



# 3D SZERKEZETKONSTRUÁLÁS

## 3D CONSTRUCTIONAL MODELING OF STRUCTURES

*Bevezetés*  
*Introduction*

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BUDAPEST UNIVERSITY  
OF TECHNOLOGY AND ECONOMICS

Faculty of Civil Engineering - Since 1782

Department of Structural Engineering

Hidak és Szerkezetek Tanszék – Department of Structural Engineering

# SCHEDULE AND PROGRAM - 1

<b>Név:</b>	3D szerkezetkonstruálás	<b>Neptun kód:</b>	BMEEOHSAS45
<b>Előadó(k):</b>	Dr. Joó Attila László, Kenéz Ágnes, Lendvai Anita, Németh Gábor		
<b>Tárgyprogram heti bontásban:</b>			
<b>hét</b>	<b>oktatott tananyag</b>	<b>ZH / ED / HF</b>	
1. 09.06	Bevezető előadás, házi feladat témák megbeszélése.	1. HF kiadás: kézi skicc	
2. 09.13	3D szerkezetkonstruálás jövőképe, virtuális kivitelezés, költségvetés, BIM fogalma.		
3. 09.20	Sportnap, rektori szünet.		

# SCHEDULE AND PROGRAM - 2

4. 09.27	Szoftverbemutatók (Nemetschek, Revit, Tekla).	Szoftverválasztás
5. 10.04	Tekla részletes bemutató óra.	2. HF kiadás: modellezés
6. 10.11	Nemetschek részletes bemutató óra.	1. HF beadás
7. 10.18	Revit részletes bemutató óra.	1. HF pót

# SCHEDULE AND PROGRAM - 3

<b>8. 10.25</b>	A BIM fogalmai és alapjai.	3. HF kiadás: rajzkészítés, tétellisták
<b>9. 11.01</b>	Munkaszüneti nap.	
<b>10. 11.08</b>	A BIM alkalmazási lehetőségei az építészetben.	
<b>11. 11.15</b>	BIM esettanulmányok, AR & VR technológiák, 3D nyomtatás.	2. HF beadás

# SCHEDULE AND PROGRAM - 4

<b>12. 11.22</b>	Acélszerkezeti rajzok készítésének alapfogalmai.	2. HF pót
<b>13. 11.29</b>	Vasbetonszerkezeti rajzok készítésének alapfogalmai.	
<b>14. 12.06</b>	Konzultáció és/vagy helyszínlátogatás.	3. HF beadás
<b>pót 12.17</b>		3. HF pót 1. 2. 3. javítás

# SCHEDULE AND PROGRAM - 5

<b>Pótlás(ok):</b>	Kis házifeladatok pótlási lehetősége határidő után egy héttel.
<b>A/F követelménye:</b>	Minimum 70%-os órai jelenlét, kis házifeladatok teljesítése a beadáskori beszámolóval együtt.
<b>Vizsga:</b>	Nincs.
<b>Jegykialakítás módja:</b>	100% HF érdemjegy a beszámoló figyelembevételével.

# SOFTWARE AND SUPERVISORS

Nemetschek: Ágnes Kenéz PhD Student

Revit Structures: Anita Lendvai, Research Fellow

Tekla Structures: Gábor Németh, PhD Student



# HOMEWORK

One frame of an industrial building

Three deadline and consultations:

Sketch: 10 points, min. 5 points – min.1 consultation, 0-2 points

3D model: 10 points, min. 5 points – min. 2 consultation, 0-4 points

Drawing: 10 points, min. 5 points – min. 2 consultation, 0-4 points

70% presence on the lectures

Grade: 36-40: excellent

30-35: good

25-29: satisfactory

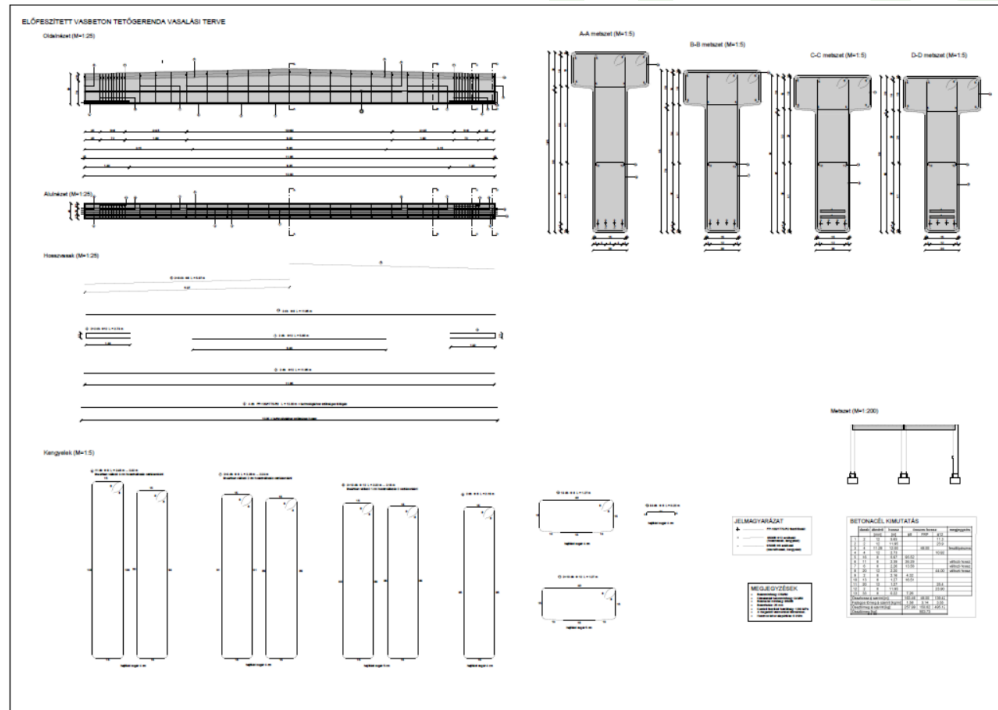
16-24: sufficient

0-15: failed

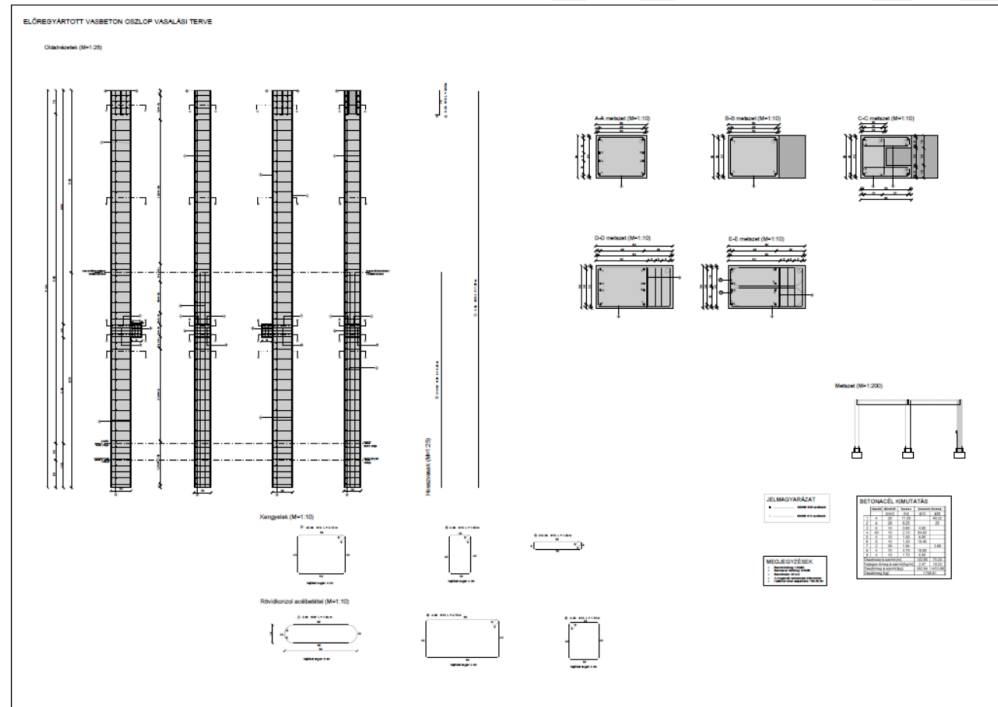




# HOMWORK – EXAMPLE PAGE 1



# HOMWORK – EXAMPLE PAGE 2



# CONSTRUCTION 2020 ACTION PLAN

Aim of the **European Commission**:

„Strategy for the sustainable **competitiveness of the construction sector** and its enterprises”

Thematic Groups:

1. Stimulating investment conditions for renovation
2. Improving human capital
3. Improving resource efficiency
4. Strengthening the Internal Market for Construction
5. Fostering the global competitive position of European construction enterprises

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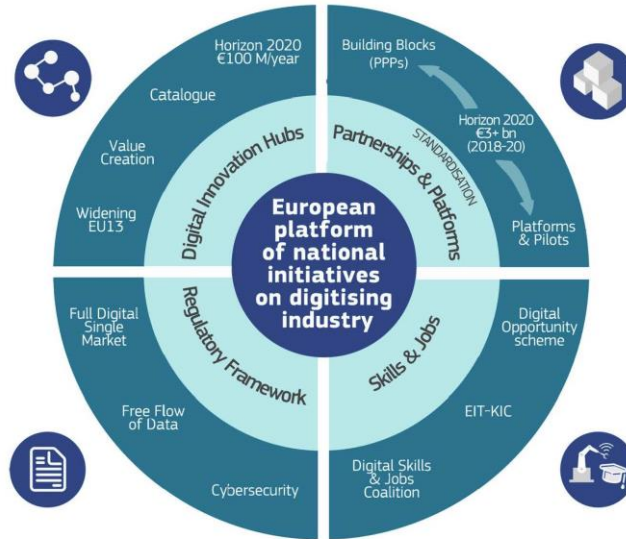
**Commission initiatives and experiences on Digital Platforms**  
*Digitising European Industry*

30/11/2017

Cristina Sandoval  
Programme Officer, A2 Technologies and Systems for Digitising Industry  
DG CNECT - European Commission

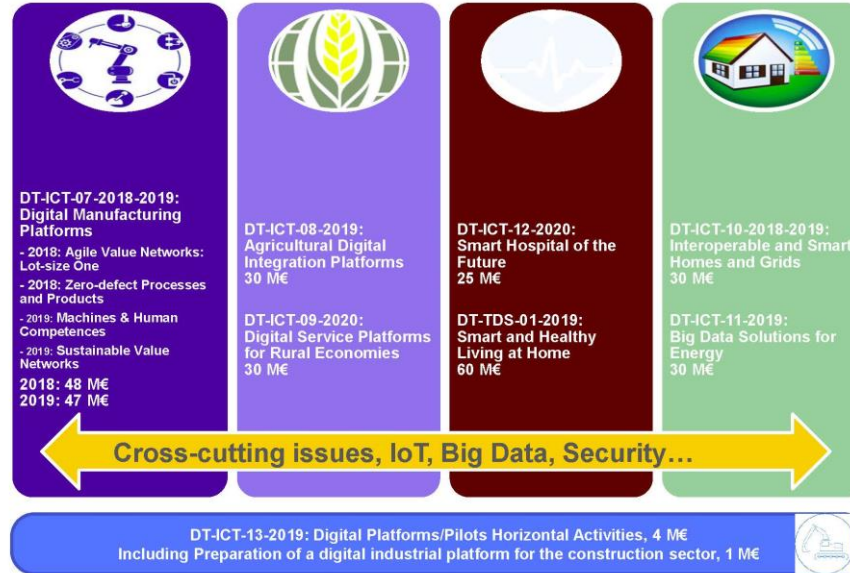
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## Digitising European Industry Status



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 **WP 2018-2020**  
Platforms and Piloting



