



## **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/>

### **Role of Companies (project phase 2)**

**Aggregated results of project partners**



Funded by the  
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## **Phase 2:**

### **Role of COMPANIES**

in

**Building Information Modelling – BIM**

**Work based learning – WBL**

**Digitalization**

**Transition in VET**



**The situation in  
GERMANY  
by  
Bildungszentren des Baugewerbes e.V. / Germany**

### **Building Information Modelling – BIM**

When we speak about companies, we consider big, medium, small and smallest companies. These range from > 250 staff in big ones, to 50 > x > 250 for the medium ones, 10 > x > 50 for small ones and < 10 for the smallest ones, which are sometimes called micro-enterprises. Micro, small and medium enterprises not seldom are contractors for the big ones.

In Germany there will be a regulation from 2020 onwards, that in all new build public buildings of more than 5 Mio. € value, there should be applied Building Information Modelling (BIM). This means all aspects of the value creation chain must be planned, calculated, operated, monitored, reported and maintained with BIM. It will be specified in the public procurement process and thus is an obligatory aspect for a bid. As mostly only the big players in the market submit a quote for a construction project of more than 5 Mio. € budget, they are the ones to apply BIM first.

The usual practice is that other – smaller – companies get contracts from the big players for parts of the construction work to be realized. In order to be able to operate plannings that have been done with BIM, they are required to know about BIM, to be skilled in applying BIM and also to report their work within this system. Hence, they are users as well as producers of content in the overall approach for big public facilities of the future.

While the big companies have or will establish a structure to apply BIM (there are numerous software types already available), be it due to their financial capacity, their skilled workforce and their bigger administration, the small ones will have to do big efforts to cope with this task, due to a lack of the above written. Nevertheless they have to change towards BIM, when they want to continue being a market player, at least within the scope for contracting for big public buildings.

### **Work based learning – WBL**

Companies – independent of size – are the core players for work based learning in Germany. In the construction branch in Germany all regular apprentices have a company contract for 2 or mostly 3 years. This is the entrance for apprentices into the dual VET-system. The companies are the employers and thus one of the three (do not get confused with the expression “dual” system, since we only differentiate between the company side and VET-schools) parties in the dual system. The other on the company side is the VET-centre, which cooperate closely with the company.

The in-company trainer is the most important factor in the apprenticeship. Most of the content of the apprenticeship will be trained the company in the context of market activities. As member of the company organization the apprentices do a job with all other staff on site and thus learn from real work life situations what they need for the final exam. Additional parts will be provided by the VET-centres.

This results in a 80-90 % ratio of taking-over apprentices into regular work contract as skilled workers. Reason is that during the (mostly) 3 years in practical work enable apprentices to directly continue as skilled worker and accumulate more experience thereafter. The companies raise their own credits, though.

Of course companies are the ones who pay the apprentices based on their work contracts.

Unfortunately about half of the apprentices, who have become skilled workers change the company after approximately 5 years after having passed their exam. Mostly money is a reason, but sometimes also a lack of career perspectives; small companies have a structural disadvantage compared to the big ones.

## **Digitalization**

There are diverse aspects how companies deal with digitalization in their daily works and duties. On the one and foremost hand the relation between customers and company is increasingly based on e-mail communication. Offers, drafts, calculations etc. are often exchanged via digital communication. Also the expectation of customers to find the service spectre of companies in a website is recently and currently of growing importance. This leads to the point that companies have to analyse all levels of their relation to customers, which could be subject to digitalization.

On the other hand there are the more administrative issues like dealing with public authorities, BIM and human resource management. Companies – in particular small and micro – have to cope with modern aspects of exchanging information and saving data only in a digital way. This, not least, requires data protection efforts, because these aspects like taxes, personal data and limited offers are sensitive details in their business and therefore subject to particular attention. Both (customer relation issues and administrative requirements) need financial investment to be realized. The technical infrastructure has to be updated as well as the company staff have to be training probably.

Consequence of not cope with current needs of digitalization could mean vanishing from the market on mid term.

## **Transition in VET**

The companies – all sizes – represent the demand side of the labour market for construction workers. With their business activities they define the qualifications, which are required by staff to be employed. Hence, companies recruit and hire apprentices for future fields of work, they employ staff for current works and they send staff for further training in order to react of knowledge and / or skill lacks to cope with market

needs. In the long run this also affects the scope and depth of occupations to be in the catalogue of occupations in Germany.

This demonstrates that companies are the focal stakeholder in the transition in VET: they absorb pupils, who intend to enter the VET sector in construction, they initiate or enable staff to be further trained and thus supporting their career, they could take over drop-outs from universities (e.g. failed students from civil-engineering) and they also hire low or not-qualified staff for minor works. The before said stresses the immense role of the companies in the work based training system like the German one.



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## The situation in SPAIN

by

Fundación Laboral de la Construcción

### Building Information Modelling – BIM

Derived from the European Directive 2014/24/UE on the use of BIM for public procurement, the Spanish Ministry of Development created the “BIM Commission” which has established a roadmap that will turn the use of BIM into compulsory for every public tender, in two stages:

- 1<sup>st</sup> phase: 17<sup>th</sup> of December 2018 for Public Tenders on Edification.
- 2<sup>nd</sup> phase: 26<sup>th</sup> of July 2019 for Public Tenders on Infrastructures.

Having these deadlines in mind, a survey has been recently conducted during December 2017 and January 2018 with the aim of analysing the level of adoption of BIM by the construction companies. The main conclusions are the following:

#### **Current situation on BIM adoption**

BIM technology offers a more effective possibility, easy to carry out and manage the different activities in a Project, however, the starting of the use of BIM is quite complex. 55% of the companies have rolled-out a BIM project, but it has to be stressed that **only 15% use BIM in a generalised way for all the projects**. In order to be successful, companies emphasise that before starting a BIM implementation, it is necessary to generate a clear, concise and realistic integration plan, adjusted to the needs required by the organisation. It is remarkable that 37% of the companies consider that BIM is not a priority and they do not receive any pressure by the sector.

Initiatives such as ES.Bim, dependent on the Ministry of Development, which integrates all interested parties (administration, engineering, companies, universities, professionals....) are essential to promote the use of BIM in the professional and academic fields. Also, it is relevant the BuildingSMART Spanish Chapter, a non-profit association whose main aim is to foster efficiency in the sector through the use of open standards of interoperability about BIM, to reach new levels regarding cost reduction, execution time and quality increase.

### **Deadlines and support for implementation**

The majority of the companies believe that it would be convenient to establish a national strategy led by the Government to promote the adoption of the BIM methodology in Spain, stressing the need to standardise this methodology. 55% of respondents believe that a plan of public grants, together with a realistic timetable of implementation would help them adopting BIM. 24% indicate that professionals are scarce, so it is necessary to design an academic map for training in this methodology in order to have skilled workers.

### **Constrains to implementation**

Although it is expected that BIM will produce plenty of benefits, there are many factors that prevent a generalised adoption. BIM technology requires a change not only with regards to the technology used, but also to the approach of the design and construction teams. There are many technological barriers affecting the implementation of BIM, which may be related to the changes necessary in the organisation and the changes in the business processes.

24% of companies indicate that the main factors affecting the use of BIM is that there is no implication by all the departments; technicians should not be the only ones adapting to the new technology. 20% consider that the costs derived from the licenses is another of the main barriers, when the change of processes/practices is the real challenge. It is identified that the acquisition of resources is still being organised around functions and projects, not around processes. Likewise, 18% of companies find out that their collaborative companies in construction projects or works are not using BIM, and 12% indicate that they do not have available staff sufficiently qualified.

### **Benefits of BIM**

For 35% of the companies, BIM has increased the quality of the projects and has reduced the mistakes and uncertainties. It is identified with a more efficient and collaborative way of working, that will improve efficiency of processes and quality of project; 20% think that BIM improves cost management, which increases company efficiency.

For 21% of the companies, the adoption of BIM causes an increase in information transparency, not only inside the company, but among architects, providers and clients. Instead of dedicating time to answering the queries of each party about what the others are doing, the information is shared and accessible for all the parties.



BIM represents a great opportunity to improve the management of the lifecycle of assets. It is surprising that only 20% indicate that BIM improves management and causes a reduction in the expenses subsequent to the construction works. BIM offers crucial information to plan all the activities for maintenance of the assets, and would allow to manage one single budget for the whole lifecycle of the building, from the time of delivery, up to the dismantling and substitution.

### **Digitalisation of the Construction Industry**

Is it quite common in the sector that some workers are 'mobile': workers on site, itinerant, or deployed in several offices..... For all these, the fact of having easy availability of information would be a huge advantage. The aim pursued by the majority of the companies is to manage all the information stored in one single repository and facilitate cooperation among all the agents participating in the same construction model. 37% of the companies indicate that the main advantage from integrating BIM and ERP (Enterprise Resource Planning) is the integrated vision of the construction work. BIM designs the construction project in 3D, and the ERP determines the final cost, deadlines and necessary resources and teams.

23% considers that this allow them to make decisions supported by data. This integration offers the capacity of seeing the exact result on the basis of any change in the construction plans. 12% indicate that BIM and ERP working together put an end to speculations and uncertainties, and allow them to work with realities.

It is surprising that only 5% of the companies indicate that the integration would involve costs savings, since the profitability analysis in the ERP may be done much faster, if BIM is integrated, allowing to consider multiple options, and anticipate to budgetary deviations.

### **WBL in Spain**

Since the 90's, there is a WBL approach in the VET programmes of the education system, by which an on-the-job learning period is compulsory for any formal VET learning programme. On the other hand, in Spain, the introduction of the Dual System for VET is relatively recent, and is regulated by a law launched in 2012: RD 1529/2012 from 8 of November, by which the 'Contract for training and apprenticeship' is developed and the bases for the Dual VET are established.

