

BIM, a new method and what it means for the industry

Professor Dr. Bernd Domer

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BIM, a new method and what it means for the industry

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Professor Dr. Bernd Domer Head of inPACT



institut de recherche i n P A C T paysage, architecture, construction et territoire

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What is so special about construction industry ?









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What is so special about construction industry ?





Compared to other industrial branches, construction:

- is not a mass production and project oriented
- relations between different stakeholders of a project are of too short duration to develop optimal collaborative work models
- is a fragmented industry companies have a market share which is too small to push technological standards
- profit margins are very low and do not allow for big investments

Construction – a risky business



Source: Pixabay





Source: Wikipedia



Source: Badische Zeitung

L'avenir est à créer



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Source: SUVA

Construction – a local business









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Construction – one of the last adventures of mankind



Source: Infrastructure productivity: How to save \$1 trillion a year", January 2013, McKinsey Global Institute, <u>www.mckinsey.com</u>. Copyright (c) 2017 McKinsey & Company. All rights reserved.



BIM – three letters promising to change construction industry for the better

Project information



et d'architecture de Genè

Adapted from Eastman, 2011.: BIM Handbook, A Guide to Building Information Modellling

BIM "Building Information Modelling" is a technology as well as a methodology, allowing to model and exchange all necessary data for design, construction, operation, retrofit and demolition of **buildings.**





Geometric representation (CAD):



Geometric representation:







Source: Zijie, Y., Smith, I.F.C.: BIM – Building Information Modelling



Building representation (BIM, object oriented):







Source: Zijie, Y., Smith, I.F.C.: BIM – Building Information Modelling





BIM Maturity Diagram



Methodology



Adapted from: Yuan Z., Smith I. F. C.: BIM Building Information Modelling, ASCE Global Center for Excellence in Computing



BIM 4D Example





Source: Traore, L. (2016): Intégration des informations de planning dans un modèle de bâtiment enrichi (Master thesis)

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BIM 5D Example

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Source: Madrari, Y. (2016): Estimation et contrôle des coûts de la construction en utilisant un modèle de bâtiment en 3D enrichie (Master thesis)



BIM Maturity Diagram





Adapted from: Yuan Z., Smith I. F. C.: BIM Building Information Modelling, ASCE Global Center for Excellence in Computing



«Everybody is talking to everybody else» (Bimal Kumar)

BIM Level 3: Collaborative approach, BIMserver



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BIMserver is a **shared knowledge resource** for information related to an AEC asset:

- Guaranties a better control of information distributed
- Data quality assurance (consistence, coherence, integrity)
- Depends on the quality of the implemented IFC interface (clear identification of software which did not well implement the interface)

building SMART Switzerland

IFC = Industry Foundation Classes



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IFC: a spatial approach





Source: Ernst Basler: BIM – Grundzüge einer open BIM Methodik für die Schweiz Version 1.0, 15.2.2015



A subset of IFC: IDM and MVD Defining the amount of information needed Hes·so//genève







Model view definition



Since the IFC structure allows a very flexible storage and interpretation of data, it is impossible to test all combinations of building elements.

buildingSMART validates Model views instead. Model views are a subset of IFC's and contain only the data needed to perform a well defined task.



Source: T. Liebich, IFC Overview

BIM – new models of collaboration

A lot of checks are possible before construction:

- completeness and consistency of data
- conformity with construction codes
- clash detection (geometric conflicts) •



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Clash detection: before



Source: Bexel Consulting

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BIM – new models of collaboration

ICE (Integrated Collaborative Engineering) sessions:



Source: Odeh Engineers



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Clash detection: after



Source: Bexel Consulting

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An example of a supply chain pushed to its limits

«Cook reduced the number of suppliers from 100 to 24 and closed 10 of 90 warehouses. Production autonomy of apple was **one month** in **1998**, September of the same year, Tim Cook **reduced it to six days**. In September of the following year, autonomy was further **reduced to two days**, for some pieces it's **only 15 hours**.»





Source : Isaacson, W.: Steve Jobs

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BIM and Supply chain management



Source: Schwab System, WIPO, Transsolar



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Source: Jantien Stoter, Professor for 3D GeoInformation, TU Delft



BIM and urban management

Solar cadaster



Source: Desthieux, G. et. al. (2013-2017), Cadastre solaire du canton de Genève

Noise propagation





Source: vdp Srl, Italy

GIS implementation model for future construction projects



Source: Domer, B. et. al. (2016-2017), Maquette de reference pour l'autorisation de construire

Fluid simulation



Source: Huijbregts et. al., CFD Simulation of pollutant gas dispersion in downtown Montreal

A bright future is ahead



For the client:

- A clear vision of the project, provided by 3D modelling and virtual reality, facilitates decision making.
- No information loss when building is taken over for operation
- Transparency concerning quality, schedule and cost



Source: Müller, B., Fraunhofer IAO





For designers and contractors:

- Better quality through better collaboration.
- Less errors on construction sites through checking and collaborative work
- Traceability of modifications and clear assignment of responsibilities
- Productivity increase through better supply chain management (prefabrication, etc.)



A bright future is ahead



For designers and contractors:

Productivity increase by new technologies, using BIM-data



Source: National Centre of Competence in Research (NCCR) Digital Fabrication, ETHZ



Source: Future cites lab, Singapore



A bright future is ahead



For designers and contractors:

• Better client relationship



Source: Pixabay

THANKS FOR YOUR ATTENTION

If you have questions, please share them with me !