









Sustainable and Resilient Infrastructure and Buildings

1 February 2022 – 30 April 2022

15 March 2022

Lecture 6: BIM - the process of intelligent management of the project information

Introduction

Dr Eng. Mariusz Szóstak employed at the Faculty of Civil Engineering, at Wroclaw University of Science and Technology (WUST), Poland.

MSc in Civil Engineering from WUST in 2013. PhD (Hons) in Civil Engineering in April 2018.

Author of more than 60 scientific papers, including papers on work safety in construction and articles in journals in the Journal Citation Reports database.

I developed several dozens of reviews of articles in journals from the JCR list such as: Applied Sciences, Buildings, International Journal of Environmental Research and Public Health, Sustainability.





Introduction

Deputy Head of the Department of Building Engineering, Faculty of Civil Engineering, Wroclaw University of Science and Technology (WUST).



Project Manager from the WUST of the project Erasmus+ Strategic Partnerships for vocational educational and training innovation "SafeCRobot Virtual Reality Immersive Safety Training Environment for Robotised and Automated Construction Sites" 2020-1-UK01-KA202-079176, 2020-2022

Guest Editor: Applied Sciences, Special Issue: Technology and Management Applied in Construction Engineering Projects



Introduction



Scientific interest:

- occupational Health and Safety;
- modeling of the development of accident situations in construction;
- analysis of the causes of occupational accidents at work in construction;
- management of construction projects;
- BIM technology.









and what is this?



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BUILDING INFORMATION MODEL

BUILDING INFORMATION MODELLING

BUILDING INFORMATION MANAGEMENT





BUILDING INFORMATION MODEL

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is the DIGITAL REPRESENTATION of physical and functional characteristics of a facility. As such it serves as a shared knowledge resource for information about a facility, forming a reliable basis for decisions during its lifecycle from inception onwards.





BUILDING INFORMATION MODELLING

is a BUSINESS PROCESS for generating and leveraging building data to design, construct and operate the building during its lifecycle. BIM allows all stakeholders to have access to the same information at the same time through interoperability between technology platforms.



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BUILDING INFORMATION MANAGEMENT

is the ORGANIZATION & CONTROL of the business process by utilizing the information in the digital prototype to effect the sharing of information overt the entire lifecycle of an asset. The benefits include centralized and visual communication, early exploration of options, sustainability, efficient design, integration of disciplines, site control, as built documentation, etc. – effectively developing an asset lifecycle and model from conception to final retirement.



What **BIM** is definitely not

• BIM is not a 3D model

• BIM is not (software name)



• In BIM, everything is self-contained





Multidimensionality of BIM technology BIM Dimensions

3D	4 D	5 D	6D	7 D
Geometry	Time	Money	Sustainability	Facility managemnt
3-dimensional (x,y,z) geographical structure	Timeline Scheduling Duration	Cost Estimation Budget analysis	Self-sustainable and Energy Efficient	Facility Management Information



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hotel building



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Benefits of 3D BIM

- Enhanced 3D visualization of the entire project
- Streamlined communication and sharing of design expectations
- Easy collaboration between multiple teams irrespective of their area of expertise
- Reduced instances of rework and revisions due to complete transparency from the beginning







Kw 4 2022

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Benefits of 4D BIM

- Improved site planning and scheduling optimization
- Seamless coordination among architects, contractors, and on-site teams
- Better preparedness in terms of next steps during every construction stage
- Enhanced information sharing related to timeline expectations helping to avoid costly delays
- Enhanced safety and efficiency due to documentation of an entire plan with specific timelines