This training may be received in the framework of the Official Vocational Training (managed by the Ministry of Education) or in the framework of the Vocational Training for Employment (managed by the Ministry of Employment). In this context, this Royal Decree provides for two types of work-based learning – Dual Vocational training (in the Education system) on the one hand, and Contracts for Training and Apprenticeship (Employment side) on the other; both have been gradually implemented on the basis of a regulation from the Ministry of Employment and Social Security (ESS/41/2015).

WBL in Spain through Dual VET (in Education system) has been increased in the recent years; according to [data released by the Ministry of Education](#) in February 2018, 24,000 students enrolled in Dual VET for course 2016-2017, which is 5 times higher than in course 2012-2013.

For the young people in dual vocational training there is no employment contract, therefore remuneration is not compulsory, although discretionary scholarships may be paid. Students enrolled in traditional VET (not Dual) must participate in a final module with practices in a company, not remunerated but compulsory in order to obtain the certification.

From the labour side, student may also be enrolled in the so-called Certificates of Professional Standards, which also include a compulsory non-remunerated practical module.

Also WBL through Contract for Training and Apprenticeship (Labour side) has been increased: in the year 2015 a total of 143,795 young people were involved in this type of contract. However, the rate for transition from contracts for training and apprenticeship to an indefinite work rate is quite low (less than 5%), according to the information provided by the National Employment Service. The young people with Contracts for Training and Apprenticeship (VET for employment) are considered as regular workers, therefore there is a remuneration established in a collective

agreement that cannot be lower than the inter-professional minimum wage (€735,90 in 2018) according to the number of hours worked.

### **Role of the companies in WBL**

Companies are among the main actors involved in the potential success of the WBL system, especially through the role of the **in-company tutor**, on whom the national legislation makes significant emphasis, and her/his functions are specifically defined in article 20 of the RD 1529/2012 (and other subsequent regulatory Orders). However, even if the role of the in-company tutor is legally recognised in Spain, the persons who carry out this role are not always recognised as such in the companies. Furthermore, there is no official recognition of this role at national level: there is neither an official training of application for these cases, nor a specific professional qualification for this professional profile.

The in-company tutor must be a worker of the company and the working hours should be coincident with the ones assigned to the apprentice. Of course, should own the proper qualification and experience to be able to train the apprentice. Also, a high motivation to train and make a follow-up on apprentices should be present.

When one Company decides to be part of a WBL Project, it will need to sign a training agreement with the corresponding training centre, including, at least, the following aspects:

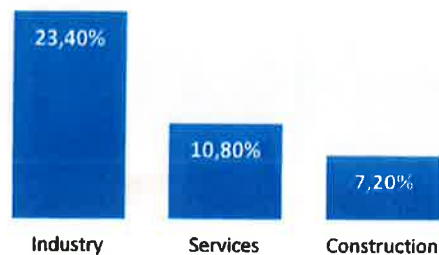
- Name and contact information of legal representatives, in-company tutor(s) and training centre.
- Training programme(s) that are going to be covered.
- Hiring modality for the apprentice.
- Evaluation and monitoring plan by the company and the training centre.
- Schedule and number of hours that the apprentice must comply with during the in-company training.
- Insurance covering the apprentice during the stay in the training company.

Under this agreement, the company is committed to appoint a tutor to ensure the positive development of the work placement and to accomplish the training programme agreed, in order to facilitate the access to the company premises to the training centre tutor, as well as to follow the student progress, assessment and supervision.

The number of companies participating in WBL projects has increased from 513 in 2013 to 1570 in 2014, according to the Monitoring Report by Ministry of Education for years 2013-2014 (last information available at the moment). It is not a very high number at the moment, but it is expected that eventually more companies (especially SMEs) will join this approach, since their role is crucial for the proper development of the work-based learning system.

## Digitalization

In recent years, innovation and the use of digital technologies have accelerated considerably, managing to transform administrations, citizens, companies and workers, even the most traditional industries. However, the investment in innovation as well as the digitization of the construction sector show values considerably lower than other productive sectors in Spain. According to the latest data available in the Survey on Companies Innovation carried out by the National Institute of Statistics, referring to the year 2016, the number of innovative companies in the construction industry was 7.2%, compared to 23.4% of the Industry sector and 10.8% of Services. With regards to innovation expenditure, it only reaches 1.1% for the construction companies (2015), which, nevertheless, contribute 10.4% of GDP.



In addition, the report [Reinventing construction: A route to higher productivity](#), by McKinsey Global Institute (MGI), reveals that the construction industry employs around 7% of the world's working-age population and is one of the largest sectors in the world's economy, with \$10 trillion spent on goods and services related to construction every year, however construction is among the least digitized sectors in the world, according to the digitization index of MGI. In the United States, construction occupies the penultimate place, and in Europe it is in the last position.

The Construction sector has two handicaps added to the reception of innovations and digital technologies, on the one hand, the aging workforce due to the lack of incorporation of young people into the sector, who in the case of Spain were derived to the hospitality sector when the crisis arose, and that hinders the adoption of digital innovations, which, together with the resistance to change and the lack of digital and innovative culture, are provoking the digital transformation of the sector to be slower and more expensive. This slowness, together with the

demand for new professional profiles that the educational system is not providing, is the evidence of the different pace of integration of technology in the sector and its demand.

Considering the current context of the construction sector, investment in innovation and the adoption of digital technologies, and without forgetting that the lack of digital talent can impede an adequate transition of the sector towards innovative work methodologies of high added value, it is necessary to promote active training policies to foster and facilitate the acquisition of digital skills of workers and companies.

Digitalisation of the construction industry is a challenge and new working methodologies, such as BIM, will be configured as the path leading the sector to improvement, productivity and efficiency. According to the report Barcelona Building Construmat 2017, carried out by the Institute of Construction Technology of Catalonia, other digital technologies -together with BIM- will potentially influence the transformation of the sector in the medium term:

- Big Data
- LEAN methodology
- Augmented reality
- Mobile devices
- 3D scanning and printing
- Drones
- The Internet of Things (IoT)
- Virtual reality
- Connectivity
- Embedded sensors

One of the main conclusions of the report is that digitalization and innovation in technology, systems and process management is the best safeguard to avoid the risk of future relapse in the sector.

## Transition in VET

The Spanish VET System is integrated by two sub-systems:

1. Sub-system for Vocational Education of the Educational System, depending on the Ministry of Education.
2. Sub-system for Vocational Training for Employment, depending on the Ministry of Employment.

Both are defined by the National Catalogue of Professional Qualifications, which constitute the basis for the elaboration of the training offer leading to obtaining a VET Diploma (1) or a Certificate of Professional Standards (2), and the modular and cumulative training offer linked to the competence unit, which is the minimum set of professional competences that can potentially be recognised and partially accredited (each competence unit is linked to a training module).

An important feature is that VET is permanently in contact with the different productive/economic sectors, thus responding to their needs.

### (1) Sub-system for Vocational Education of the Educational System

The Vocational Education of the Educational System is composed of more than 150 training cycles divided into 26 professional families, with theoretical and practical contents in line with the different professional scopes. For each professional family the student may participate in **Basic VET cycles**, **Medium VET cycles** (corresponding to Secondary School) or **High VET cycles** (corresponding to Higher Education), all referring to the National Catalogue of Professional Qualifications.

The number of students enrolled in Medium and High courses has been increased almost in 50% in recent years (from 450.000 students in 2008 to 720.000 in 2016).

There are several mechanisms that allow the transition from these cycles to other types of studies:

From...	Mechanism	Transition to....
	Compulsory + voluntary modules	The student automatically reaches the Compulsory Secondary Education level

<b>From an Initial Professional Qualification Programmes</b> (for those students who have not reached the compulsory secondary education level)	Compulsory modules	Medium VET cycle
	Professional Specific Modules	Certificate of Professional Standards
		Access exam for the VET Medium cycle
<b>Basic VET cycle</b>	Passing all the Professional Modules	The student reaches the Compulsory Secondary Education level
	Passing all Professional Modules linked to a Competence Unit with a complete Qualification	Certificate of Professional Standards (Level 1)
		Access exam for the VET Medium cycle
<b>Medium VET cycle</b>	Passing all the Professional Modules	Secondary High School ( <i>Bachillerato</i> )
		Another Medium VET cycle
		Certificate of Professional Standards (Level 2-3)
		Access exam for High VET cycles
<b>High VET cycle</b>	Passing all the Professional Modules	University (through an access exam)
		Another High VET cycle
		Certificate of Professional Standards (Level 3)

It is also possible to move from University to VET; in this case it may also be possible to convalidate some subjects. The procedure for this convalidation is carried out by the Competent Administration.

**(2) Sub-system for Vocational Training for Employment, depending on the Ministry of Employment**

This VET for Employment system aims to train and qualify persons towards employment, update their competences and knowledge along their professional lifecycle. It includes actions for



workers' labour (re)insertion as well as actions for the lifelong learning in the companies, allowing for the acquisition and permanent updating of the workers' professional qualifications.

There are three types of initiatives:

- Training programmed by companies for its workers.
- Training offer for employed workers.
- Training offer for unemployed workers.

The so-called Certificate of Professional Standard (CPS) is the instrument used for the official accreditation of the professional qualifications included in the National Catalogue of Professional Qualifications in the Labour Scope, which certifies the person's qualification for the development of a working activity. This certification has an official nature in the whole country and are awarded by the Public Service of State Employment or the Spanish Regions in some cases.

Certificates of Professional Standards are composed of a series of training modules and one practical module (which preferably will be done after finalisation of the other modules). They are organized in 3 different levels of professional qualification; in order to access to any of them any of the following requirements must be fulfilled:

- Level 1: No requirements (training or professional).
- Level 2: Certificate of Compulsory Secondary Education; Access exam for Medium VET cycle; another CPS of the same level; one CPS from Level 1 in the same professional family; Access exam to University for people older than 25 years old.
- Level 3: for older than 19 y.o.; Certificate of Secondary High School; another CPS of the same level; Access exam to High VET cycle; one CPS from level 2 of the same professional family; Access exam to University for people older than 25 and/or 45 years old.

