

BIM EDUCATION - GLOBAL – 2018 UPDATE REPORT

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EXECUTIVE SUMMARY

In January 2014 NATSPEC issued the first version of a report summarising the status of BIM education in a number of countries across the globe. The report was updated and reissued in 2015, 2016 and again in 2017. This report is version 5.0 of what is now an annual update to the original report.

Each year the countries included in previous versions of the report are given the opportunity to update their section to reflect the current status of BIM education in their respective countries. In the updated versions since the original 2014 report, additional countries have provided input, expanding the scope of the original report. This fifth edition of the report includes information for 17 countries, with Chile and Switzerland providing additional input to this year's report.

Most countries are reporting BIM education being provided to Architecture Engineering Construction (AEC) students by their higher education and technical training institutions. An increase in the number of courses being offered was reported in most countries, with the exception of a few, such as Singapore, which reports that the number of diplomas, that include BIM content, provided by the BCA Academy has actually reduced from last year. However, this could be due to BIM education being sufficiently provided by other institutions in Singapore.

Detailed studies completed in countries such as Australia, Canada and the UK has indicated that there are many challenges being faced by educators in regards to incorporating BIM into

the curricula and a number of these challenges are indicated in this report.

With the exception of South Africa and Japan, most countries' higher education institutions are including structured BIM education within the syllabus of their AEC courses, at both an undergraduate and postgraduate level. Countries such as Australia, Finland, Netherlands, Singapore, Sweden, UK and USA are reporting a significant volume of courses and subjects available. Many vocational education institutions are also providing BIM education to the industry's workforce.

Whilst the majority of BIM education being provided tends to focus on the use of particular BIM software packages. It has been reported that training for both graduates and professionals in openBIM concepts, BIM management and working in collaborative BIM environments, appears to be increasing, particularly in the northern European countries, but it still has a long way to go.

Countries including Australia, Finland, Hong Kong, Norway, Singapore, Sweden, Switzerland, UK and USA have reported training and education being available in these topics.

The trend towards accreditation/certification schemes to validate the BIM knowledge of professionals in industry continues. Countries such as Australia, Canada, New Zealand, South Africa, UK and USA have all reported the existence or development of such schemes in their respective countries.

INTRODUCTION

Question

In October 2013 Richard Choy (NATSPEC) sent an email to a global group of parties with an interest in BIM, asking for a brief paragraph outlining the current status of BIM education in each of their respective countries.

This question was interpreted in two ways, with the respondents either describing the current level of BIM awareness/use in their country or the current level of training/higher education available. Some respondents also provided a much more detailed response than a brief paragraph.

Original report

A report summarising the responses received was compiled by NATSPEC and issued in January 2014. The report only included countries from which a response was received and was based purely on the responses provided. It did not attempt to fully document the status of BIM education/awareness in each country.

Updated report

In 2015, 2016 and again in 2017 NATSPEC produced an updated version of the original report. Each year the updated reports included input from additional countries than simply those who contributed to the original report. This year the updated report also includes input from Chile and Switzerland.

Early in 2018 NATSPEC again contacted the respondents who had contributed to the previous versions of the report, offering them the opportunity to update their information to reflect the current status of BIM education in their respective countries.

This report again summarises the responses received. As per previous versions, this report is based purely on the responses provided; it does not attempt to fully document the status of BIM education/awareness in each country.

5 countries who have previously contributed did not provide an update this year but most have indicated that they will next year. Where no response was received from a previous contributor, it was assumed that the status of BIM education in their country has remained unchanged.

BIM EDUCATION - BY COUNTRY

AUSTRALIA

Education/Training

There are 30 Universities that are accredited to provide undergraduate programs in AEC disciplines. Of these, 11 provide programmes in all three discipline streams.

These 11 institutions have shown the greatest uptake of BIM in their undergraduate programs. However, this has mostly been at a basic level of information, simply covering the concepts of BIM or the basics of using a particular piece of BIM software. At this stage these courses are not yet looking at collaborative BIM across all three disciplines.

The construction management programs appear to be showing the fastest uptake of BIM education courses.

Many TAFE (technical) colleges are providing courses where BIM is incorporated into the syllabus. However, this is usually related to the use of specific BIM software packages.

The topic of BIM management or the procedures for working in a collaborative environment are not generally covered in these courses.

The University of Canberra (UC) has recently incorporated BIM into several different subject areas in its Building and Construction Management Degree program as well as introducing a specific new compulsory unit of study in BIM. Students are introduced to 3D modelling tools, complementary with scheduling and costing tools. In their final year, students complete a dedicated unit in BIM where they apply their knowledge in a real case study in 3D, to integrate the model with the time dimension to generate 4D, grasp 5DBIM via cost integrated modelling and run technical clash detection. UC is also planning the introduction of new subjects and programs, such as a Graduate Certificate of BIM and a Master's Degree of BIM in the near future.

In Western Australia, the Central Institute of Technology is developing a 3-year BIM course, and also runs a short 3-day course titled 'Introduction to BIM'. The University of Western Australia offers a BIM Masters course.

NATSPEC has been providing an *Introduction to BIM* presentation to undergraduate students at Universities across Australia for the past 7 years.

NATSPEC also provides industry seminars on the use of the NATSPEC BIM Project Inception Guide, NATSPEC National BIM Guide, NATSPEC BIM Management Plan and the recently released NATSPEC BIM Object Properties Generator.

Initiatives/Organisations

Three Universities (University of South Australia - UniSA, University of Newcastle - UoN and University of Technology, Sydney - UTS) were involved in a project supported by the Australian Government Office for Learning and Teaching called CodeBIM (Collaborative Building Design Education using BIM).

The project aimed to examine whether collaborative design education could be improved using BIM technologies; how best to adapt these technologies to existing AEC courses; and to develop new curricula for collaborative building design courses in a variety of delivery modes (traditional face to face, distance and block/intensive mode, for example).

A framework to help academics implement BIM (the IMAC framework), was developed and published. It aimed to help identify existing courses that can be modified to incorporate BIM and collaborative working practices, rather than having to create entirely new courses.

Some of the identified problems faced by educators in implementing BIM include:

- How to fit new topics into an already crowded curriculum.
- Reluctance to change teaching habits established over many years.
- With those who may have developed their own niche or expertise, there may be resistance to take on a new subject, about which they are not expert, or to retrain in an area they are not familiar with.
- Technologies supporting BIM evolve at a rapid pace; they may feel overwhelmed trying to keep abreast of them.
- Class sizes of 80 students (and often over 130 students) are common place. The resources required to convert large lecture-based courses into smaller multidisciplinary teamwork-based courses may seem a substantial challenge.

Outcomes from the CodeBIM project have resulted in the development of new undergraduate courses. For example, an “IPD studio” class has been developed at UTS which involves multi-disciplinary students working over a semester on a project using BIM tools and processes, learning how to work in a collaborative team and the information needs of their partner disciplines. At UniSA, similar collaborative BIM courses have been developed.

The Australian Institute of Architects (AIA) and Consult Australia established a BIM education working group of industry and academia members in 2011.

This group produced a series of documents, published in August 2012, which represented the position of the group and were to act as a foundation for further work.

The Western Australia AIA BIM Group is collaborating with Curtin University, University of Western Australia, Central TAFE and the Construction Industry Training Board (CITB) to advance BIM education.

Curtin University has also collaborated with Huazhong University of Science and Technology (HUST), Wuhan, China, to establish the Australian Joint Research Centre for BIM.

The centre focuses on developing leading research that integrates BIM with other advanced concepts and technologies and acts as an allied international platform for creating and sharing knowledge among researchers, engineers and innovators to improve the performance and productivity of building projects in the energy, mineral and construction industries across Australia and China.

buildingSMART's National BIM Initiative report to Federal Government (2012) identified 6 key areas needing attention to drive the construction industry forward. One of the key areas identified was multi-disciplinary BIM education.

