year consists of **220 hours of training** (~ 8 hours per week in the evening).

- Introduction – the challenges of BIM (8 hours)
- Digital tools and site management (16 hours)
- Management of the BIM software (100 hours), including:
    - Architecture (52 hours)
    - Stability (20 hours)
    - Special techniques (20 hours)
    - IFC models (8 hours)
- Management of a BIM collaborative approach (16 hours), including:
    - Convention, protocols and BIM contract (8 hours)
    - BIM Management (8 hours)
- Communication (16 hours)
- Internship supervision (4 hours)
- Digital BIM model (practical exercises) (60 hours)

Year 2 – BIM Coordinator

The BIM Coordinator is the is responsible for the supervision of the BIM modelers of his company and ensures the exchanges with other companies involved in the building project. The BIM coordinator makes sure that the BIM modelers comply with the rules of the BIM project protocol.

The second year consists of **132 hours of training** (~ 4 hours per week in the evening).

- Management of a BIM collaborative process (72 hours), including:
    - IFC documents and detection of clashes (40 hours)
    - Convention, protocols and BIM contract (16 hours)
    - BIM Management (16 hours)
- Communication (32 hours)

- Technical project monitoring (16 hours)
- Project coordination (12 hours)
+ Preparation of the end of studies work (TFE) (**18 hours**, in autonomy)

Method

The BIM training combines theoretical courses with practical exercises.

Courses cover not only technical topics specific to BIM but also more general topics like communication, which is crucial for a successful BIM construction process.

Additionally, a 40-hour observation internship in a company or design office must be carried out by the learner as part of the end-of-study work (TFE).

In order to succeed the training, the learner must attend at least 2 thirds of the courses, must have a 50% average success rate in courses and must have a 60% average pass rate on the final exam. This final exam covers all the skills acquired during the training: the learner must prepare a technical file and defend it in front of a jury. This personal work allows the learner to integrate, in a global way, transversal and specific skills in technical and project management.

Diploma

In case of success of Year 1 of training, the learner already obtains a Certificate of Competence acquired in training (CECAF) as a BIM Modeler.

Upon successful completion of the 2 years of training, the learner obtains a diploma of BIM coordinator.

Sources

- https://liege.formation-construform.be/formation/bim-modeleur-bim-coordinateur
- https://liege.formation-construform.be/actualites/construform-fait-le-bim

2) Continuous trainings

In addition to the training to become BIM Modeler/Coordinator, the vocational training centres of the IFAPME network also offer shorter BIM-related training courses as part of their continuing education offer.

For example, Centre IFAPME Liège-Huy-Verviers offers the following trainings:

- Management of the REVIT software – basic (35 hours)
- Management of the REVIT software – advanced (35 hours)
- Management of ArchiCAD software – basic (32 hours)

These training courses are intended for architects, designers, sketchers, draftsmen, engineers, managers of design offices, and any person who must use a CAD software.

Sources

- https://www.formation-continue.be/vpage-87-2-D.A.O.-Dessin-assiste-par-ordinateur-#.XnSpd4hKhPa

- https://liege.formation-construform.be/actualites/construform-fait-le-bim

BIM trainings offered by universities

Universities in the French-speaking community of Belgium (Brussels and Wallonia) also offer BIM trainings as part of their continuing education offer.

The **University of Liège (ULiège)** offers a BIM continuing education (10 ECTS) for Small and Medium Structures. The training is mainly aimed at professionals of small and medium structures who wish to update their current way of working in order to integrate the BIM process. It concerns in particular: architects, engineers, surveyors, CAD draftsmen, contractors and construction workers. This training aims to provide participants with basic knowledge of the BIM process in the construction industry, to raise awareness of BIM issues in the construction and management of small and medium projects and to give them the keys to a progressive integration of the use of BIM for small and medium projects.

Source: https://www.programmes.uliege.be/cocoon/20192020/programmes/TYCBIM90_C.html

The **Catholic University of Louvain (UCL)** offers an intensive BIM continuous training (2 weeks, 12 ECTS). This training is aimed, among others, at architects, design office engineers, project managers and contractors (engineers, site managers, etc.). The main objective of this training is to prepare professionals in the act of building, to take the step from a traditional organization to a new methodology of collaborative type with the use of a digital BIM model.

Source: https://uclouvain.be/fr/etudier/iufc/bim-conception-et-gestion-integrees.html

The **Free University of Brussels (ULB)** launched a new BIM continuous training (20 ECTS) in January 2020. This 224-hour-training is intended for professional architects as well as for students wishing to complete their academic curriculum. The training aims at providing each participant with sufficient knowledge and skills to design a complete architectural project integrating BIM on his or her own. The training is organized in three stages: (1) A common theoretical training, during which courses will be given on the basic concepts of BIM, general methodological aspects, legal and contractual aspects, (2) Intensive practical training in the BIM-software selected by each participant (Revit, Archicad or Briscad), and (3) Elaboration of a digital BIM model during supervised workshops, which will be presented to a jury of experts and professionals.

Source: https://www.ulb.be/fr/programme/fc-653

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