There is no direct equivalence between Certificates of Professional Standards and VET diplomas, therefore, it is not possible to convalidate a whole CPS in the Educational System. However, the training in both cases is organised in modules which, in some cases, may be coincident (not all of them). In this case, if the student is interested in being enrolled in a VET Cycle after acquiring a CPS, s/he may only ask for the convalidation of coincident modules (subjects).

### **Role of the companies**

In both types of VET (Education and Employment scopes) it is compulsory to do one practical module in a working centre, usually, once the other modules have been passed. This practical module will also be evaluated upon its finalization, and passing it is essential to reach the final Diploma or Certificate.

It is possible to ask for the exemption of this practical module, for this it is necessary to accredit a prior related labour experience of one year (for the VET of the Education System) and three months (or 300h) in the scope of the VET for Employment.



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

## **Building Information Modelling – BIM**

### **Lithuanian construction sector and BIM**

The Lithuanian construction sector is quite small compared to other EU countries, yet it accounts for a significant portion (10%) of national GDP and approximately 10% of total national employment. The construction sector accounts for about 50% of all public procurement in Lithuania. The introduction of digital construction technologies and good practices in Lithuania is essential to make the construction sector sustainable and competitive, both nationally and internationally. It is made even more important by the fact that Lithuania has close economic ties with other countries that are among the most advanced users of BIM. Most Lithuanian construction companies operating on the markets of the European Union are involved in projects where the BIM methodology is applied, which is why they are intensively developing this methodology internally. In 2017 about 60 construction companies in Lithuania were applying BIM standards in their operation. However, this is mainly true for the big construction companies while the SMEs are less advanced in this sense.

### **Digital Construction initiative**

Conscious of rapid ICT development taking place across Europe, Lithuania recognised that there was an urgent need to develop and implement a single digital construction information model. In 2014, the Lithuanian Builders Association (LBA) created a public institution called the Digital Construction (Skaitmeninė Statyba) to coordinate the digitalisation process in the Lithuanian construction sector and enhance building information modelling and the National Construction Classification.

In total, 106 specialists from construction sector, academia, IT and public institutions are involved in implementing the Digital Construction initiative in Lithuania, focusing on the following topics:

- Preparation of BIM requirements and standards, used in digital construction;
- Preparation of guides;
- Adaptation of IFC in Lithuania;
- Definition of the statistical index for the development of digital construction and description of the monitoring index for the BIM environment;

- Adaptation and analysis of adjustments to digital construction methodology and integration with Lithuania's current legal and regulatory system;
- Design and development of the national classification and coding systems structure; compatibility and integration with the EU;
  - o Define and describe the structure for updating the classification and coding system, catalogues of databases;
  - o Compatibility and integration of national and EU data bases, administrating and describing the order of usage of databases;
- Design, development, administration and description of the information and communication technology infrastructure for digital construction;
- Publicity and dissemination of the results of good practice;
- Regional cooperation for BIM development;
- Establish BIM study and certification programmes, organize study programmes for high schools and informal training, validation of qualification, and set up a certification procedure for participants in the construction process, BIM project managers;
- Development of legal regulation for BIM-related public procurement.

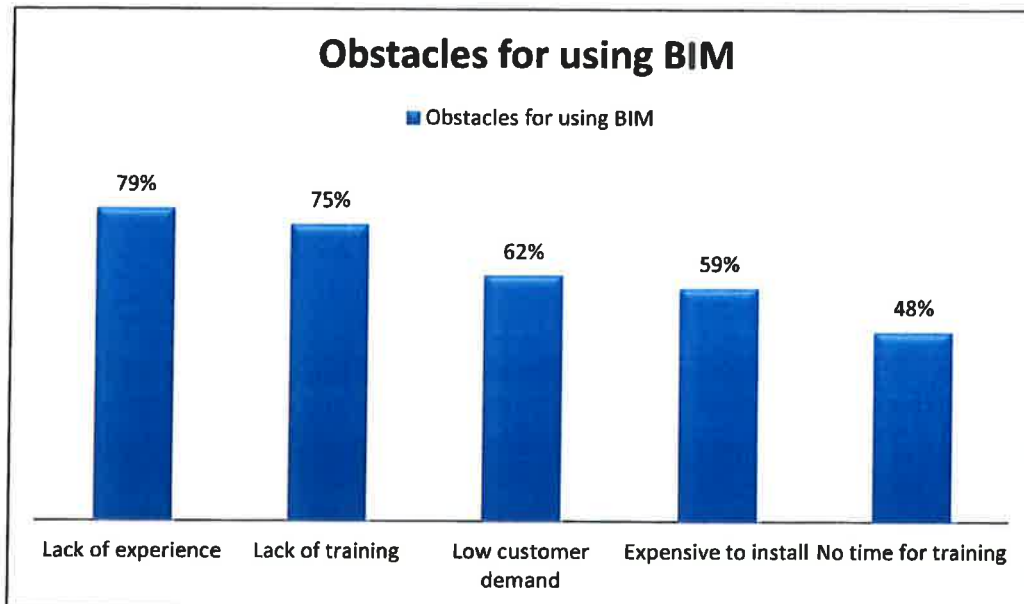
### **BIM education opportunities**

Due to the fact that there is a shortage of skilled construction professionals in Lithuania, the initiative has joined with universities to sign an agreement to provide more education courses on digital construction. The **Master's Programme on BIM technologies**, for example, was introduced in 2015 and now runs every year in Vilnius Gediminas Technical University. The aim of this Master's Programme is to train specialists, to enhance knowledge of BIM deployment and strategy, and to create and develop standards to guide and coordinate BIM drafting processes. A Bachelor's Programme on digital construction design is also offered at the university. Next step will be introduction of mandatory BIM basics into the courses offered by VET providers starting with 2019.

### **Main challenges and barriers**

From the perspective of construction services, the main barrier for digital construction in Lithuania is that people are either not convinced that digital technologies add value to the construction sector or they are not aware of the opportunities they provide. Many specialists still do calculations manually and information is gathered from drawings. The problem is that there is no transparency in the process as each specialist creates his or her own system to follow in a project. There is no database shared for project partners, and drawings and specifications are usually carried around by hand.

Another barrier to the introduction of Digital Construction in Lithuania is how smart technologies are perceived by construction companies. The use of integrated technologies in the construction sector is still very limited and many construction companies consider the price of software as too expensive. The research carried out by the Ministry of Environment in 2017 defined the major obstacles in using BIM by Lithuanian construction companies:



With regard to small construction companies, many of them lack awareness and knowledge about software solutions and their potential, and therefore have no urgent need to buy expensive products. Therefore, one of the challenges that Lithuania faces is the need to convince small business (SMEs) of the advantages of digital construction. SMEs are typically afraid that they will not be able to compete with larger businesses that are already familiar BIM users. As small businesses begin to understand that the integration of BIM software in their daily work is both unavoidable and beneficial, especially if they want to compete abroad (especially in the Scandinavian market), then they will take up these new technologies in greater numbers.

## **Work based learning – WBL**

### **VET in Lithuania**

Lithuanian VET is part of a well-structured, straightforward and potentially permeable education and training system together with general education (preschool, pre-primary, primary, lower and upper secondary) and higher education (colleges and universities). Most VET programmes are school-based, meaning that they are undertaken in accredited institutions. The main way of work-based learning (perceived as apprenticeshiplike schemes by most stakeholders) is a practical component of school-based VET programmes: a student first enrolls in a training programme in school, receives theoretical training and school-based practical training, and only then goes to a company. The final practical training in company is the longest alternance period in VET programmes.

An employer assumes responsibility for the company-based part of the programme leading to a qualification. According to the existing regulations (Ministry of Education and Science, 2012, Article 36), a company needs to ensure that the workplace has adequate equipment, tools and other technology for learning and that safety measures are observed. Companies also are responsible for nominating a competent person to supervise students.

### **Main developments of WBL**

For the last decade, Lithuania has been in the process of searching for a work based learning model that would best suit its traditions and context. Promotion of work based learning has become one of the priorities of the National Strategy on Education 2013-22, one of the measures of the National Programme for increasing employment 2014-20, and the National Reform Programme 2014.

Important steps and achievements made:

- a) apprenticeship has been set as one of the forms of organisation of formal vocational education and training since 2008 (Parliament of the Republic of Lithuania, 1997);
- b) new sectoral qualification standards and modular programmes have been developed;
- c) gradual increase of the proportion of practical training in companies up to 60% in all VET programmes (currently it should be at least 30%);
- d) the government invested in developing VET infrastructure: 41 sectoral practical training centres have been equipped with the most up-to-date machinery and technology and are already operational;
- e) mechanisms for social partner (companies) involvement are in place and there is interest and need for qualified workforce from the industry.

Employer and industry organisations have recently become more active in finding their way into decision-making processes and shaping vocational education in the country. Some companies and branch organisations were actively arguing for further development of WBL and apprenticeships. However,

employers are not uniform in their position and often promote interests specific to their sector, occupation or even company and do not cover general system level.

Key aspects of companies' role in WBL that still remain unaddressed and not defined:

- a) assessing capacity of companies and monitoring their performance;
- b) competences of in-company trainers;
- c) assessment of learning outcomes gained in companies.