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WP 2018-2020

Digital Platforms/Pilots Horizontal Activities: CSA

- Preparatory action to envision how the construction sector will look like in the future and to define the **roadmap**.
- Spot the improvement potential in the whole construction lifecycle for a more sustainable sector. Optimising resource use, environmental performance, energy-efficiency, health or comfort, aligned with the **Circular Economy** Action Plan.
- Identify how **novel** technologies/approaches in the construction sector fit together and which are the tangible contributions from European key players to the platform building process.
- Identify the **barriers** for the digitisation of the construction sector and the adoption of new technologies.
- Promote an active **eco-system** of relevant stakeholders, including start-ups and SMEs.
- **Instrument** to pave the way for digital industrial platforms in the construction sector

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WP 2018-2020

Digital Platforms/Pilots Horizontal Activities: Scope

## c) Preparation of digital industrial platform for construction sector

- Define reference architecture for digital industrial platform for construction sector
- Take into account Level(s), the recently developed framework to assess environmental performance of buildings, including circular economy aspects \*
- Take stock of ongoing initiatives, promote mutual learning and coordination, and identify knowledge and intervention gaps
- Building Information Modelling and building passports are part of scope

- 1 M€
- Deadline: 14<sup>th</sup> November 2018
- At least one CSA will be supported

\* <http://ec.europa.eu/environment/eussd/buildings.htm>

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## Digital Industrial Platforms

For more information

- [Publication](#) LEIT-ICT Work Programme 2018-20
- Digitising European Industry [WG2 report](#)
- Industrial Innovation [Information Days](#)  
Brussels, 3-4 Oct 2017
- Workshop "[Digital Manufacturing Platforms for Connected Smart Factories](#)"  
Brussels, 19 Oct 2017
- Digitising European Industry  
<http://bit.ly/DigIndEU>  
@DigIndEU

# CRISTINA SANDOVAL – EUROPEAN COMMISSION



Thank you!

Cristina Sandoval

[cristina.sandoval@ec.europa.eu](mailto:cristina.sandoval@ec.europa.eu)

Programme Officer, A2 Technologies and Systems for Digitising Industry  
DG CNECT - European Commission

# FERNANDO SIGCHOS JIMÉNEZ – EUROPEAN BUILDERS CONFEDERATION



*European Builders Confederation*

## **Construction SME's perspective on digitalisation Needs, opportunities, barriers**

DG GROW WG TG1

“Stimulating investment in building renovation,  
infrastructure and innovation”

Brussels – 30 November 2017

Fernando Sigchos Jiménez  
EBC Policy Officer



# FERNANDO SIGCHOS JIMÉNEZ – EUROPEAN BUILDERS CONFEDERATION



## Global challenges

1. **Mind-set change:** reluctance towards the digital revolution of the sector
2. **Economic framework:** slow recovery from the financial crisis and low production
3. **Demographic challenge:** ageing know-how and poor business transfers
4. **Youth unemployment:** lack of attractiveness
5. **Image of the sector towards new generations:** not only a heavy and dirty sector anymore
6. **New competences:** digital, technological and green skills

# FERNANDO SIGCHOS JIMÉNEZ – EUROPEAN BUILDERS CONFEDERATION



## Construction 4.0 for SMEs

- The Internet of Things (IoT)**
- Building Information Modelling (BIM)**
- Off-site construction tools:** 3D printing; preassembled modules
- New materials:** nanomaterials; robotisation
- Compatibility between different tools:** clouds; handheld devices interoperability; simple and intuitive design
- Specific issues:** training schemes; mobile nature; geographical dispersion; subcontracting liability; share of responsibility

**While the whole sector feels heavily these changes, construction SMEs feel these challenges on an even bigger scale!**

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## Digital opportunities

- New and **modernized image of the construction sector**, which may be pivotal to change the negative image of the industry
- Improvement of **cost-efficiency** and ensuring the global **sustainability of the sector**
- Possibility to **upskill construction SME employers and workers** through appropriate training programmes and schemes
- Major improvements to **project management and maintenance** during the whole lifecycle of a building
- Sustained **alleviation of heavy construction tasks**
- Enhanced **communication and trust** along the value chain