A working group was set up, and details can be found at buildingsmart.org.au.

The Australasian Procurement and Construction Council (APCC) and the Australian Construction Industry Forum (ACIF) jointly published their *Framework for the Adoption of Project Team Integration (PTI) and BIM* at the end of 2014. Education and training

in PTI and BIM is a key theme of this framework.

As a result, APCC and ACIF established a BIM education working group to develop a framework and objectives for training providers. This was released early in 2017 and titled *BIM Education and Skills Framework*. A corresponding BIMcreds knowledge testing tool has been developed by buildingSMART to compliment the APCC/ACIF framework.

The Australasian BIM Advisory Board (ABAB) was founded in 2016 by APCC and ACIF, together with the key standard-setting bodies, NATSPEC, buildingSMART and Standards Australia, to promote best practice and consistent approaches to BIM standards, requirements and methodologies. The Board links industry leaders and expertise from government, industry and academia, with the Australasian Universities Building Education Association (AUBEA) being represented on the Board.

Awareness/Uptake

BIM is being widely used on projects in Australia and by Australian consultants working on overseas projects. The use of BIM for FM/Operations/Maintenance is starting to take a hold, with more projects using BIM for these purposes. Some projects such as the Opera House and Pyrmont Bridge in Sydney are using BIM retrospectively to create a working model for FM.

The NATSPEC National BIM Guide and BIM Management Plan are being increasingly adopted across industry and government both as a framework for building projects as well as within education programs.

The NATSPEC BIM website, accessed by clicking on the BIM logo on the NATSPEC homepage (www.natspec.com.au), is a useful resource for general information on BIM, BIM R&D projects and the numerous BIM guidelines that are available.

CANADA

Education/Training

The [Roadmap to Lifecycle Building Information Modeling in the Canadian AECOO Industry](#) continues to drive the change required to realise industry transformation.

buildingSMARTCanada (bSC) and [Canada BIM Council](#) (CanBIM) are jointly moving ahead with the implementation of the Canadian BIM Education Strategy. The

Strategy was soft-launched at two events in May and October 2016 respectively. A joint academia/industry workshop took place in May, prior to the Canadian Society for Civil Engineering annual conference, in London, Ontario. This was followed by bSC/CanBIM participation in a two-day BIM Research in Education workshop at the École de Technologie Supérieure in Montreal, Quebec in October. The latter workshop brought together key actors in BIM training, research and education as well as key players in industry from across Canada. The goals of the workshop were to identify challenges and needs regarding BIM research and education in Canada, look abroad for potential solutions and devise an action plan to establish a way forward.

As a result of these events, five work groups comprising bSC and CanBIM members, academia and industry partners have been created to develop a Canada-centric BIM learning outcomes framework (LOF), associated University, college, professional development curricula, and recommend BIM accreditation/certificate for the Canadian ACEOO industry. Target completion of the LOF is September 2017.

bSC continues to participate on the buildingSMART International Technical committees and is an active member of the bSI People Compliance Committee. This committee is developing an international BIM qualification that will serve as a benchmark for Open BIM knowledge and awareness.

The CanBIM committee continues to focus its efforts on exploring and understanding how BIM is best implemented within the AECOO industry while also understanding the connection between Education and Industry. Since its inception in 2014, the success of CanBIM's Certification Program for Professionals has led to the creation of the CanBIM Educational Certification Program which, through the establishing of course and program outcomes, assists educational institutes in aligning their respective curriculum to CanBIM education assessment targets. To date, the CanBIM Educational Certification Program has certified and/or currently reviewing upwards of 20 BIM-specific programs or courses offered both nationally and internationally.

Initiatives/Organisations

bSC Initiatives

Practice Manual

Government funding was secured in 2015, under the National Research Council of Canada Industrial Research Assistance Program (IRAP), to help the Institute for BIM in Canada (IBC) to deliver a Canadian Practice Manual for BIM. Volunteer in-kind support and other in-kind contributions contributed the remainder. This manual has since been completed and is expected to be promulgated in March 2017.

The practice manual is multi-disciplinary, multivolume, intended to be a comprehensive guide that reflects both international best practices as well as the use of BIM in Canada.

The practice manual builds on the Roadmap to deliver value to industry. It is being used to develop a BIM 101 course/workshop to be offered by bSC. IBC/bSC have identified a communications strategy to overcome some of the challenges in raising awareness and continue to work through the Education Committee to facilitate content delivery to those providing education at a regional and local level.

Educational Outreach

bSC has produced a short video to promote the benefits of Open BIM. The video will be launched in 2017 for outreach across the country in conjunction with ongoing presentations on the Roadmap. In addition, bSC runs monthly webinars open to anyone who registers through the bSC Community.

Educational Offerings Matrix

bSC has created and maintains a matrix of educational opportunities in BIM at the College and University levels. This matrix included course offerings and key contacts for BIM training and is routinely updated. Instructors are encouraged to contact and collaborate with their counterparts to share and exchange case studies, lesson materials, and best practices. The bSC scan can be viewed at the following website:

buildingsmartcanada.ca/educationnetwork/.

CanBIM Initiatives

Certification

The CanBIM Certification Program was launched in 2014 with the objective of bridging BIM education and the AECOO industry's implementation and use of BIM through the

pursuit of excellence in certification. The aims of CanBIM Certification Program are:

- A four-level certification program for BIM Professionals recognizing knowledge, skill and experience.
- Assessment and certification of courses and/or programs offered by:
 - . Educational Institutions both private and public.
 - . AEC industry training providers for industry professionals.
- Assessment and Certification of tiered CanBIM Certification Program for BIM-enabled companies and organizations.
- Assessment of single-course and program learning outcomes and objectives in Canadian post-secondary education.

Provision of guidelines for Continued Professional Development through:

- CanBIM Regional Sessions – Educational Presentations and Panel Discussions.
- Technology Exhibition – showcasing the latest technologies in the building industry.
- BIM-related academic programs.
- BIM-related industry training providers.
- In-house company/organization sessions.

CanBIM Satellite Sessions

2016 saw the launch of the CanBIM Satellite Sessions; a joint event between CanBIM and CanBIM Educational Member Institutions; with Industry and Academia presenting on relevant topics within the host Region. These events are intended to bridge the gap and unite the interests between Academia and Industry. The host Academic Institution has the opportunity to highlight its BIM related programs, a student from the host school is invited to present a BIM-relevant topic and the remainder of the agenda is filled out with Industry leaders from the host region. It's an opportunity to educate and connect all stakeholders over the course of an evening while also showcasing the latest developments of the educational institutions across Canada. CanBIM has three Satellite Sessions planned for 2017.

Awareness/Uptake

Awareness and uptake continue to be on the rise. Many local interest groups across the country have grown in number as bSC and CanBIM work to promote understanding of BIM. New programs continue to be developed, the most recent being Algonquin College's BIM Lifecycle Management Course.

bSC and CanBIM continue to offer monthly newsletters to their respective memberships with interviews and articles from industry leaders discussing the latest in BIM.

The bSC and CanBIM Education Committees continue to work together to progress BIM education in the ACEOO community and actively participate at each other's events.

CHILE

Education/Training

In Chile, the AEC industry employs approximately 871,169 workers (IALE, 2017), whose educational level is mainly medium to low. According to data gathered by the Chilean Labor Observatory (www.observatorionacional.cl), 86% of the workers in this sector have finished or reached secondary education, while nearly 14% have studied technical or professional careers.

Technical education for AEC-related careers is mainly provided by higher education institutions, such as Universities and technical schools. In 2017, 229 related careers and programs were identified throughout the country: 86 undergraduate programs, 72 technical careers, 32 master's degree programs, 20 postgraduate programs, 11 continuing-education programs, and 8 PhD programs. Only 35% of them include some form of BIM training.