### **Main challenges**

WBL has not yet gained its position as a clear pathway in Lithuanian VET and a number of challenges need to be overcome through systematic approaches and information and communication:

- a) the dual status of an apprentice as a student and as an employee needs to be further clarified;
- b) planning for WBL based on the labour market analysis does not happen; this prevents estimating necessary resources;
- c) implementation provisions are missing or not clear to all stakeholders;
- d) the expectations and perception of WBL differ significantly among stakeholders;
- e) lack of in-company trainers who meet the set requirements as well as motivation of existing ones: the costs in terms of lost productivity for businesses to engage experienced employees to train apprentices are often very high. Company employees are often not able and/or willing to train others due to workload, issues with confidentiality, risk of possible damage to equipment or fear of possible future competition;
- a) WBL model is not well promoted to potential students, their parents and companies;
- b) there are no clear cost-sharing or compensatory measures in place to encourage companies to take apprentices.



## Digitalization

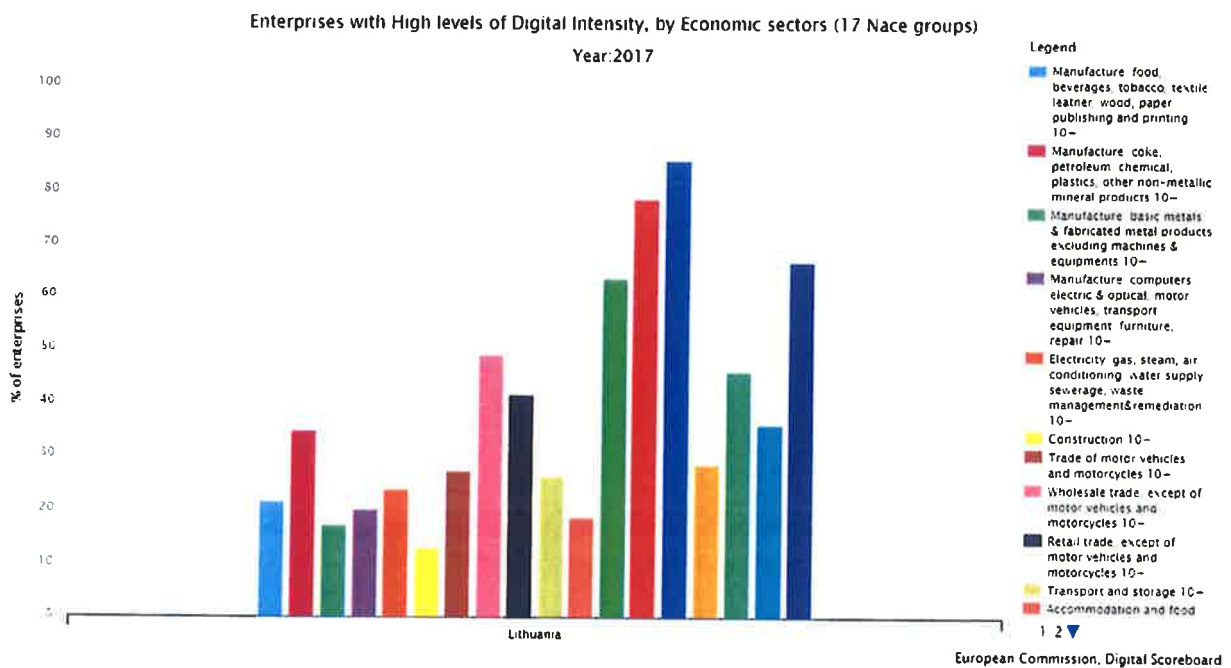
The Lithuanian construction sector has experienced significant changes over the last 25 years adapting to the new market environment. Its development was influenced by both the local and global marketplace of technological and organizational construction business innovations. The efficiency of the Lithuanian construction sector and its rate of development are far behind the other industry sectors, which are rapidly implementing the achievements of information and communication technologies, technological and organizational development.

The Lithuanian construction sector, similarly to the global construction sector, is very fragmented, and mainly consisting of the low profit enterprises that are highly inert to innovations. Some new technologies and tools have emerged, but the rate of innovation and innovation adoption has been very slow. The main underlying causes could be defined as follows:

- Informal processes or insufficient consistency in process execution. The processes typically adopted by construction companies regularly lack maturity. Companies often seem to put greater emphasis on defining the final product than on planning the actual construction process.
- Insufficient knowledge transfer from project to project. Although each construction project will have its own unique characteristics, the processes of construction itself are repeated in their essentials from project to project. Lessons learned from one project could therefore often be usefully applied to subsequent projects. Yet few companies have institutionalized such a process. Past experience is therefore often lost, and projects continue to rely heavily on the expertise of the individual project manager.
- Weak project monitoring. A related issue is the weak monitoring of projects, relative to other industries. In many manufacturing industries, for example, operations are continuously tracked and large quantities of data are collected. In that way, if something goes wrong, a car manufacturer, for instance, can quickly identify the root causes and implement remedies immediately and efficiently. Few construction companies are set up in this way.
- Conservative company culture. The construction industry operates in a somewhat traditional environment and generally retains a conservative corporate culture. The widespread perception is, justifiably enough, that construction companies are not sufficiently progressive or forward-thinking.
- Shortage of young talent and skilled workforce. The image that people have of the construction industry as an employer is a relatively poor one, with inadequate gender diversity and little job security. As a result, construction companies often struggle to attract talented employees to their workforce. Moreover, a very high number of skilled people are leaving the country to be employed abroad and skills shortages continue to be high and risk becoming an important bottleneck for the growth within the sector.

Lithuania ranks 13th out of the 28 EU Member States in the European Commission Digital and Society Index (DESI) 2017 (DESI Country Profile for Lithuania: <https://ec.europa.eu/digital-single-market/en/scoreboard/lithuania>). Lithuania's DESI score is above the EU average but the level of

digitalization of Lithuanian construction companies remains rather low, compared to other economic sectors of the country.



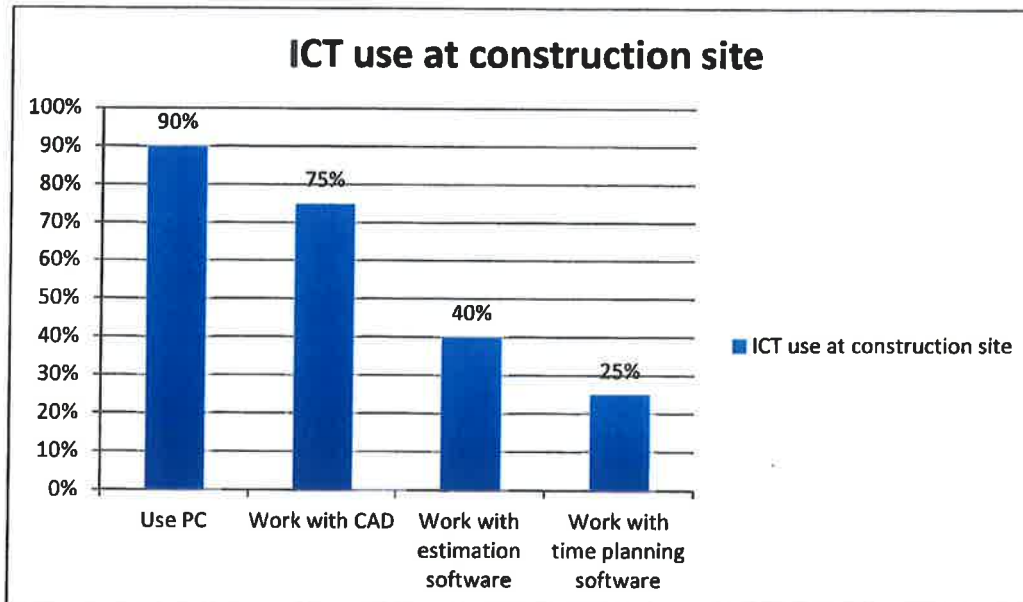
**Indicator:** Enterprises with High levels of Digital Intensity.

- **Definition:** The Digital Intensity score is based on counting how many out of 12 technologies are used by each enterprise. High levels are attributed to those enterprises using at least 7 of the listed digital technologies.
- **Notes:** The list of technologies includes: usage of internet by a majority of the workers; access to ICT specialist skills; fixed broadband speed > 30 Mbps; mobile devices used by more than 20% of employed persons; has a website; has some sophisticated functions on the website; presence on social media; does e-sales for at least 1% of turnover; exploit the B2C opportunities of web.
- **Source:** Eurostat - Community survey on ICT usage and eCommerce in Enterprises

Other indicators related to digitalization of Construction enterprises in Lithuania:

- Buy Cloud Computing services used over the internet: 15,7%
- Enterprises that share internally electronic information with an ERP (Enterprise resource planning software): 28,7%
- Persons employed which were provided a portable device by their employer: 17,2%
- Enterprises using mobile Internet to run business applications: 16,8%

The research made in 2015 focused on the numbers of qualified construction employees (Levels 5, 6 EQF) that use technical and software tools on the construction site. It involved 2090 site managers and technical supervisors from medium-sized and large construction companies:



Very few companies address the need of digital training of their staff. In many cases, digital training of workers is still perceived as an informal or non-formal way of learning, and the company does not take responsibility for that. Digital training opportunities available on the market usually address higher skilled employees, like site managers, technical supervisors, but not ordinary construction workers.

**Main targets of Lithuanian construction sector digitalization strategy 2021:**

- Sustainability;
- Increasing competitiveness;
- Increasing efficiency;
- Export promotion;
- Minimizing accidents;
- Creation and monitoring of BIM statistical indicators system;
- Lithuania is a regional center for developing digital construction initiatives and solutions.