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## Construction SMEs needs

- ❑ Applying a **bottom-up approach** instead of top-down solutions: tools adapted to real market requests
- ❑ Proper **involvement of SME representatives** in all relevant fora, specially in **standardization**
- ❑ Ensuring a **progressive roadmap and adapted transition** phase from traditional methods to digital ones for SMEs
- ❑ Financial support for upskilling blue-collars and **training SMEs** to face digital challenges
- ❑ Facilitation of the exchange of **good practices** and the **creation of networks** at the European, national and local level
- ❑ Digital tools **adapted to crafts/traditional, renovation and energy efficiency works** to lower life-cycle costs of buildings

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## Digital challenges

- Guarantee digital model tools **financially bearable** for SMEs
- Very **rapid evolution and complex development**
- Ensure proper SME representation in the **standardisation process**
- Changes to the **share of responsibilities**: liability; protection of data; reluctance from insurance providers
- Risk of **monopoly and dependence** on large players
- Emergence of new **business models and methods**
- BIM** should be understood as a global digital revolution for the sector



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## Digital barriers

- Lack of **financial means**: training funds and upfront investments
- Inclusion of digital tools in **VET** and **on-site training**
- Perception of **robotisation** as a replacement of skills and professionals
- Compatibility of digital model tools: notably with **e-declaration of performance** and **CE marking**
- Tools must be adapted to **traditional buildings and renovations**
- The **standardisation community** - Small Business Standards
- Avoid **to make one BIM software the reference**

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## Recommendations on BIM

- Addressing the needs of SMEs in how to design a **European standardised approach** to BIM
- Promoting the **adoption of BIM to facilitate higher energy efficiency** and lower life-cycle costs of buildings
- Promoting **BIM training programmes** targeted to guide all construction professionals
- Ensuring the **soft-landing of public procurements changes**
- Promoting **Industry Foundation Class (IFC)** to facilitate the exchange of data across the construction supply chain
- Stimulate the **exchange of best practices on roadmaps for SMEs**: UK Government's Construction Strategy 2011, French PTNB

# FERNANDO SIGCHOS JIMÉNEZ – EUROPEAN BUILDERS CONFEDERATION



**“Let’s build a new generation of  
construction SMEs and workers!”**

# FERNANDO SIGCHOS JIMÉNEZ – EUROPEAN BUILDERS CONFEDERATION



*European Builders Confederation*

**Thank you for your attention**

**Fernando Sigchos Jiménez**  
**EBC Policy Officer**

**Fernando.sigchos@ebc-construction.eu**  
**www.ebc-construction.eu**

# GEORGE BRASHNAROV – EUROPEAN DIGITAL SME ALLIANCE

Digitization of construction:  
an open ecosystem for digital SMEs  
to serve the construction sector

*30 November 2017, George Brashnarov  
European DIGITAL SME Alliance  
Vice-President*



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European DIGITAL SME Alliance

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# GEORGE BRASHNAROV – EUROPEAN DIGITAL SME ALLIANCE



**European DIGITAL SME Alliance**

## Giving a voice of European digital SMEs: *European DIGITAL SME Alliance*

- The first European association in the ICT sector **exclusively focused on SMEs**
- Founded in 2007 from an initiative of **UEAPME** (the European Association of SMEs)
- Members are national associations of digital SMEs and ICT cluster from **19 countries**
- Representing over **20.000 enterprises**, across Europe
- Now active on several **topics**: digitization of industry (e.g. BIM), data economy, cybersecurity, ICT standardisation, digital taxation, digital skills...