Regarding the institutions that teach these programs, only 2 out of 16 Technical Training Centres (CFT as per Spanish acronym), 3 out of 13 Professional Schools, and 26 out of 42 Universities include BIM content in their programs (IALE, 2017). This means that higher education institutions teach BIM content only to a reduced percentage of their students, that is, 36%.

Furthermore, this training is mainly focused on the teaching of technology tools and modelling software, providing a partial vision of skills required from human capital. Just a few programs include concepts such as collaborative and interdisciplinary work, OpenBIM or topics such as information management and facility management in BIM.

Regarding AEC-related careers, 59% of University students graduate with some level of training in BIM. The situation of technical education is worrying, since only 14% of the students receive BIM training.

In addition to academic institutions, BIM training in Chile has been driven by software vendors, specialized academies, and private consulting firms, focusing on the training in diverse software.

Regarding companies that currently work in the AEC industry, only 27.8% use BIM. Nevertheless, by 2020, these companies will require that 65% of the professionals and technicians of the sector have BIM capabilities (IALE, 2017).

Workers that currently possess skills in the sector are not sufficient to cover this increasing demand of human capital, not even considering the new qualified professionals by 2020. This translates into a gap of about 105,000 professionals and technicians with BIM capabilities that will be required by companies of the AEC industry by that year.

Initiatives/Organisations

Starting in 2016, the Government of Chile, using its procurement capacity as a driving force, is promoting the uptake of BIM, which will be a requirement in most of public-works tenders by 2020.

Planbim emerged to promote and support the adoption of BIM by public institutions. It is a 10-year program under the supervision of CORFO (Economic Development Agency) and the Ministry of Economy. This program, together with other ministries and institutions, is defining the National BIM Mandate and developing a National BIM Standard for public projects. Likewise, Planbim is developing consistent and standardized requirements for public projects that require the uptake of BIM in their calls for bids, terms of reference, or tender terms and conditions.

To date, public institutions that have adhered to the Plan are the following: Ministry of Public Works; Ministry of Housing and Urban Planning; Ministry of Economy, Development, and Tourism; Ministry of Social Development; Ministry of Health; Ministry of Education; Ministry of the Interior and Public Security; the Civil Registration and Identification Service; *Carabineros* (law enforcement police); *Policía de Investigaciones* (Criminal Investigations Bureau); Directorate General of Civil Aviation; Administrative Corporation of the Judicial Branch; Ministry of Finance; Economic Development Agency (CORFO); the Chilean

Chamber of Construction; and the Institute for Construction.

Additionally, these institutions have formed BIM Committees that lead BIM implementation in their teams and projects, managing resources to train their workers internally.

Planbim is supported by public and private institutions, such as the [Chilean Chamber of Construction \(CChC\)](#) and [BIM Forum](#). The latter is a technical organization that promotes BIM implementation, leading round tables and covering the following topics: education; standardization; technology transfer, and project management. BIM Forum gathers diverse stakeholders of the industry, specially from the private sector.

Awareness/Uptake

In 2017, Planbim launched two videos, [What is BIM? and What is Planbim?](#) (in Spanish) to disseminate BIM and properly explain the concept to everyone. By early 2018, a seminar was held to cover “Human Capital Education in BIM”, with international speakers, such as Jennifer Macdonald and Bilal Succar.

Additionally, Planbim has developed the following initiatives:

- [Diagnostic study on Human Capital Education in BIM](#), PMG, 2016 (in Spanish)
- [Study on Human Capital Education in BIM](#), IALE, 2017 (in Spanish)
- A joint work with 25 academic institutions that has set the goal of creating a “BIM Education Network” to collaborate with and promote the active and interdisciplinary teaching.

Moreover, since 2016, Planbim has been developing roundtables and workshops with representatives from the private and public sectors, and academia. Based on this work, in 2017 a [Matrix of BIM Roles](#) was elaborated, where 5 BIM roles were defined: Review, Modeling, Coordination, Management, and Direction. It also describes 42 BIM capabilities that are required to perform said roles.

Due to these actions, it is already possible to observe the first initiatives for the development of collaborative training programs for students of AEC-related careers in Chile. To date, there is – at least – one program developed by Pontificia Universidad Católica de Chile, and we expect new cases in other Universities in the short term.

CHINA

Education/Training

The China BIM Union has given many education presentations to thousands of BIM professionals, presented by Mr Huang Qiang, the vice president of the China Academy of Building Research (CABR), the chairman of the board of directors of China BIM Union.

Mr Huang also attended and presented at the Government BIM Symposium 2013 in Singapore, the APEC Workshop on “Utilizing Building Information Modelling to Increase Building Performance” held in 2014 in China, and HKUST & CIC joint technical forum “The Current Status of Global BIM Standards” held in 2015 in Hong Kong. The China BIM Union has hosted 3 MOHRSS workshops on BIM systems and application since 2015. Over 200 senior professionals attended the workshops, and more than 10 top experts are invited to give lectures at the workshops.

A joint experiment research centre on building internet + BIM has been founded by China BIM Union and Shenzhen University, and the lab was completed in 2017.

Initiatives/Organisations

The China BIM Union and the development of BIM standards keep progressing. The Chinese National Standard ‘Unified Standard for BIM Application’ was approved and issued by MoHURD in 2016 and came into effect from 1st July 2017.

A series of CECS standards was approved and issued for P-BIM (Practice-based BIM) software application and data exchange for specific tasks in 2017.

The China BIM Union has been approved as the China Industry Technology Innovation Strategic Alliance by the Ministry of Science and Technology of the People's Republic of China in 2013.

Awareness/Uptake

Current BIM objectives for China include:

- Targets/Goals: Data sharing and interoperability in project life cycle.
- Motivation: Improve efficiency in industry.
- Challenges: The distribution of interests of BIM data.

- New initiatives: Promote BIM through P-BIM mode and HIM (Huang Interoperability Matrix).
- Strategies: Combine BIM application with specific tasks of AEC in the project life cycle.

CZECH REPUBLIC

Education/Training

In the Czech Republic there is a lot of BIM education and training through BIM seminars, workshops and presentations led by CzBIM (Czech BIM Council), Universities, companies, technical chambers etc. CzBIM set up a working group titled 'BIM and Education' to look at trying to introduce BIM into the education system.

Leading Czech Technical Universities gradually implement BIM into their curriculum, mainly as standalone subjects or as innovations of regular subjects. BIM becomes a part of research and development projects on a regular basis. Universities also connect more with professionals both in research and educational area.

BIM is also being implemented in secondary education (especially at technical high schools) mainly in CAD based subjects. There is no dedicated BIM study branch or programme.

Initiatives/Organisations

CzBIM – Czech BIM Council is a non-profit organisation which is focused on support of BIM implementation in the Czech Republic. It assembles professionals from both companies and individuals active in the BIM area. The main goals are popularization, education, standardisation and implementation of BIM. CzBIM hosts an annual conference titled 'BIM DAY'. Under its wings there were several documents published and many others have been prepared. It also plays a key role in negotiation with ministries and standard bodies. It resulted in success last year.

In 2017 the Czech government approved a BIM implementation document which covers a strategic plan for the next 4 years. The main goal is to prepare the Czech construction environment for BIM - aiming to the beginning of 2022 when big governmental projects should run in BIM.

To support this a new part of the Czech Office for Standards, Metrology and Testing was

established – Czech Agency for Standardisation (CAS) – to execute the task of BIM implementation.

Within the Czech Office for Standards, Metrology and Testing the acceptance process of ISO standards related with BIM is ongoing. Thus, group of experts (TNK152) was assembled in 2016 to analyse standards, related terminology, etc.

Awareness/Uptake

There are a few BIM projects currently running (big projects) but 2D is still used for the majority of projects. Some of the big contractors are running their own pilot projects.

Designers are still a bit sceptical of BIM, primarily due to the cost of software and education/training. But some of them are starting to see the possibility of market advantage if they provide this service and knowledge.