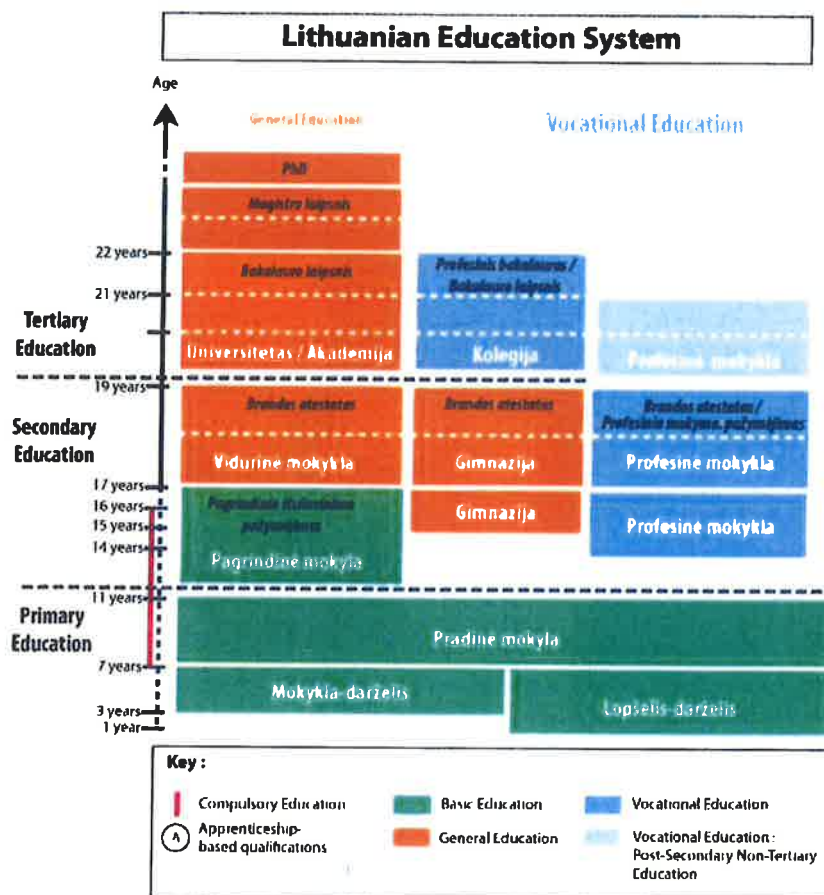
# Transition in VET

## Education system in Lithuania

The Lithuanian education system consists of traditional general education (pre-school, pre-primary, primary, lower and upper secondary education), initial vocational education and training (VET) (lower, upper secondary and post-secondary education), continuing VET and higher education (college and university studies).

In Lithuania education is compulsory for persons under the age of 16. The compulsory education is associated with the completion of lower secondary education (ISCED 2), after which students can choose upper secondary general education or VET programmes at ISCED 3 level (leading to a qualification or to a qualification and a school leaving (maturity) certificate). Those who fail to graduate from lower secondary education may enter VET programmes or youth schools at ISCED 2 level. Graduates of upper secondary level programmes leading to a maturity certificate (either vocational or general education-oriented) may enter either post-secondary vocational training (ISCED 4) or higher education (ISCED 5) programmes. The diagram of the education and training system is presented in *Picture 1*.

Picture 1. Diagram of Education System in Lithuania



## Qualifications framework

Like the European Qualifications Framework (EQF), the Lithuanian Qualifications Framework (LTQF) has 8 qualification levels. Levels of qualifications are arranged hierarchically, in accordance with the criteria defining qualifications' levels: complexity, autonomy and a range of activities which a person with certain qualifications can be expected to carry out. The LTQF includes qualifications for working and learning, the main purpose of which is to prepare a person for further learning. Such qualifications are acquired upon completion of general lower or upper secondary education programmes.

VET qualifications are attributed to the first five levels of the LTQF in the Lithuanian qualifications system. Qualifications at levels 1-4 are acquired by completing vocational education and/or general education programmes, whereas qualifications at level 5 are acquired by completing training programmes intended for people with a vocational qualification and professional experience, higher education programmes not leading to a degree, and/or through professional experience and independent study.

Level 6 qualifications are acquired by completing cycle one of university or college studies and, in cases and according to the procedure specified in legislation, by completing study or requalification programmes not leading to a degree.

Level 7 qualifications are acquired by completing cycle two of university studies or integrated study programmes, in cases and according to the procedure specified in legislation, by completing study or requalification programmes not leading to a degree.

Level 8 qualifications are acquired by completing doctoral studies. In addition, qualifications at all levels may be acquired by gaining professional experience or by independent study.

Qualifications awarded at present in the LTQF:

LTQF	Qualifications
8	Doctoral diploma
7	Master diploma Certificate of residency
6	Bachelor diploma Professional bachelor diploma
5	VET diploma
4	VET diploma Matura diploma (on completion of the upper-secondary education programme and passing matura examinations)
3	VET diploma Lower-secondary education certificate** (completion of lower-secondary education programme and testing learning outcomes) (grades 5 to 10)
2	VET diploma
1	VET diploma

### **Key characteristics of VET provision**

As stipulated in the Law on Vocational Education and Training (1997, new edition - 2007), the Lithuanian VET system covers initial VET (IVET), continuing VET (CVET) and vocational guidance.

VET programmes are designed for different age and educational background students. Initial VET is intended for the acquisition of a first qualification. In IVET, students are provided with opportunities of acquiring a qualification and completing general lower or upper secondary education.

CVET is designed for the improvement of a person's existing qualification, acquisition of a new qualification or gaining a competence needed to implement specific jobs (functions) as regulated in legal acts.

Those having no general lower or upper secondary education are provided with the opportunity to acquire it together with a vocational qualification. Thus VET programmes help to return early school leavers to the education and training system. After completing general upper secondary education and having gained a vocational qualification VET students may continue their studies at higher education institutions. In recent years the conditions to apply to higher education were improved for successful VET graduates.

From 2002 VET curricula in Lithuania are competence-based, with clearly defined training objectives. IVET programmes are developed by VET providers in cooperation with representatives of employers. When developing programmes, the providers follow VET standards and general requirements approved by the Minister for Education and Science. Formal CVET is implemented following national programmes.

VET in Lithuania is school-based; however, practical training and training in enterprises constitute the major part of the training. For example, in IVET practical training comprises 60-70% of the total time allocated to teaching vocational subjects, of which 8-15 weeks is organised in a company or a school-based workshop simulating working conditions.

Social partners participate in shaping the content of new qualifications, qualification standards and VET programmes, in assessing that VET programmes correspond to the labour market needs and in organising practical training. They also take part in organising and implementing assessment of qualifications.

### **Strengthening transition into VET:**

The transition from regular school into the VET system is sufficiently facilitated in Lithuania, however, implementation of certain measures should be taken into account:

- Ensuring proper career guidance and counselling . Some students are not able to assess their skills and capacities or do not receive the required counselling while still at a general education institution. For these reasons, they later tend to have difficulties in choosing a profession that suits them, which leads to emigration or unqualified jobs.
  - Preventing the "competition" between general education and VET institutions for the so-called "student's basket" (the amount of funding allocated to the schools for each student). General education institutions sometimes manage to convince their past students to discontinue their training at a VET school and return to the general education institution.
  - Improving the quality and relevance of VET programmes in order to meet the current requirements of the industry and labour market.
-

Regarding the integration of failed university students, there are clear and sustainable offers to facilitate their inclusion into the VET-system. There are also formal procedures to acknowledge university degrees (or successful parts of degrees) in the VET-system.

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

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

## **Phase 2:**

### **Role of COMPANIES**

in

**Building Information Modelling – BIM**

**Work based learning – WBL**

**Digitalization**

**Transition in VET**





# The situation in NETHERLANDS

by

Open Universiteit / Netherlands

## 1. Digitisation of the Dutch Construction Industry

Accounting for around 4.5% of the gross domestic product and over €60 billion in production, the total construction sector plays a huge part in both the living and working climate in the Netherlands.

Companies	Employees	Production
162.530	293.000	63.325 mln Euro

While digitisation is still relatively new to the construction industry, the use of the digital Building Information Model (BIM) is itself already well advanced in the construction process in the Netherlands. The BIM system stores all relevant information from member construction companies throughout the whole construction process and is currently used by the larger construction businesses, including input from architects, contractors, subcontractors and installers, allowing them to share the information and work together. The smaller enterprises are not yet into the BIM system, meaning that this digitised system is not yet embraced by all on the construction platform.

Digitisation heralds greater efficiency and, now the crisis is over, can allow for forward-thinking companies to open up new product-market combinations, advancing both efficiency and productivity. These areas for growth include the process, the production and also personnel. While digitization is well on its way in the process, the construction industry is still only on the brink of moving into digitising the product, though an outstanding example is of the total 3D printing of a canal house in Amsterdam.

The third area for consideration, which is that of personnel, is where attention should now be focused. Using robots will create the greatest impact to the future of the construction industry, though some jobs may be more affected than others. Low-tech occupations, including painters, concrete workers, roofers and welders, could become digitised, whereas the high-tech responsibilities of, for example, architects and engineers, are less likely to change. Such digitisation of specific occupations will lead to a change in the breakdown of responsibilities, bringing about the need for other personnel and the redesigning of work space to make use of robots. Digitisation in personnel will increase productivity, a necessity for companies who wish to be in the lead with output.

## 2. BIM in the Netherlands

The Construction Information Council (referred to as BIR) is the prime energy behind the BIM and members of the BIM encourage and create practical agreements between the six sectors in the construction industry, including clients, engineering offices, architects, contractors, manufacturers and installers, guaranteeing common interests in the different branches within their sector.

The BIM system can work both within an organisation itself (referred to as Little BIM), with the aim of improving internal business processes via software and training, or with also the collaboration of other companies using the system, this being referred to as Big BIM. Implementing BIM's central directional and coordinative role throughout the Dutch infrastructure is aimed at the continuous improvement of the international competitive position of the construction sector, via the continuity and quality coming from all involved in working towards the same standards of quality and efficiency. In turn, the BIR applies direction and coordination to the system evolving, so as to share the principles of BIM via teamwork and education.

Working for the common aims of quality and efficiency by sharing the same data and structures in the BIM system will help reduce error costs and make the final outcome clear to all.