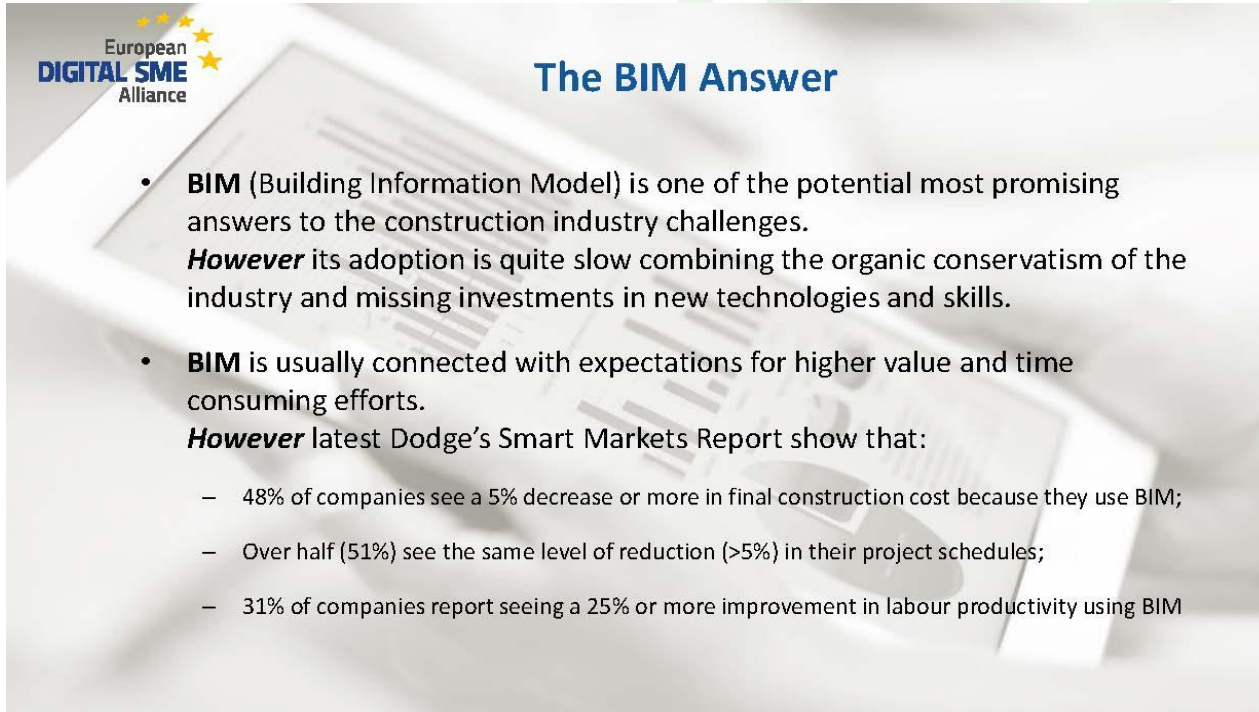
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## The challenges of digitization in construction

- Construction industry is one of the most complex and conservative industries
- **Lack of coordination** along the value chain
- Potential risks for breaching deadlines and budgets (example - "new" Berlin Airport)
- Scandinavian countries and UK advanced on the introduction of BIM public buildings (best examples worldwide – Singapore and US GSA regulations)
- BIM is developed through different corporate interest involving **heavy licensing expenses**

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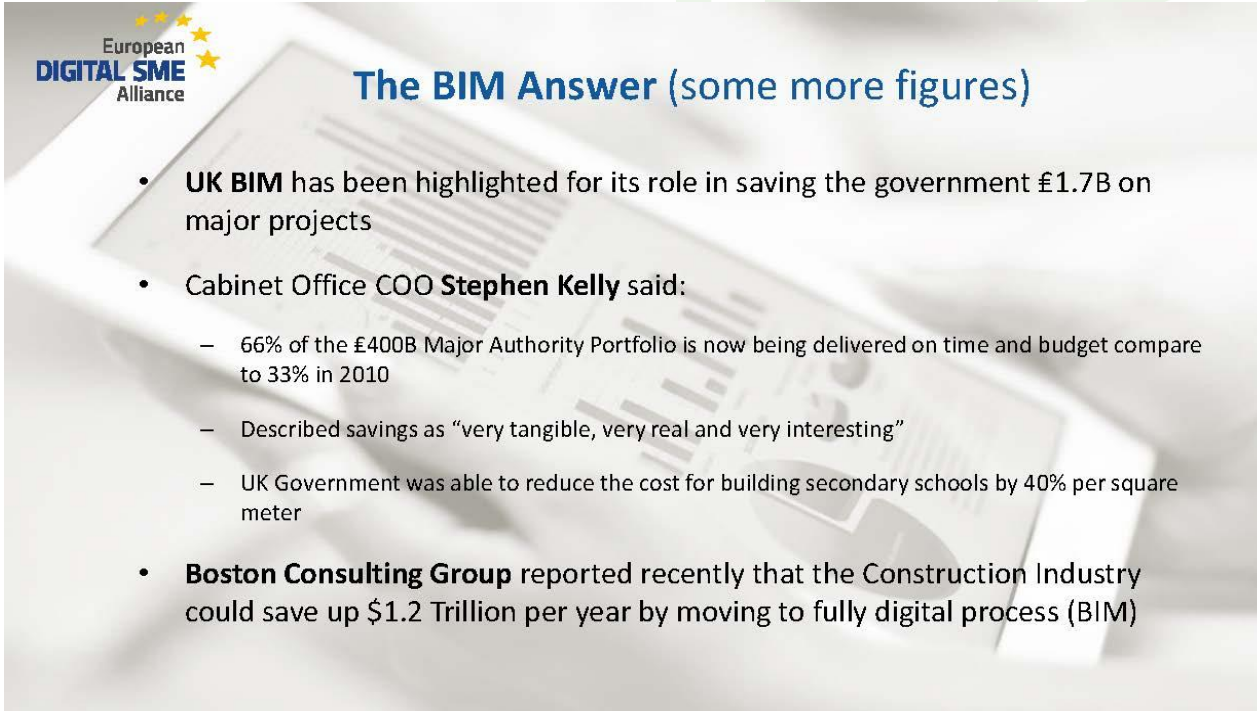
**European Digital SME Alliance**