Quite a new impulse came from investors who finally start to see the benefits of BIM. Usage of BIM in the operational phase is a big topic now but there are no practical impacts.

Rising awareness of BIM in the Czech Republic is also supported by the need of society to search for modern technologies and their use.

FINLAND

Education/Training

Universities, Universities of Applied Sciences (UAS) as well as Vocational Education Institutes provide BIM education for their students. All current construction and architecture students study BIM to some extent included in their professional courses.

Some UAS also provide whole bachelor's degree for Architectural education where the key areas are modeling (BIM) and model utilization: visualization, renovation, maintenance of buildings, lifecycle thinking and energy efficiency. Different courses are also integrated in various AEC programs e.g. BIM for Building Production; BIM for Structural Engineering; Simulation Tools for Building Services, BIM in Housebuilding Projects (integration of BIM holistically to building process).

Some Vocational Education Institutes provide continuing education related to BIM e.g. CAD-BIM utilization for HVAC on construction sites. A new curriculum for a degree program for design assistants has been updated with inclusive BIM covered in every module of the study (implementation starts in August 2018).

For postgraduate and further education students, there are several options:

- Special Courses and Further Education is provided by some UAS:
 - . BIM for Vocational Education Teachers, 15 ECTS
 - . BIM Basics Online, 5 ECTS
 - . BIM Coordinator, 15 ECTS
 - . BIM Manager, 5 ECTS
 - . <http://metropolia.fi/bim>
- Software companies:
 - . All vendors (Solibri, Autodesk, ArchiCAD, Trimble, Novatron, Symetri, Civil Point, Magicad etc.) are providing BIM training for their own software solutions.
 - . Various courses provided by a variety of players.
 - . <https://www.symetri.fi/koulutus/>
 - . <https://www.magicad.com/fi/koulutus/>
 - . <https://mad.fi/tapahtumat/archicad>
 - . <https://www.tekla.com/fi/palvelut/koulutukset>
 - . <http://novatron.fi/tapahtumat-2018/>
- Large companies such as Skanska, YIT, NCC, Lehto Group (construction) and Senaatti (state client office) arrange focused in-house training as required in co-operation with Universities and UAS's.
 - . <https://lehto.fi/lehto-vastaa-tietomalliosaajapulaan-kaynnistaa-oman-leka-akatemia/>

Initiatives/Organisations

There are a number of initiatives taking place in Finland, including the following:

- buildingSMART Finland has over 130 company members and user groups for Education, Building, City planning, Dictionary and Infra are all up and running. <https://buildingsmart.fi/en/home/>
- KIRA-digi, a Government's key project, involves ministries, municipalities and the KIRA forum. The aim is to create an open and interoperable information management ecosystem and harmonized practices for the built environment. <http://www.kiradigi.fi/en/front-page.html>

- COBIM, the national common BIM requirements, was published in March 2012 and it is now in widespread use. English, German, Estonian and Spanish translations of the requirements have also been completed and four Annex for building owners were published.
- Guidelines similar to COBIM, but for Infrastructure, have also been developed.
- The Finnish XML based data format for neutral BIM data exchange for infrastructure is now a buildingSMART project.
- The first Finnish textbook for BIM education: "BIM on a construction site" was published in 2016 by Building Information Ltd.
- ROTI 2017 is a report and an expert assessment on the condition of the built environment carried out and published every other year. It offers impartial information and viewpoints for experts, decision-makers and citizens alike. The ROTI report raises the issues of architecture, planning, design, and art in the built environment. In addition, the section 'Digital Solutions' is also part of the 2017 ROTI. ROTI gives recommendations like: improving the digital capacity and skills of both individuals and organizations, standardizing the electronic system interfaces to be open and machine-readable, determining common goals for RDI activities in the real estate and construction industry, significantly boosting construction companies' own research and development investments etc. <http://www.ril.fi/en/alan-kehitys/the-roti-2017-report.html>

Awareness/Uptake

BIM is now in everyday use in Finland. Large firms such as Skanska, NCC, YIT use BIM for 100% of their own production. Furthermore, BIM sessions (training) relative to specific uses depending upon the profession and activities are organized on a regular manner. Public sector clients are using BIM on some of their projects.

In Finland BIM always means using open standards: IFC for buildings and LandXML for infrastructure.

BIM education and training was carried out for Vocational Education Teachers and interested UAS teachers as a project to promote BIM education integration on all education levels through Ministry of Education research.

HONG KONG

Education/Training

The Construction Industry Council (CIC) has long been supporting the industry in promoting the implementation of Building Information Modelling (BIM) technologies. Since the publishing of the Roadmap for BIM Strategic Implementation in Hong Kong's Construction Industry in 2014, CIC's BIM Task Forces organized numerous events such as BIM Seminars, Conferences, BIM Excellence Awards and released publications such as BIM Standards (Phase 1).

To build BIM capacity in the industry, CIC conducted a total of 19 BIM training courses at the BIM Innovation and Development Centre, covering Basic and Advanced BIM modelling, BIM Data Management, and BIM Project Management, etc.

With an aim to collaborate with local Universities on the development of BIM teaching courses and to introduce BIM knowledge into higher education, CIC signed a memorandum of understanding with the Faculty of Engineering of the University of Hong Kong and the School of Engineering of the Hong Kong University of Science and Technology at the CIC's BIM Conference in December 2017.

Initiatives/Organisations

To meet the upcoming BIM demands, CIC established the new Committee on BIM (Com-BIM) in 2017 to lead and direct the adoption of BIM in the construction industry. The Committee is led by the chairperson, Ms. Ada FUNG, together with 43 members and co-opted members, who represent stakeholders from sectors of the AEC industry, such as public and private clients, architects, engineers, surveyors, BIM professional institutes, trade unions and academics.

Com-BIM established two new Task Forces in November 2017: Task Force on BIM Training and Task Force on BIM Standards (Phase 2). They will advise Com-BIM on the training strategies and the preparation of new BIM Standards respectively.

The BIM Standards for General Building Plan (GBP) Submission (Phase One) was endorsed and published in November 2017. The objective of this Standards is to utilise the advantage of BIM to streamline the submission

process to relevant statutory authorities and departments. This provides an effective approach to help the industry perform quick quality checks on their submissions by using BIM technology before making a formal submission.

JAPAN

Education/Training

Very few Universities provide courses for BIM in Japan. Some technical colleges have BIM training courses. There are many training programs available for specialists.

buildingSMART Japan is considering the establishment of a BIM specialist certification to the bSI certification program.

Initiatives/Organisations

The Ministry of Land, Infrastructure, Transportation and Tourism (MLIT) established BIM guidelines for government buildings in 2014.

The focus is now on using BIM, starting from the schematic programming stage right up to maintenance after completion of the project.

As mentioned above, the construction field was preceded by BIM usage for public works, but Civil Information Modeling and Maintenance (CIM), which is the civil engineering field's BIM, has been started in earnest. A draft version of CIM guidelines was developed in 2018.

Regarding the use of BIM in construction confirmation, the trials of sharing the BIM model file at the pre-check stage have been conducted by some confirmation bodies. Until now, the cases were limited to small scale buildings, but the scope of trials is gradually expanding to the confirmation of large buildings.

Awareness/Uptake

More and more design firms and construction companies are initiating BIM technology in the private sector. Use of BIM is increasing not only as a tool for simulation, presentation and modelling for drafting in design firms but also as a tool to study work sequencing in construction companies.

For R & D, the technology in order to conduct inspection and quality checks after completion,

by verifying the construction result against the BIM model as shown in the VDC guidelines of Singapore, is developing.

This R & D is executed to sophisticate the trials of BIM construction planning and is conducted by national research institutes for public works or by major constructors of private works.

However, BIM collaboration between companies is hardly ever achieved. BIM collaboration is increasing though, especially for in-house design firms of Japanese style construction companies. Also, the construction of the main stadium for the 2020 Tokyo Olympic Games is expected to utilise BIM.