As stated earlier, not all companies are yet on board with the BIM system and companies are also debating where the cost of digitising the construction industry, as well as the costs of training and education, lies.

## **Looking at Values around BIM**

In the construction industry in the Netherlands, a Building Information Model (BIM) has been established, which allows for all the responsibilities in the construction industry to contribute to, and learn from, a common method of working together. This allows all members to share ideas, and indeed errors, with the aim of working towards excellence in the future of construction. heralding digitisation throughout the roles of the process, product and personnel, the system is currently used by major companies, with the hope that the smaller companies will come on board in the near future.

In 2013, research was carried out by SBRCURnet, with the idea that, if the cultural values of BIM were stimulated, the spreading of the process of BIM would be quickened. Research results were used, to create a plan to take on board the favoured cultural values then present in companies and projects and the results were viewed from three angles:

Result 1: The most obvious results related to teamwork and the sharing of information (i.e. collaboration) and these are necessary at all levels in the BIM, in both the current methods of working and those desired for the future. The future method of cooperation must focus more on human contributions, which can maximise the potential of BIM.

Result 2: Rapid growth within the BIM framework is meeting the institutional barriers of property rights, contracting and the diffusing of Information and Communication Technology (ICT), as well as the human factors of the culture within the management and skills in the construction sector.

Result 3: Using the BIM system within an organisation (Little BIM) and using this system in the larger system of shared information between construction companies (Big BIM) needs attention, in order to work together in the sharing of common (to all) values of cooperation, information sharing and teamwork.

## **Conclusions**

1. Putting more emphasis on collaboration than on hard performance seems to be the way forward. This includes teamwork, cooperation and the sharing of information, all of which lead to clearer communication. Working together builds trust, openness, enthusiasm and involvement, with less focus in the current moment being given to the already addressed values of performance, quality and cost. This process needs further investigation.
2. People want to recognise themselves in the cooperation and teamwork taking place (ownership of performance and results). Team players have similar feelings towards personal and cultural values and their moving away somewhat from the hard values of quality and performance may explain the reduction in their discomfort with these.
3. The transition of companies using Little BIM into the eclectic Big BIM system will allow for greater information sharing and teamwork.

## **Recommendations**

1. The BIM values of commitment, openness, trust, enthusiasm and the sharing of clear information, all fall under the umbrella of teamwork / collaboration and are all necessary for success. This is a

culture programme which is already in place and will grow from step-by-step integrated development and evaluation, which addresses attitude and behaviour within its culture.

2. The previous diffusion strategy of 'top-down (Tell and Sell)' approach has now changed to 'bottom up (Connect & Share)', which allows for a mutual exchange of facts and views in the construction sector.
3. Discussing projects right from their initial outset to their end result, will allow members working with the MIB system to develop, to succeed and to also understand setbacks and how they were overcome.
4. Managers need to work with a common objective and be on the same wavelength (the Barrett study showed that 70% of values in any organisation have their origins in the behaviour and attitude of its managers). Success depends on managers' agreement to this approach.
5. Via programmes and values in the curriculum, organisations need to develop systems and procedures which will make target values both tangible and discussable.

### 3. Workplace Learning

In the civil engineering and construction industry, the provision of education and training is the key to quality and craftsmanship and the Dutch VET system of secondary vocational education and training (referred to as MBO) is a system which links theory with hands-on experience in a variety of occupations. Whilst this system is an opportunity for young adults (from 16 years of age), more mature adults are also encouraged to embark on this method of learning the trades associated with construction. There are currently 485,000 people enrolled on VET courses, as well as another 145,000 on contract basic programs via education courses. For the construction sector specifically:

Students	Pathway MBO	Instroom MBO
28.627	11.532	5.541

The secondary vocational education (or MBO) programme offers two pathways of learning, both offering equal qualifications and opportunities. These pathways are:

1. A work-based pathway (referred to as bbl), in which students spend at least 60% of their time in a work placement, where they learn from hands-on practice.
2. A school-based pathway (referred to as bol), which consists of students spending more time concentrating on theory and getting hands-on practice for between 20 and 60% of their course time.

The MBO system offers five courses of learning, beginning with entry level and rising to specialist training. These are:

1. A one year course for those who wish to start with an entry training level 1 qualification
2. A two year course in basic vocational training, with a level 2 qualification
3. A three year course which offers professional training to a level 3 qualification
4. A three to four year course in middle management training, giving a level 4 qualification
5. A one year long specialist course, which follows on from completion of a relevant professional training course. This course offers a level 4 qualification.

Entry at level 1 means that one needs no entry qualifications and the student must work through all of the required levels in turn.

Entry from level 2 onwards means that the student has specific (maybe high school) education, allowing the student to enter into the levels at some other point. With the high school continued education level (referred to as HAVO), the student can enter as high as level 4).

Whether in the Netherlands or abroad, companies offering vocational training will be only those who meet the quality criteria set out by the Collaboration Organisation for Vocational Training in Industry (referred to as SBB). Meeting these accreditation regulations mean that:

1. The student receives guidance from a trainer who is competent and the company meets the requirements for general safety in the workplace
2. The training given must meet the needs set out in the programme qualification for which the student is enrolled.

Schools are wholly responsible for a student's education, including the work placement (referred to as Bpv). The practical agreement (referred to as pok) outlines agreements which are agreed between the student, the school and the company, including shared guidance, as well as assessment and the length of the internship.

Any damage which may occur during a trainee's performance of duties within the internship is the legal responsibility of the training company. It is not for the trainee to prove that an accident occurred through no fault of their own and a company offering apprenticeships cannot exclude such a liability for the damages suffered by a trainee. Should this happen though, the educational organisation and their student would not sign such a practical agreement.

#### **4. Transition in the Method of Construction Education**

The Netherlands Employees Insurance Agency (referred to as UWV) expects that 2018 will lead to 13,000 more jobs in the construction industry, of which 4,000 will be from the self-employed sector. This upward trend indicates growth in this important industry.

Due to the previous crisis, there has been a limited supply of construction professionals via vocational training and current growth has indicated a shortage of executive staff at senior secondary vocational education level. These shortages includes trades such as bricklayers, carpenters, preparation and installation technicians, as well as foremen and contractors needed in the areas of preparation, planning and also management of the construction process.

The Education & Training Agenda of Bouwend Nederland was drawn up from the information gained via member panels and education committees and this agenda plans and upholds the policy framework for the association of Bouwend Nederland. It sets out a three year plan of ambitions and objectives, with which it keeps all interested parties up to date, including member companies, stakeholders and its board members and employees.

Bouwend Nederland has recognised several trends in education and training and these include:

- While employment is improving, the number of people in mainstream education is falling. While the retirement age is rising, there is a trend for people working longer. Both these factors are creating an ageing population and an older workforce. The population is now being added to via refugees and this could be where a younger population and opportunities for status holders will add to the workforce.
- Lifelong learning in employment will lead to a better quality of instruction and training.

- Regular training both in-house and via private providers will help retain the skills and values found in long-term staff.

## Developments in Vocational Education and Training (VET)

Some of these developments include:

1. Technology needs to become more instilled in our education system, as there are not enough pupils moving towards technology as a profession.
2. Vocational education now seems to be more of a focus than secondary education, from which students then move on to higher professional education (referred to as HBO) via VET.
3. The report 'Focus on Craftsmanship (2011-2015)' was developed and implemented in the previous cabinet and, whilst aiming at improving vocational training, this policy placed a lot of emphasis on language and arithmetic, areas of expertise which were necessary to success in development. However, many able pupils prove to be more practical than theoretical and so the attention is now on excellence, with education at all levels now focusing on encouragement of students at all levels of education.
4. Universities of applied sciences need to make training easier and more accessible to minors in employment e.g. cooperating with companies for alternative forms of work (modular and dual). Mirroring higher professional education (HBO), collaboration between companies and universities could include minors within every training programme.

Education is always changing and the construction industry must keep up to date with these developments.

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**Phase 2:**

**Role of COMPANIES**

in

**Building Information Modelling – BIM**

**Work based learning – WBL**

**Digitalization**

**Transition in VET**



**The situation in  
POLAND  
by  
Educational Research Institute (IBE)**

## **Building Information Modelling – BIM**

### **Awareness of BIM among Polish companies**

Research conducted last year (Antal, 2017) 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.

Statistically significant differences in BIM awareness depending on the size of the company allow to claim that BIM is more widespread in larger offices and enterprises. However, even in small companies over 40% of respondents declared that they had contact with BIM. Respondents estimate that BIM awareness is higher among architects, construction and installation designers, lower if we talk about contractors, investors or building owners (Autodesk, 2015).

### **Using BIM by Polish companies**

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 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 (Antal, 2017).

### **Legal aspects of using BIM in Poland**

Using BIM is not legally required, however there are several areas of law that affect the application of the BIM methodology. This includes: intellectual property law, public procurement law, administrative law, Act on computerization of entities performing public tasks, broadly understood building law, Act on planning and spatial development, environmental law, special acts, civil law together with civil code and criminal law (MIC, 2016).

One of the most relevant legal area for the companies in terms of BIM is Public Procurement Law. This law was amended in June 2016. The amendment introduced an article that would transfer the recommendation of the EU directive regarding the application of the BIM methodology in public procurement. According to art. 10e of the Public Procurement Law: *"In the case of works contracts or competitions, the contracting authority may require the use of electronic data modeling tools for construction data or similar tools. In this case, the contracting authority provides access to these tools in accordance with art. 10d until such tools become publicly available."*

## Barriers for companies and needed actions

The research conducted three years ago (Autodesk, 2015) 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 (Autodesk, 2015).

## BIM and the Sectoral Qualifications Framework for Construction Sector

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)*.