## The BIM Answer

- **BIM** (Building Information Model) is one of the potential most promising answers to the construction industry challenges.  
*However* its adoption is quite slow combining the organic conservatism of the industry and missing investments in new technologies and skills.
- **BIM** is usually connected with expectations for higher value and time consuming efforts.  
*However* latest Dodge's Smart Markets Report show that:
  - 48% of companies see a 5% decrease or more in final construction cost because they use BIM;
  - Over half (51%) see the same level of reduction (>5%) in their project schedules;
  - 31% of companies report seeing a 25% or more improvement in labour productivity using BIM



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**European DIGITAL SME Alliance**

## The BIM Answer (some more figures)

- **UK BIM** has been highlighted for its role in saving the government £1.7B on major projects
- Cabinet Office COO **Stephen Kelly** said:
  - 66% of the £400B Major Authority Portfolio is now being delivered on time and budget compare to 33% in 2010
  - Described savings as “very tangible, very real and very interesting”
  - UK Government was able to reduce the cost for building secondary schools by 40% per square meter
- **Boston Consulting Group** reported recently that the Construction Industry could save up \$1.2 Trillion per year by moving to fully digital process (BIM)

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## An open BIM ecosystem (SME point of view)

- Choosing **open standards** is highly **strategic to SMEs**
- **Open standards** provide common interoperability allows all the parties involved (users, customers, organisations and governments) to communicate and work freely across borders
- Open Standards create the opportunity to **integrate solutions at lowest cost, which is crucial for SMEs**, providing local innovation and niche high value services to their customers.
- **Lower costs of market entry** and possibility to bid for smaller bits of larger tenders

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## An open BIM ecosystem (SME point of view)

- **openBIM** is a universal approach to the collaborative design, realization and operation of buildings based on **open standards** and workflows
- Project members can participate regardless of the software tools they use, thus **openBIM reduces technologic barriers for SMEs.**
- Small and large (platform) software vendors can participate and compete on **system-independent, 'best-of-breed' solutions**
- This approach supports a **transparent, open workflow**

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 **Digital SMEs stimulate innovation in construction**

- Digital companies offer **technologies** and **skills** needed to transition construction into Industry 4.0.
- Several sectors, supported by incentive policies, are investing in **digital transformation**. Construction sector has great potential for modernization.
- Digital SMEs offer **cost-effective services** for the digital transition of construction enterprises of all sizes

# GEORGE BRASHNAROV – EUROPEAN DIGITAL SME ALLIANCE



## Digital SMEs stimulate innovation in construction

- A **European digital platform** for construction should aim at promoting open approaches, independent players and enable data exchange
- A European digital platform should foster **collaboration** among different players in the value chain and promote **fair competition and innovation**
- The new digital platform should build on the **open specifications** developed by BuildingSMART and the experiences (good or bad) by ENCORD ([www.encord.org](http://www.encord.org))
- **DIGITAL SME** also supports the vision of a **European digital platform for construction** to promote open approaches and enable data exchange