NETHERLANDS

Education/Training

BIM is taught in all three technical Universities of the Netherlands at both Bachelor and Master levels.

All 14 Universities of applied science with a built environment department are organized in the BIM Education Network by the national Building Information Council (BIR). The network is supported by school-management but populated with mainly lecturers.

The Netherlands has approximately 50 institutions for intermediate vocational education. BIM adoption by these 50 institutions is also rising.

Initiatives/Organisations

The Building Information Council (BIR) is very active in the development of strategic policies for BIM in the construction and civil works industry.

The BIR's BIM Education Network was created in 2013 to raise BIM awareness among lecturers. In 2017 the network presented its first version of the minimum BIM level for BIM knowledge graduates of all 14 Universities of applied science.

In 2018 a similar BIM network for intermediate vocational education has been established aiming for experience exchange among teachers of the various institutions. At the end of 2018 a first version of their minimum BIM level for graduates will be presented.

In all before mentioned networks and activities, companies throughout the whole construction chain are involved and represented.

In 2017 The BIM Education Network organized its first annual BIM education conference (www.bimonderwijsdag.nl). Over 500 people visited this event where students, lecturers, and BIM experts shared knowledge and learned about new BIM developments. Among others, the highest-ranking government official of the Ministry of Education was present to show his support to the initiative.

In advance, 8 Student-teams battled for two days to earn the title 'Best Student BIM team of 2017'. The assignment was to redesign an old industrial building into a desirable place for young people to live. Not only the building had to be designed, but also the connection to public transportation. The winning team visited Autodesk University 2017 in Las Vegas.

The CB-NL (Concept Library) was initiated and agreement was reached with buildingSMART International on collaboration with buildingSMART Data Dictionary (bsDD).

The Netherlands construction industry as a whole is involved in the project, over 200 people. It covers construction, civil works and geospatial environment, with new technology and new content being developed.

Awareness/Uptake

The development of knowledge leaflets by the BIR is helping to create greater awareness in the industry about opportunities and possibilities created by using BIM.

At this moment 5 knowledge cards have been developed and translated into English. They can be accessed at www.bouwinformatieraad.nl/main.php?mode=download_cat&cat_id=9

NEW ZEALAND

Education/Training

BIM is taught by a several tertiary institutes and Universities with new courses and course content being regularly added and updated.

BIM101 courses by the BIM Acceleration Committee were rerun and recorded and now available from the BIMinNZ.co.nz website.

Software vendors provide specific training and regularly promote new BIM products or versions. A number of one-off industry presentations and seminars have also taken place aimed at designers and product manufacturers.

Initiatives/Organisations

The BIM Acceleration Committee (BAC) is the driving force behind BIMinNZ. BAC are a nationwide alliance of industry and government, established in Feb 2014 to coordinate efforts to increase the use of BIM in New Zealand. Even with changes in direction within the Ministry of Business, Innovation, and Employment (MBIE), the 'BIM Acceleration Committee' (BAC) has continued to be supported by MBIE, BRANZ, and industry.

The goal of the BIM Acceleration Committee is to develop a better building process for improved building performance in the design, construction, maintenance, and operation of all constructed assets. BAC expanded its strategic focus for the 2017-2020 period to six key areas:

1. Conquer the digital divide to better enable BIM uptake for those smaller and further down the value chain.
2. Develop and deliver BIM training to build BIM expertise in industry and tertiary educations.
3. Create more client-side demand for BIM through the education of government and other large clients in the benefits of BIM, specifically in facility and asset management.
4. Increase the support for collaboration that maximises the benefits of BIM use.
5. Develop data quality and process standards to facilitate interoperable (computer to computer) exchange of reliable data along the value chain.
6. Communication and general awareness raising. Telling the BIM story to existing and new audiences.

BAC have supported the establishment of network groups in Auckland (BIMAK), Wellington (BIM.well) and in Christchurch (BIMsiNZ) which meet approximately quarterly and are well attended (80 plus people). The groups tell the BIM story, have key speakers, present case studies, and hold panel discussions on relevant topics.

Masterspec - Construction Information Ltd are working with MBIE and Land Information (LINZ) to restructure the recently developed NZ Asset Metadata Scheme to align with BIM based content with the view of this developing into a framework for parties across the BIM value chain to use to build their metadata

requirements on to ultimately enable a complete digital dataflow.

Awareness/Uptake

BAC completed the annual survey BIM in New Zealand – an industry-wide longitudinal study. Quoting BAC reports, "This survey was the fourth instalment of a five-survey series that follows the progress being made in accelerating the introduction of BIM into New Zealand. This longitudinal study follows an industry control group of large and influential organisations in New Zealand's built environment.

This year also marks the second year a specific client control group of asset owners and managers from organisations with large property/constructed asset portfolios has been surveyed. Their inclusion was to better understand attitudes, drivers, and barriers towards BIM use.

The Masterspec BIM survey provides a good picture of the status of BIM in New Zealand. The survey results show that 98% of respondents were aware of BIM and 57% are currently using BIM. The results of the survey can be found at the following link: <https://masterspec.co.nz/BIM-Resources/6861/>.

Client responses to the biggest benefits and barriers/challenges increased in most categories. Despite a perceived negative result, this may indicate an improved understanding of BIM and its associated complexities.

The growth in BIM use amongst industry appears to have slowed compared to previous survey results. The respondent's comments suggest that this is due to a maturation of BIM knowledge and use in the industry, indicating a successful education of the fundamentals of BIM over the past four years. This suggests industry requires more detailed and targeted BIM research to further accelerate its use – particularly in the operational use stage of a building, and its associated asset and facilities management uses, which continue to be the largest projected growth areas if future BIM use and benefit. It also indicates that BIM education of the industry control group, which consist primarily of building design professionals, may have reached saturation point. The next step is to target the next tier of users along the value chain e.g. contractors, subcontractors, and small firm/project specialists."

NORWAY**Education/Training**

There are at least seven faculties that are running openBIM courses and several colleges that have special BIM studies.

There is no central government requirement for BIM education at a tertiary level. A few engaged teachers are driving openBIM education in colleges and Universities and buildingSMART Norway (bSN) has initiated a programme to support the teachers who are using BIM in their classes.

The collaboration will support, coordinate and raise awareness of digitalisation of the industry.

In June 2014 bSN released an educational program. The program focused on quality assurance of content and output of courses. Three teaching plans (Basic, AEC and Client) have been released by bSN, specifying the minimum requirement for BIM training at two basic levels.

Several private companies have developed courses based on these teaching plans. The teaching plans do not include specific software training but focus instead on how to behave in a multi-discipline openBIM environment. The plans are free to use for bSN member organisations.

In addition, bSN has established a web-based multiple-choice user certification system, allowing users to get a diploma for their openBIM knowledge.

Initiatives/Organisations

In March 2015 bSN released the BIM Guideline database. The bSN guide allows clients to specify requirements for BIM deliveries without having specialised BIM expertise in the organisation.

The client can configure the requirements with an intuitive wizard, according to the intended BIM usage.

Several Norwegian organisations are involved in the development and revision of National and International standards for digitalisation of business processes.

bSN has 80+ member organisations, representing 25% of the total AEC industry turn-over. bSN coordinates most industry initiatives and BIM User Groups for all disciplines, in a series of arenas.

Awareness/Uptake

Government for Municipalities and Modernisation and its legislative body the Norwegian Building Authority are fully aware of the need for digitalisation.

The Building Authority runs and supports several initiatives in collaboration with the industry.

The projects using and making benefit of openBIM can be counted in the hundreds, from the large openBIM award winning project "New Østfold Hospital", to small residential refurbishments.

The next frontier is to digitalise construction product information and FM/operational documentation.

SINGAPORE**Education/Training**

There are 11 Institutes of Higher Learning (IHLs) providing a total of 33 full-time programmes and 20 part-time programmes with BIM curriculum. Third-party BIM software educational vendors were also crucial in training, especially for professionals. To date, more than 2,500 full-time students and 10,000 professionals have been trained in BIM.