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2. *Building Information Modeling. Ekspertyza dotycząca możliwości wdrożenia metodyki BIM w Polsce [Building Information Modeling. Expertise on the feasibility of implementing the BIM methodology in Poland]* (MIC, 2016); Report prepared for the Ministry of Infrastructure and Construction (MIC) by KPMG Advisory, Subcontractor: ARUP: <http://www.bimblog.pl/wp-content/files/mozliwosciwdrozeniametodykiBIM.pdf>
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](http://damassets.autodesk.net/content/dam/autodesk/www/campaigns/bim-event/BIM_raport_final.pdf)

### Relevant organisations:

*Cluster of Information Technology in Construction* (BIM Klaster) is a network of cooperative relations, which was established in 2012, on the initiative of several companies from the Małopolska province. At present, BIM Klaster functions as an officially registered Association associating pro-innovative and highly specialized small and medium enterprises operating in the construction and ICT industries as well as public institutions from the



business and scientific environment supporting entrepreneurship and innovativeness of the economy in Poland. The cluster's main goal is to combine the potential and competences of companies and other entities allowing for the implementation of any construction projects in the latest ICT technologies. The added value of a construction cluster is inspiring activities aimed at the full use of BIM technology in the entire investment process, from concept through execution to commissioning use, and even throughout the life cycle of the building.

*BIM for Polish Construction* – the Association brings together natural persons, organizational units without legal personality and legal persons interested in promoting and developing the application of BIM technology in Poland in the area of design, cost estimation, scheduling and implementation of public investments. Unit established in 2014.

*The European Certification Center BIM (ECCBIM) - Foundation* is a platform that connects various environments interested in the effective implementation of BIM technology in Poland as a tool significantly increasing the efficiency of public and private investments. A non-profit organization whose main purpose is to promote good practices, guarantee high quality of BIM services provided by Polish design and implementation companies, and to indicate to investors how to obtain maximum financial results from BIM.

## **Work based learning – WBL**

From 1 September 2017, new regulations are in force defining the principles of organizing practical vocational training, among others at employers who employ young workers under a contract for vocational training. The Ordinance of the Minister of National Education of 24 August 2017 *on practical vocational training* determines the conditions and procedure for organizing practical vocational training: in school workshops, in school studios, in continuing education institutions, in practical education institutions as well at employers as well in individual farms; and the qualifications required from persons leading the organizing practical vocational training and their entitlements.

The new regulations provide that practical vocational training is organized in the form of practical classes, and in technical and post-secondary school - also in the form of apprenticeships. In addition, practical classes may take place at employers - on the principles of a dual education system - based on:

- a) contracts of employment for the purpose of vocational training, concluded between a minor (student) and an employer,
- b) contract for practical vocational training, concluded between the school principal and the employer accepting students for practical apprenticeship.

## **Employers and financial aspects of WBL**

Pursuant to the regulation, the bodies running schools (that organize practical vocational training outside) provide financial means enabling students to complete practical vocational training. The financial resources are intended for:

- a) refunding to employers the remuneration of trainers of practical vocational training, conducting practical classes with students, including practical classes held by employers on the basis of a dual education system - up to the minimum basic remuneration rate of a contract teacher holding a university teacher's diploma,

- b) refunding to employers a training supplement for instructors of practical vocational training conducting practical classes with students, including practical classes conducted at employers on the principles of a dual education system - in an amount not lower than 10% of the average monthly remuneration set by the Central Statistical Office; the training allowance is determined and paid by the employer,
- c) refunding to employers the costs of clothing and work footwear as well as personal protective equipment necessary for a given training position, allocated to students for practical classes conducted by the employer in a given school year, including practical classes carried out with employers on the principles of a dual education system - up to 20% average salary,
- d) refunding diets and benefits to employers (applies to professional practices carried out on marine and inland vessels).

### **Instructors of practical vocational training**

Practical classes are conducted by teachers. In the case of practical classes carried out at employers and in individual farms, classes may also be conducted by vocational training instructors who have appropriate qualifications.

### **Patron/Tutor of apprenticeships**

Apprenticeships organized by employers or individual farms are conducted under the supervision of apprenticeship tutors, which may be employers or their employees or persons running individual farms.

An employer with whom a student's vocational training is organized may exempt partially or completely a professional apprentice from the performance of a job resulting from a contract of employment due to the specificity of the employer's activity or the number of students undergoing apprenticeship. For the time of partial or total dismissal from the work, the trainee is entitled to monthly pay calculated as holiday leave.

If the supervisor is not dismissed from the work, the employer establishes and pays to the tutor of the apprenticeship a training supplement in the amount not lower than 10% of the average remuneration.

The tutor may receive from the employer for the period of conducting apprenticeship a bonus not lower than 10% of the average remuneration.

## **Digitalization**

Polish companies deal with digitalization in their everyday work at different levels. Their relations with customers are more and more often based on e-mails, skype and other communicators or clouds. Thank for digital communication they are exchanging data, calculations, offers, ideas etc. On the other hand the customers expert to find basic information (scope of services, prices, products) on the websites. To satisfy customers, the companies need to be up-to-date regarding digital developments.

Polish organizations are increasing their involvement in projects aimed at digitizing customer relations and enabling them to take advantage of the company's offer through various - mutually integrated and complementary - access channels. The digitization of processes and the implementation of new contact and purchase channels is a phenomenon that is particularly visible in the sectors operating in B2C logic, including in banks, financial institutions, retail chains or in the services sector.

It is worth mentioning that Polish enterprises are beginning to perceive digitization much more widely than before. "Digital" does not just mean "IT" anymore.

In addition, companies began to take seriously the area combining business and technology, or data analytics in terms of customer behavior, machine work or cooperation with suppliers. Thanks to it and investments in digital technologies, enterprises want to increase their revenues (49% of indications in the PwC study from 2017) and save on operating costs (13%).

And what are the key competencies for effective digital transformation today? First of all, the ability to implement new technologies in business (73% of indications), data analyst (67 percent) or designing customer-oriented solutions (40%). However, the client's experience in contact with a company or its product (customer experience) is treated as a priority only by 16% of the respondents (PwC, 2017).

There are numerous State programmes that offer support (mainly financial) in digitalisation of the companies. The funds come from EU sources in most cases.

### Sources of information

- *Digital IQ - Cyfrowy wyścig firm* [Digital IQ - Digital company race], (PwC, 2017), [www.pwc.pl/digitaliq2017](http://www.pwc.pl/digitaliq2017)
- *Digitalizacja rynku B2B* [Digitalisation in B2B market], (Deloitte, 2017), [https://www2.deloitte.com/content/dam/Deloitte/pl/Documents/Reports/pl\\_Raport\\_Aleo\\_Deloitte\\_2016\\_ONLINE\\_01.pdf](https://www2.deloitte.com/content/dam/Deloitte/pl/Documents/Reports/pl_Raport_Aleo_Deloitte_2016_ONLINE_01.pdf)

### Transition in VET

Companies are those who, in great part, share the labour market and competences of potential employees. They define which qualifications are needed, they employ, they recruit the apprentices, they train (or outsource trainings) employees and apprentices. They participate sometimes also in VET (by different means). Of course they do it in response to the technological developments and need for their services. Companies are also crucial at the moment of drop-out from higher education. It is especially important in the construction sector – thanks for its specificity and diversity not only highly qualified and specialized workers are needed. Companies also hire low qualified staff for minor, simple works.



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

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

## **Phase 2:**

### **Role of COMPANIES**

in

**Building Information Modelling – BIM**

**Work based learning – WBL**

**Digitalization**

**Transition in VET**



## **The situation in Finland by Sataedu**

### **Work based learning – WBL**

Upper secondary vocational education and training will have new challenges because of the educational reform. New laws based on the reform has become valid on 1.1.2018. Purpose of this reform is, among other things, to strengthen the societal meaning of upper secondary vocational education and renew it so that future know-how needs can be fulfilled. Work based learning time will be increased without forgetting the quality. Learning environments will be digitalized and new digital services can be seen.

Teacher's role is to teach but new methods may be needed. Already several years the role of teacher have changed more like a trainer or tutor and this coming reform is not changing that trend. Co-operation between work-life and school and work based learning will have a bigger role in future. Teachers, students and companies have a positive attitude to on-joblearning. work based learning is increasing and care must be taken that the quality and goals can be achieved.

The guidance of a student during the work based learning period is coordinated by a company tutor and a teacher. The student should interact with his / her company tutor on a regular basis as company tutor's duties include, inter alia, in conjunction with the educational institution, planning workplace learning and student guidance and assessment. The guidance provided by the company tutor is named by the the workplace, but not all the guidance is the responsibility of the designated company tutor, but the entire work community is involved in vocational guidance.

The employer provides students with work based learning, which usually takes place without employment, so that the company is responsible for safety at work, appoints a responsible company tutor and a representative of the company to sign the required contracts. The student's occupational safety is the employer's responsibility. The task of the company tutor is to ensure that the student is familiar with occupational safety in accordance with the Occupational Safety and Health Act

Company tutors are usually experienced employees of a company who have received workplace tutor training. Their job is to guide and monitor the student and evaluate his achievements. The task of the company tutor is to ensure that the student is acquainted with the job and understands the safety requirements. A company tutor also acts as a role model whose choices and procedures guide the student in his / her own work.

According to surveys, company tutors are very realistic in evaluating their own guidance and assessment skills. In their own experience, they themselves generally give inadequate feedback to the students they have instructed. One of the reasons for this is, of course, that there is no pedagogical background for the workplace instructors or training in student evaluation. As another factor, company tutors have their own job, so the pressure and rush caused by their own work does not always give the opportunity for guidance and evaluation over time.