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		Roboty budowlane				23.221.300,53			
		1. Przygotowanie placu budowy, roboty ziemne				443.263,79			
1	KNR 2-25 0102/01	Montaż obiektów kontenerowych	kontener	10	215.18	2.151.80	16.3	8.1	
2	KNR 2-25 0102/02	Demontaż obiektów kontenerowych	kontener	10	73.47	734.70	6.5	4.6	
3	KNR 2-02 1804/03	Ogrodzenie z siatki o wysokości 1,5m na słupkach żelbetowych 18x12x350cm obsadzonych w gruncie	m	340	125,29	42.598,60	569,636	1,768	
4	KNR 2-02 1808/02	Typowe wrota o szerokości 3m (na gotowych słupkach) z furtkami o szerokości 1m z sialiti w ramach z kątowników, bez pasa dolnego, o wysokości 1,8m	kpl	2	1.548,64	3.097,28	24,16	0,04	
5	KNR 2-01 0126/01	Usunięcie warstwy ziemi urodzajnej o grubości do 15cm za pomocą spycharki	m2	3.090,16	0,59	1.823,19	16,378	7,725	
6	KNR 2-01 0126/02	Usunięcie warstwy ziemi urodzajnej za pomocą spycharki - dodatek za każde dalsze 5cm grubości humusu (ponad 15cm)	m2	3.090,16	0,19	587,13	5,562	2,472	
7	KNR 2-01 0126/02	Usunięcie warstwy ziemi urodzajnej za pomocą spycharki - dodatek za każde dalsze 5cm grubości humusu (ponad 15cm)	m2	3.090,16	0,19	587,13	5,562	2,472	
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9	KNR 2-01 0126/02	Usunięcie warstwy ziemi urodzajnej za pomocą spycharki - dodatek za każde dalsze 5cm grubości humusu (ponad 15cm)	m2	3.090,16	0,19	587,13	5,562	2,472	
10	KNR 2-01 0126/02	Usunięcie warstwy ziemi urodzajnej za pomocą spycharki - dodatek za każde dalsze 5cm grubości humusu (ponad 15cm)	m2	3.090,16	0,19	587,13	5,562	2,472	
11	KNR 2-01 0126/02	Usunięcie warstwy ziemi urodzajnej za pomocą spycharki - dodatek za każde dalsze 5cm grubości humusu (ponad 15cm)	m2	3.090,16	0,19	587,13	5,562	2,472	
12	KNR 2-01 0126/02	Usunięcie warstwy ziemi urodzajnej za pomocą spycharki - dodatek za każde dalsze 5cm grubości humusu (ponad 15cm)	m2	3.090,16	0,19	587,13	5,562	2,472	
13	KNR 2-01 0207/05.3	⁹ Roboty ziemne w gruncie kategorii III wykonywane koparkami podsiębiernymi o pojemności łyżki 2,50m3 z transportem urobku samochodami samowykładowczymi 15-20t na odległość do 1,0km	m3	13.442,196	12,97	174.345,28	1.172,159	892,561	
14	KNR 2-01 0214/01.4 doplata 10x	^V Nakłady uzupelniające do tablic 0201-0213 za każde dalsze rozpoczęte 0,5km odległości transportu gruntu kategorii I-II samochodami samowyładowczymi 15-20t na odległość ponad 1km po terenie lub drogach gruntowych	m3	13.442,196	15,95	214.403,03	564,572	1.169,471	
		4				6.368.286,33			
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15	KNR-W 2-02 0205/01.2	⁹ Płyty fundamentowe żelbetowe z układaniem betonu z zastosowaniem pompy	m3	3.090,16	473,39	1.462.850,84	1.390,572	216,312	
16	KNKRB 2 0210/02	^N Zbrojenie żelbetowych elementów budynków i budowli prętami stalowymi okrągłymi żebrowanymi	t	328,34	5.362,16	1.760.611,61	14.079,219	5.680,282	



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BIM Dimensions 5D – Money





BIM Dimensions 5D – Money

Benefits of 5D BIM

- Real-time cost visualization with notification on changes in costs
- Automatic count for components/system/equipment associated with a project
- Simplified cost analysis and budgetary analysis with predicted and actual spends over time
- Minimization of budgetary offshoot due to regular cost reporting and budgeting







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Benefits of 6D BIM

- Reduced energy consumption in the long run
- Faster and more accurate decision making related to component installation during the design process
- Detailed analysis and impact of a decision on economic and operational aspects over the entire lifecycle
- Better operational management of the building or structure after handover



BIM Dimensions 7D – Facility Management





BIM Dimensions 7D – Facility Management







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BIM Dimensions 7D – Facility Management

Benefits of 7D BIM

- Optimized asset and facility management from design stage to demolition
- Simplified and easy replacement of parts and repairs anytime during the entire life of a building
- Streamlined maintenance process for contractors and subcontractors



• during the design process, information should be introduced into the model only when it is necessary for the further design process,

• information should be taken from the model in a rational and legible manner.



Features of BIM technology

- interoperability,
- group cooperation,
- communication,
- cross-industry coordination, collision detection,
- 3D modelling, visualization and virtual reality.



Features of BIM technology





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Features of BIM technology



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SafeCROBOT

Virtual reality immersive safety training environment for robotised and automated construction sites

2020-1-UK01-KA202-079176 01.12.2020 - 30.11.2022

www.safecrobot.pwr.edu.pl



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SafeCROBOT: Virtual reality immersive safety training environment for robotised and automated construction sites











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SafeCROBOT: Virtual reality immersive safety training environment for robotised and automated construction sites











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SafeCROBOT: Virtual reality immersive safety training environment for robotised and automated construction sites





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BIM technology, what more?

- levels of model detail,
- platforms for information exchange and cooperation CDE platforms,
- data exchange standards,
- programs using BIM technology for modeling, planning and management,
- innovative technologies supporting BIM technology: virtual and augmented reality, photogrammetry, laser scanning, drones,













Sustainable and Resilient Infrastructure and Buildings

1 February 2022 – 30 April 2022

15 March 2022

Lecture 6: BIM - the process of intelligent management of the project information