The Institute of Technical Education (technical college) have integrated BIM, mainly on software capabilities, into their skill qualification programmes for architectural space design, civil & structural engineering design and facility systems design.

Four out of five polytechnics provide BIM modules in the three discipline streams and beyond, such as in sustainability-related programmes.

Five out of six Universities offer BIM modules in their bachelor and master programmes. Nanyang Technological University and the National University of Singapore have also launched Centres of Excellence in BIM to focus on nurturing BIM R&D capabilities.

The Building and Construction Authority's education and research arm, the BCA Academy, takes the lead, going beyond BIM, and into collaboration and the use of Virtual Design and Construction methodologies for its curriculum.

The BCAA conducts two specialist diplomas in BIM and VDC, six certification courses on BIM Modelling (for Architecture, Structural and MEP), Management, Planning for Owners and Facility Managers, and MEP Coordination. The BCAA also collaborated with the University of Newcastle, Australia, to conduct a joint construction management (building) programme at bachelor degree level, focusing on the use of BIM in construction management.

BIM/VDC is also incorporated into 10 BCAA specialist diplomas, 8 BCAA full-time diplomas covering all disciplines across the construction value chain, and a joint degree programmes between BCAA and Universities including Singapore University of Social Sciences, the University of Newcastle (Australia) and the University of Florida. BCAA also organizes short courses and workshops on BIM Quantity Take-Off, BIM Scheduling and Process Management and Computational BIM for Architecture.

More than 700 full-time students and 5,600 professionals have been trained through the BCAA's BIM-related programmes. The BCAA also launched the Centre for Lean and Virtual Construction (CLVC) in end 2015 as a first-of-its-kind immersive and experiential facility for BIM, VDC and Lean Construction, to encourage IHLs and industry firms to utilise the Centre for training and experiential learning purposes.

The Singapore Contractors Association Limited (SCAL) Academy has also trained more than 200 students from its member firms in BIM software. The Singapore Institute of Architects also holds programmes engaging their members in BIM management and implementation.

Initiatives/Organisations

The Building and Construction Authority formulated the 1st BIM Roadmap in 2011 to drive the adoption of BIM under 5 areas:

- Public sector taking the lead.
- Promoting success stories.
- Removing impediments.
- Building BIM capability and capacity.
- Incentives for BIM adopters.

By 2015, the 1st BIM Roadmap achieved BIM adoption in most of the larger consultants and contractor firms in the industry. The 1st BIM

Roadmap also saw the adoption of BIM in 102 public projects, 181 projects meeting mandatory BIM electronic submission requirements, SGD20 million committed to more than 700 firms who achieved an average of 21.5% efficiency gain, launch of the Singapore BIM Guide, Essential BIM Guides, BIM e-Submission guidelines and software-specific template guidelines.

The 2nd BIM Roadmap was launched in 2015, to advance the use of BIM in an integrated manner over the building life-cycle under 4 areas:

- Focus on VDC:
 - . Driving BIM collaboration throughout value chain.
 - . Building BIM capability of specialist contractors.
 - . New training programmes and facilities (such as the Centre for Lean and Virtual Construction) at all levels.
- BIM for Design for Manufacturing and Assembly (DfMA).
- BIM for Facilities Management and Smart Buildings.
- Research & Development.

As part of Singapore's Construction Industry Transformation Map (ITM) launched in October 2017, Integrated Digital Delivery (IDD) is one key area identified to transform the built environment sector. Enabled by BIM, IDD aims to fully integrate processes and stakeholders along the value chain from design, fabrication, to assembly-on-site and operations and maintenance of buildings through advanced info-communication (ICT) and smart technologies. Plans are already underway to encourage the industry to adopt shared platforms and standards to fully integrate the various parties involved in building projects.

The Building and Construction Authority also engages industry leaders through the new IDD Steering Committee and subgroups, as well as practising BIM/VDC experts from various disciplines both upstream and downstream through the BIM/VDC Managers Forum.

The International Panel of Experts on BIM also convene bi-annually to review and provide valuable inputs on the BIM/VDC Roadmap.

Awareness/Uptake

BIM is an important feature in the annual Singapore Construction Productivity Week

(SCPW), one of the Building and Construction Authority's key sectorial events to engage industry stakeholders and raise awareness on construction productivity.

The International BIM Competition is organised with various student teams representing educational institutions in Singapore and overseas, such as Turkey, South Korea and Australia, working with mentors who are BIM managers from their respective countries, to demonstrate BIM innovation and collaboration over a limited period of time.

A local BIM Shoot-out is also held annually to test the BIM modelling capabilities of students and is quite popular among students from technical colleges.

SOUTH AFRICA

Education/Training

There are pockets of excellence and certain Universities considering adding BIM to their syllabus, but that has not yet been approved by any University faculty.

Some University faculties are widening their vision and raising their game by introducing BIM education within their short learning programmes. BIM is still not yet part of the territory syllabus in any Universities in South Africa.

In September 2017 the [BIM Academy Africa](#) training academy was established for the professional consulting and educational space in BIM. The Academy is now assisting various organisations and owner operators on numerous projects in SA to leverage their investments on BIM projects. The Academy has also to date certified more than 166 industry professionals in achieving their international BIM Professional accreditation.

Apart from the various classroom courses being offered, there is also a vast uptake from students and professionals registering for the BIM online training offered by the BIM Academy Africa.

Initiatives/Organisations

The BIM Institute has published their own [National BIM Guide](#) in August 2017, based on the framework guidance development philosophy by Australian [NATSPEC National BIM Guide](#). In partnership with other associations, the BIM Institute is soon to release its first African classification standard in line with international standards.

The [Africa BIM library](#) has also recently been published in order to provide for specifiers, component manufacturers and suppliers of BIM elements.

In October 2017, the [BIM Institute Blog](#) won the award for the top 30 BIM blogs on the internet for promoting BIM case studies in Africa ([Blogs.feedspot.com](#)), and in March 2018 the 3rd annual BIM Africa Conference was held in Sandton, Johannesburg.

The BIM Academy Africa has also formed a partnership with [WhiteFrog \(UK\)](#) which won a contract in 2017 with Ethiopia to implement BIM within certain government ministries. Ethiopia is the first African country to adopt BIM successfully through their government initiative driven by the Ethiopian Construction Project Management Institute [ECPMI](#).

This is an ongoing project for the BIM Institute in 2018 & 2019. The BIM Institute is also currently engaging with various other African countries in helping them develop BIM strategies and upskilling in software and adopting standards.

Awareness/Uptake

There is still little BIM development within SA government in adopting BIM on public projects although certain discussions are ongoing with the BIM institute and Oracle Construction & Engineering in developing a roadmap for BIM in South Africa.

Many designers in South Africa still criticise BIM as it forces them to produce designs counterintuitively to how they have been trained at Universities and Technikon. There is still a strong traditional thinking among architects and engineers that requires a shift in the fee structure when convincing clients to invest more capital earlier to generate the 3D model. This is especially true for designers who are not convinced that moving from AutoCAD to Revit is a good ROI.

BIM uptake among owner operators in South Africa is still very slow due to the traditional business stance of many asset management companies, that still cannot see the ROI in having their information in a 3D model. There is still too much emphasis that BIM is just software among many industry professionals and clients in SA.

SWEDEN**Education/Training**

Construction related University teaching programs in Sweden have, with only few exceptions, adopted BIM in their respective curricula. Engineering Bachelor programs at University colleges have the highest general representation of BIM subjects in the curricula. The adoption of BIM in architectural schools is, however, significantly limited.

The degree of BIM adoption differs significantly between the respective teaching programs. Only a few Universities have adopted BIM as an integrated subject in courses that deal with general construction related issues. The predominant approach is however to implement BIM subjects as discrete teaching modules, i.e. stand-alone courses, in which BIM is regarded as a technical tool rather than a facilitator for process integration and organisational development.