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**The situation in  
BELGIUM (EU-level)  
by  
the EUROPEAN BUILDERS CONFEDERATION**

**Building Information Modelling – BIM**

EBC and its construction SMEs and crafts put forward several recommendations for a favourable implementation of BIM in Europe. However, a proper understating of BIM benefits and challenges still requires promotion and familiarisation efforts. EBC insists on the need of a soft transition to BIM methods, notably regarding public procurement, while BIM and other digital tools need to be promoted to other markets such as the building renovation market. BIM models and tools of should be greatly promoted in traditional buildings, but also in renovated ones as they have a great potential to boost energy efficiency and limit the environmental impact of the construction industry as a whole. In overall, BIM tools should be compatible with the EU Construction Product Regulation n. 305/2011 and costs must be bearable by all SMEs and relevant stakeholders. Moreover, professional trainings should be provided and promoted to all relevant players of the construction sector.. Last but not least, construction SME entrepreneurs and crafts encourage SME representation and participation in the relevant CEN Technical Committees (TC) through Small Business Standards (SBS).

**Work based learning – WBL**

The concept of work-based learning (WBL) is often known by professionals in the construction industry. Respondents of the questionnaire have at least had one experience with work-based learning, which has helped them acquire essential knowledge, skills and competences for everyday tasks. It is more important than ever to facilitate the transition of work-based apprentices to employment settings: a successful transition into the labour market depends on the information and development possibilities accessible. New attractive work-based learning programs and well-established apprenticeship schemes in the construction sector are required both at European and national levels. More financial support needs to be offered to those institutions that create opportunities for high-quality work-based learning education and training.

**Digitalisation**

EBC and its construction SMEs and crafts supports the digitalisation already taking place in the construction industry, but they also require further involvement in the arenas shaping this process as they represent the overwhelming majority in the construction sector. EBC encourages the digitalisation of the construction industry through the Digital Single Market (DSM) initiatives. New and better regulatory frameworks should be put in place to improve the current system of: intellectual property rights, cybersecurity, data quality and data management in face of general data liability and GDPR. So far, not all relevant stakeholders in the construction sector are well aware of BIM, nor do they fully understand the strategic importance of BIM methods and tools. While BIM is considered as an increasingly important tool,



oftentimes the major operational actors of the sector, SME entrepreneurs and crafts, lack adequate and sometimes services such as adequate computer, a broadband internet access etc. Moreover, all stakeholders consider qualification and training support is required in the form of: webinars, programmed contents, seminars/ courses, BIM guidance measures and handbooks. On this basis, EBC considers the post-2020 budget should provide the right financial tools to support the digital transformation of SMEs and relevant stakeholders, through among others: involving SME and SME representatives in the debates and decisions on the digitalisation of the construction sector; offering training and support in digital construction; promoting SME-friendly IT infrastructure throughout the construction sector in the EU.

## **Transition in VET**

Vocational education and training is evolving across sectors in Europe, to make sure that people have the skills they need in the fast-changing economy. EBC supports the development of VET high-quality programmes in the construction industry, which would benefit individuals, companies and society at large – by providing professional trainings and the technical, digital and green skills in required by evolving construction markets. Respondents of the questionnaire acknowledge that not enough apprenticeship opportunities or training programmes are offered in the construction sector. EBC pledges for increasing the number and quality of apprenticeship and training in the construction industry, through a proper implication of SMEs and SME representatives in the definition of training programmes, improving existing apprenticeship and training models through the exchange of best practices, a better promotion of training benefits to companies, to,. Yet, to facilitate the transition from school into the labour market, it is more important than ever that VET training prepare individuals with the skills really required in the construction sector, especially by its main actor construction SMEs, in order to avoid the mismatch between what is expected from apprentices and what they have learned during their apprenticeship processes. Also a better social and financial support for apprentices should be ensured. Construction stakeholders believe the European Union should further support good practices of apprenticeships and training in the area of construction.



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**The situation in  
BELGIUM  
by  
Centre IFAPME Liège-Huy-Waremme**

## **Building Information Modelling**

### At this point, what is BIM's vision for companies?

For companies targeting medium or large markets, BIM becomes unavoidable because, even if it is not mandatory, more and more owners (public or private), require it. The first objective of the BIM interlocutors is to know for what uses the client solicits BIM. The role of the BIM manager is then essential because he will inform the client on the potentialities of BIM and on the precise uses, that it would be interesting to develop, in the project concerned. For all actors, architects, design offices and companies, everything remains a little confused at this level ... even for those who are already involved. We are indeed only at the beginning, in the discovery. Trade management protocols must be defined and this is not yet easy to integrate for the various stakeholders. If companies guess a little how it can happen on site, many questions remain unanswered (which software, used by whom, with what information, project updates? by who ?)

### How can companies get started?

We can say that there are two different levels of involvement.

First level involves the company herself; using BIM to improve the site management without involving other stakeholders. And this point already requires some efforts.

Secondly, here is the level where the company intervenes with other partners. This is already becoming a more complex level.

Having a well-developed protocol is one of the best guarantees for success. Company owners have to acquire new skills on the management of various computer tools (software, tablets, digital platforms ...).

It takes time!

The best advice for companies is to go step by step, starting with a well-chosen project and learning by getting involved to the best of their abilities.

### BIM, brake or opportunity?

Both ! BIM is a brake because it requires changes. And there is always resistance to changes. The brakes are at the financial level because companies will have to buy new equipments, new softwares, they will need to train their staff. Changes are at an individual level, because one has to dare to changes one's practices, opting for new ways of communicating ...; changes are also at management level, because everyone must learn to communicate in a new way by respecting new rules imposed or to establish in common. But BIM is above all a great opportunity to improve

the practices of all construction partners and work in a more collaborative spirit than it is now (which is rather individualistic). It provides a good answer to the increasing complexity of projects that accumulate more and more standards, obligations, specific criteria ... A single person is not able to have all the information on his brains. The digital model can contain all this information. But we have to find a way to format it and use it effectively. It is therefore a real opportunity to guarantee the quality of the projects with a more collaborative way of working on the part of the various stakeholders. In fact, our whole society is moving towards this new way of doing; more collaborative, participative, it is not just attached to the construction sector. It is a natural - and beneficial - evolution of our society.

## **Work based learning – WBL**

WBL is essential in construction sector. Learning by doing ... WBL, especially in crafts jobs. Young people have the opportunity to learn on site the different techniques and skills monitored by professionals. This also allows exchange of experiences between the experienced worker and a younger one. This permit the transmission of knowledge and is important for the trades and for the future of the handicrafts. WBL should be implemented in all profession as it is the best way to realize how it works in real working conditions, dealing with real life. This can engage the students better in their professional lives.

It is a pity that fundings are quite low in the French-speaking of Belgium and do not allow a better investment in the training of young people, as well as tutor's rôle that is still not present enough. Indeed, profitability is considered as a priority, what can sometimes overshadow quality coaching. However, having, as is the case with us, 1 day at the Center and 4 days in the company, our trainers being active professionals (and therefore aware of the reality of construction and technical developments), the young person has opportunity to come to the Center with his questions and receive more detailed explanations of what he may not have understood. In addition, the trainer of the center received a pedagogical training, allowing him to adapt his explanations to the request. The point that needs to be explored is the problem, is the lack of communication between the trainer and the entrepreneur. The IFAPME referent plays this role of intermediary but it would be important to encourage the direct dialogue between the representative of the company and the trainer of the young person, but if in case of major problem, it happens but it should be systematized. Training through work allows important social inclusions and an impressive insertion in the labor market. Indeed, if we take the integration rates of our young graduates, more than 70% of them find a job within 6 months after the exit of our system. This places our system in the top three of the sectors that lead to employment.

## Digitalization

According to the "Leaders 2020" study carried out for the SAP account, in an Oxford Economics survey, only 16% of companies are ready to take up the digital challenges!

At the same time, at a global level, many companies already turned to digitalization, and will soon impose their working methods on their subcontractors, their trading partners, and so on.

The time of the awareness of the TPE will have to end, it is necessary to take actions now! It is necessary to build a vision of the strategic and managerial stakes, that companies will face in 2020 and to list the challenges they will face.

With an increasingly connected world, the explosion of social networks, an abundance of data, unlimited access to knowledge, Belgian TPEs, mainly Walloonians ones, are not ready at all to face the supremacy of American companies. But time is short.....and the challenges are numerous:

- Reinvent business models
- Capitalizing data
- Promote the customer's experience
- Differentiate and innovate
- Consider partnerships
- Rethinking its own organization
- Mastering new digital risks
- Managing Talent
- Change the type of management (e-leadership)

UCM has experience, for many years, with the subject and organises seminars, mailings, ... to sensitize companies on the topic of digitalisation. They are conscient about the fact taht companies, especially in construction sector, are reluctant, and this ist most the case as far as micro companies are concerned.

Companies really need to understand the challenges !!!

## Transition in VET

Many parents push their children to pursue higher education or university because it is "on the page", unlike vocational training that does not always have a good reputation. Who is rather seen as a relegation pathway rather than a top quality option. Yet, craftsman professions can be seen rather as a passion, an art.

As a result, a quite high number of young people, pushed by their parents, are pursuing higher education. When they perceive that it is not for them, the question of professional choice arises again and the future prospects also.

Unfortunately, the bridges between the different types of education are not well taken into account and the communication between the networks is quite weak.

Paths should be set up for young people who want to go to the craft trades, on the one hand, to show them the opportunities, but on the other hand also to break the stereotypes of the sector.

Indeed, the construction sector is dealing with a labour shortage and companies are really ready to train young people and give them a workcontract after the training. It is a reality that the integration rate into the labor market. It is therefore essential to enhance the image the professions but also to provide the opportunity to create bridges between different types of education, that would allow young people to be able to change the sector by validating and recognizing their prior learnings.

### The place of digital in construction sector

With digitalization becoming more and more present in the sector, this approach could also be highlighted to attract young people to our businesses. In this case too, a young person who has already acquired notions or skills in a more traditional form of education could be have some exemptions. To this day, the different types of education and VET are still too individualistic and should communicate more for the development of the individual!



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