# GEORGE BRASHNAROV – EUROPEAN DIGITAL SME ALLIANCE





# ORGANIZATIONS

Hungarian BIM Association – [www.mabim.hu](http://www.mabim.hu)

Lechner Non-profit Ltd. (Lechner Tudásközpont) –  
[www.lechnerkozpont.hu](http://www.lechnerkozpont.hu)

Hungarian Standards Institution – [www.mszt.hu](http://www.mszt.hu)

EU CEN/TC 442 [www.standards.cen.eu](http://www.standards.cen.eu)

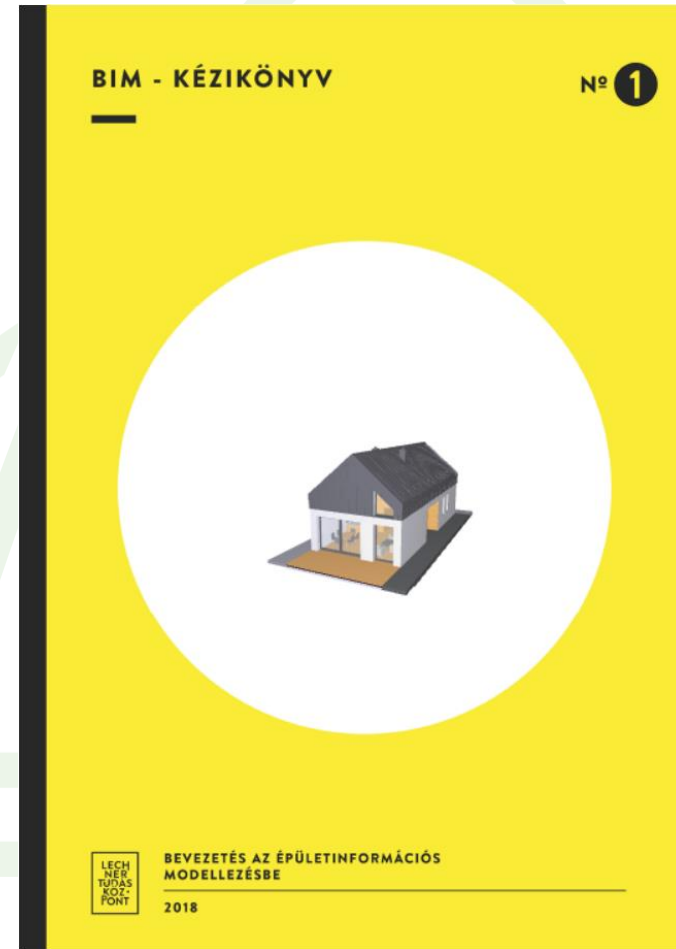
National Standards: UK, Sweden, ...

BME VMS: Venture Mentoring Service

<https://www.facebook.com/bmevms>

# LECHNER NON-PROFIT LTD.

## BIM Handbook





# BIME INITIATIVE – BIM DICTIONARY



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General Principles  
our commitments ▾

Resources  
free downloads ▾

Projects  
ongoing efforts ▾

Members & Volunteers  
the expanding community ▾

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**Latest Updates**

Mar 26, 2018

Welcome to the BIME Initiative!

A summary of the BIME Initiative is available below in a number of languages.



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An International Research Journal

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- Design & Engineering
- Construction Technology
- Maintenance & Management

*Automation in Construction* is an international journal for the publication of original research papers. The journal publishes refereed material on all aspects pertaining to the use of **Information Technologies** in **Design, Engineering, Construction Technologies**, and **Maintenance and Management** of

Feedback



# MSC PROGRAM FROM 2020 - CONSTRUCTION INFORMATION TECHNOLOGY ENGINEER

Civil  
Engineering

• Digitalisation

Architecture

• Digitalisation

Mechanical  
Engineering

• Digitalisation

Electrical  
Engineering

• Digitalisation

C4.0

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