There are about 50 national institutions of higher education in Sweden, of which 10 Universities and 8 University colleges provide construction related teaching programs. Together, these institutions represent a total of 36 (4 M.Arch, 7 M.C.E, 23 B.C.E and 2 M.C.E+M.Arch) different teaching programs and 109 courses (92 in 2013) with syllabuses that relate to various BIM subjects.

The general picture of all teaching programs shows that generation of drawings and visualisation from the BIM-model are the most prominent teaching objectives:

- Drawings (generation of drawings): 49% (51% in 2013).
- Visualisation (communication, render): 32% (32% in 2013).
- IFC (data exchange): 11% (9% in 2013).
- Construction management (4D, 5D): 7% (7% in 2013).
- Business strategies (implementation): 1% (1% in 2013).

81% of the courses use 3D CAD and 19% use only 2D CAD at Universities in Sweden.

Only 1% of the BIM related ECTS-credits provided concern matters of business strategies, in relation to the implementation of BIM, as its principal learning objectives. This crucial aspect of BIM integration in existing, as well as new processes, new forms of collaboration, new roles and responsibilities, new ways of communication, etc. is clearly

under-represented in the Swedish University curricula.

One Masters program (in Jönköping) has been developed specialising in Sustainable BIM as a topic. Since 2013, 11 of the 18 new courses on advanced level BIM have focused on BIM coordination or BIM strategies.

Initiatives/Organisations

Since 2013 there has been national investment for digitalization for research and development in construction. The governmental program of Smart Built Environment has started which has a number of knowledge packages to develop education with digitalization.

BIM Academy Sweden, as a part of BIM Alliance was started in 2016 for knowledge transfer between Universities.

Awareness/Uptake

There is a considerable discrepancy between the technically oriented BIM curricula at the Universities and the more process and change oriented approach to BIM represented by the industry.

Besides, the industry emphasises the importance of BIM implementation in urban planning and real estate management, which currently is more or less neglected in curricula at Swedish Universities.

The large consultancies and contractors drive the Swedish BIM movement and are ahead of the Universities concerning BIM awareness, maturity and competences.

SWITZERLAND**Education/Training**

This part is provided in Switzerland by several partners: Being focused mainly on open BIM, Technical Universities and Universities of Advanced Sciences offer a wide range of courses on undergraduate and postgraduate level.

ETH Zurich (University of Science and Technology) and EPFL (Ecole polytechnique fédérale de Lausanne / Swiss Federal Institute of Technology) both push BIM forward by offering CAS, DAS and MAS programmes. This is true also for Universities of advanced sciences like FHNW (University of Applied Sciences and Arts Northwestern Switzerland)

with its Institute for Digital Construction that focuses on changes triggered by digitalisation.

At zhaw (Zurich University of Applied Sciences) the continuing education concentrates on the field of Facility Management and Life Cycle Costs including BIM. The CAS Digital networking in timber construction is offered at BFH (Berne University of Applied Sciences).

Software providers are also involved in education and training, mainly, and not surprisingly, more on the closed BIM side. A major role in this part is taken over by private training institutions.

Initiatives/Organisations

Since January 2018 the Swiss chapter of buildingSMART has started to take action. It is closely connected to Bauen digital Schweiz, being the legal entity for the chapter.

Another driver is Netzwerk digital, the coordination unit for the digital transformation of the planning, construction and real estate sectors. This is an initiative of SIA (Swiss Society of Engineers and Architects), CRB (Swiss Centre for Construction Rationalization), KBOB (Coordination conference of the building and real estate bodies of public clients), and IPB (Association of private, professional builders).

Awareness/Uptake

Professionals are increasingly aware of the fact that continuing education becomes important especially as far as BIM is concerned. In the last two years events and courses on this topic popped up all over the country.

Additionally, the Swiss BIM Congress came into life in 2016 and is implemented on a yearly basis.

UNITED KINGDOM

Education/Training

The BIM Academic Forum (BAF – discussed later) published [Embedding building information modelling \(BIM\) within taught curriculum](#) in 2013 and “Current position and associated challenges of BIM education in UK higher education” in 2015. The latter report indicated that BIM is now becoming widespread across the various levels of higher

education, albeit ad hoc and without consistency. In the main, this tends to be driven by individual academics or schools/departments that have a particular interest in the area of BIM and recognise its importance in the education of professionals.

Over the last few years, a number of BIM specific programmes at Masters level have emerged. A number of BIM specific BTEC level programmes have also now begun to emerge. Apart from architecture and construction related disciplines, there are overall low levels of interest in BIM incorporation in teaching across built environment related disciplines. At the cutting edge where BIM is fully embedded into programmes/modules, architecture maintains a significant edge over all other built environment disciplines.

BAF held its first international conference at Glasgow Caledonian University, 13th-15th September 2016. This brought together delegates from both industry and academia to discuss aspects around Education & Training, Process & Standards, Strategy & Implementation, Knowledge Management & Decision Support, BIM Maturity & Assessment, Asset Handover & Operational Management, Technology. The programme also included a workshop to explore establishing a European BIM Academic Network to bring together the European national BIM academic forums. BAF are currently focusing on taking the first report of embedding BIM within the taught curriculum forward by drilling down to disciplinary perspectives at the undergraduate level. BAF are also aligning their activities in support of the UK BIM Alliance, and the Upskilling work stream, in particular.

Since 2015, the [BIM Regions](#) have been actively seeking partnerships with local Higher Education Institutions. The London and SE BIM Region formed a partnership with the University of Westminster and ran a [series of free BIM Events](#) aligned to its Masters programme. [thinkBIM](#) is run by the Centre for Knowledge Exchange at Leeds Beckett University in partnership with the Yorkshire and Humber BIM Region. The South West BIM Region is run in partnership with University of West England. The [BIM Academy](#) is partnered with Northumbria University.

[Design, Engineer and Construct](#), run by Class of Your Own, is an accredited learning programme for secondary-school age students and has been expertly developed to create and

inspire the next generation of Built Environment professionals. Class of Your Own are leading the [BIM4Education](#) initiative. This initiative has recently been awarded [CITB](#) funding to get teachers and students excited about BIM and construction.

There are now many providers of BIM training within the UK. As identified above, the BIM Regions have partnered with local Universities to provide free events. Other providers of paid for content include:

- Professional Institutions:
 - . Royal Institution of Chartered Surveyors (RICS).
 - . Chartered Institute of Architectural Technologists (CIAT).
 - . Chartered Institute of Building (CIOB).
 - . Institution of Civil Engineers (ICE).
 - . Building Services Research and Information Association (BSRIA).
 - . Building Research Establishment (BRE).
 - . Construction Industry Training Board (CITB).
 - . National Federation of Builders (NFB).
 - . British Standards Institute (BSI).
- The [BIM Campus](#) provides a six-week intensive course.
- The B1M is an online video resource which includes a [BIM for Beginners](#) programme.

Many of the AEC companies have run their own in-house training programmes which are compulsory to attend and require a certain level of attainment.

There is significant body of research being undertaken into BIM. Each Higher Education Institution has its own research programme and there are also numerous Knowledge Transfer Partnerships (KTPs) being undertaken. [KT4BIM](#) involves BIM4SME acting as a client to a virtual project with numerous KTPs; the objective is to achieve a Level 2 compliant project.

Initiatives/Organisations

The UK Government influenced a significant movement within the UK AEC industry by requiring the use of BIM on public sector projects in its [2011 Government Construction Strategy](#). The primary objective of the strategy was to sustainably reduce the construction costs incurred by the public sector. BIM was identified as one of the principal initiatives to achieve the objective and was supported by the creation the [BIM Task Group. Training and](#)

[Education](#) was one of the Task Group's four work-streams and a key output was the [BIM Learning Outcomes Framework](#). As a consequence, there has been a significant increase in the provision of formal academic qualifications, training, accreditation and research.

The subsequent [Government Construction Strategy 2016-2020](#) maintained the emphasis on developing digital and data capability in construction, although the BIM Task Group was no longer funded to support the wider adoption of BIM. The formation of the [UK BIM Alliance](#) has taken on the mantle from the BIM Task Group and there is a work-stream dedicated to upskilling the industry. The Alliance was formed in late-2016 and is in the process of consulting on its proposed plans.

The BIM Task Group instigated a community of special interest groups with the aim of raising "awareness of BIM and promoting a shared understanding of the value proposition and issues affecting the implementation of BIM" as stated in the [BIM4 Community Charter](#). Each group determines their own approach and certain groups are seen to be significantly more active e.g. [BIM4SME](#) and the [BIM Regions](#).

The BAF is the BIM4 Community special interest group representing Higher Education. Formed in 2011, BAF consists of a group of representatives from a large number of UK Universities, with the aim of creating a dynamic collaborative group to enhance and promote teaching and learning together with the research aspects of BIM, therefore serving as a conduit between industry demands and BIM education in higher education institutions.

Scotland's BIM Delivery Group is acting on Government's requirement to implement the majority of recommendations to encouraging the adoption of BIM across Scotland's public sector by April 2017. It recognises the diverse range of interests which pose significant questions for Scotland's built environment educators and training providers in developing appropriate pedagogies. Research is being undertaken to investigate the potential of the Scottish Qualifications Framework (SCQF) to act as an overarching paradigm for education/training in addressing the many challenges raised by aspirations to digitise Scotland's construction sector.

Awareness/Uptake

The government's BIM requirements and the subsequent activity of the BIM Task Group and the wider BIM community has significantly influenced the awareness and take up on BIM within the UK. This is evidenced above by the broad range of support and resources available to via the UK BIM Task Group Website, the BIM Regions and BIM4 groups such as BIM4M2 and BIM4SME. This is supported by a frequent programme of conferences run by amongst others the professional institutions and in 2016, the second [Digital Construction Week](#).

In addition, institutions and industry related journals have sections on their websites specifically focused on BIM, which together with the plethora of BIM-specific resources such as [BIM Plus](#), support the growing awareness of BIM within the UK.

The proposed programme of the UK BIM Alliance includes a work-stream focused on Awareness and being the champion for BIM Level 2.

The [Government Construction Strategy 2016-2020](#) indicates that progress has been made in "developing digital capability in design and construction, with all departments on target to procure assets using Building Information Modelling (BIM) Level 2 by 2016". The strategic objective within this strategy is "increasing BIM Level 2 maturity across government will enable departments to gradually move to BIM Level 3, which would support a fully integrated and collaborative process" (point 25). Further guidance is set out in [BIM-Level2.org](#).

The Government in conjunction with industry will develop the next generation of digital standards to enable BIM Level 3 adoption under the remit of the [Digital Built Britain Strategy](#).

UNITED STATES

Education/Training

Currently there are 68 public and 39 private Universities offering formal Architectural and Engineering programs. The majority of these Universities are accredited by the National Council of Architectural Registration Boards (NCARB) to provide undergraduate programs in all three of the AEC disciplines and all of which offer some 'BIM courses' as part of the syllabus. However, a select few lead the field for BIM specific courses and initiatives

including Purdue University, Brigham Young University, Pennsylvania State University, Georgia Southern University, University of Oklahoma, University of California - Irvine, and Georgia Tech University.

The American Institute of Architecture (AIA) sponsors the AIA Academic Engagement which fosters academic research focusing on the advancement of educational programs and initiatives including a joint venture symposium between the AIA and the Association of Collegiate Schools of Architecture (ACSA) geared toward bridging the gap between academia, practice and Architectural industry.

The Associated General Contractors of America (AGC) has developed - in conjunction with leading BIM practitioners, technology firms and educators - a BIM Education Program designed to prepare construction professionals at all experience levels to successfully implement BIM on a construction project.

The program comprises the following four units:

- Unit 1 | An Introduction to Building Information Modeling - Revised Edition
- Unit 2 | BIM Technology-Revised Edition
- Unit 3 | BIM Contract Negotiation and Risk Allocation
- Unit 4 | BIM Process, Adoption, and Integration

The highly interactive program provides 32-hours of instruction and training to get construction industry professionals at all levels ready to take advantage of the benefits of BIM. After participants complete all four units in the program they become eligible to sit for an exam to earn the Certificate of Management—Building Information Modeling (CM-BIM). Successful candidates will carry the CM-BIM designation.

Initiatives/Organisations

The Academic Interoperability Coalition (AIC), founded by the buildingSMART alliance and the BIMForum incorporates 53 Universities from the U.S. and abroad with the common mission of coming to a consensus about BIM education. Their 9th BIM Academic Symposium presented papers in the following areas: A Case Study on Hybrid BIM Course Development, BIM Estimating in the Classroom, and many others.

Awareness/Uptake

Research published by McGraw-Hill Construction (now Dodge Data & Analytics) in 2012 showed a rapid increase of BIM usage by architects, engineers, contractors and clients in North America. The percentage of companies using BIM was recorded at 71%, a jump from the 49% recorded in 2009 and the 28% recorded in 2007.

The 2015 SmartMarket report by Dodge Data & Analytics, titled *Measuring the Impact of BIM on Complex Buildings*, indicates that 40% of owners report an accelerated project completion due to the use of BIM. 41% of contractors report that BIM reduces final construction costs by at least 5% and 67% of contractors report improved productivity by using BIM.

CONCLUSION

As reported in previous years it is clear from the responses received that BIM education and BIM awareness/uptake is still at different levels of implementation across the globe.

Most countries are reporting BIM education being provided to AEC students by their higher education and technical training institutions. An increase in the number of courses being offered was reported in most countries, with the exception of a few, such as Singapore, which reports that the number of diplomas, that include BIM content, provided by the BCA Academy has actually reduced from last year. However, this could be due to BIM education being sufficiently provided by other institutions in Singapore.

Detailed studies completed in countries such as Australia, Canada and the UK has indicated that there are many challenges being faced by educators in regards to incorporating BIM into the curricula and a number of these are indicated in this report.

Challenges such as fitting additional material into an already crowded curriculum and converting lecture-based courses into smaller multidisciplinary teamwork-based courses.

With the exception of South Africa and Japan, most countries' higher education institutions are including structured BIM education within the syllabus of their AEC courses, at both an undergraduate and postgraduate level. Countries such as Australia, Finland, Netherlands, Singapore, Sweden, UK and USA are reporting a significant volume of courses and subjects available. Many vocational education institutions are also providing BIM education to the industry's workforce.

Whilst the majority of BIM education being provided tends to focus on the use of particular BIM software packages. It has been reported that training for both graduates and professionals in openBIM concepts, BIM management and working in collaborative BIM environments, appears to be increasing, particularly in the northern European countries, but it still has a long way to go.

Countries including Australia, Finland, Hong Kong, Norway, Singapore, Sweden, Switzerland, UK and USA have reported training and education being available in these topics.

BIM awareness and BIM uptake appear to still be on the rise. However, this is not strictly a consistent global trend, with BIM reported as being widely adopted in countries such as Finland and Australia, and even required by government, in some countries, such as Singapore and UK, whilst still only being considered in others.

The trend towards accreditation/certification schemes to validate the BIM knowledge of professionals in industry continues. Countries such as Australia, Canada, New Zealand, South Africa, UK and USA have all reported the existence or development of such schemes in their respective countries.

It is clear that the provision of BIM education is growing globally, spearheaded by progressive higher education institutions and educators. As observed in previous years, liaison between education providers and industry is also improving, to coordinate the training provided with the needs of industry, the aim being to provide a graduate workforce with the collaborative BIM skills required for the future industry of which they will be part.