

# 6D<sup>+</sup> CONSTRUCTION MODELLING

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**Motto:**

It is a rare situation when available achievements of technical innovation are preceding apperceived practical needs ...

## Some Linguistics - I

- Mock-up:  
(Maquette)** A scaled static design or replica of a thing or of a device for presentation purposes
- Modelling:** Analyzing behaviour of a system or of a phenomenon with main emphasis on its inner transformation mechanism
- Simulation:** Imitating behaviour of a system or of a phenomenon with main emphasis on its output or on its performance
- Animation:** A kind of presentation technique for creating illusion of motion or of spatial extent by displaying sequences of static images slightly differing from each other
- Visualization:** To make something visible, displaying

## Some Linguistics - II

<b>Building:</b>	„The product” „The process”	– as an object – as activity
<b>Construction:</b>	„The structure” „The process”	– as system of joint elements – as activity
<b>Building Management (BM):</b>	Maintaining/operating a house (a facility)	
<b>Facility Management (FM):</b>	Developing/maintaining/operating a facility	
<b>Construction Management (CM):</b>	Managing the building process	
<b>Construction Site Management (CSM):</b>	Managing the building site	
<b>Building Information Modelling (BIM):</b>	Modelling INFORMATION flow	

## Building Information Modelling

**Building Information Modeling (BIM)** is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition.

/US National Building Information Model Standard Project Committee/

**Key feature:** Data interface - **IFC** (Industry Foundation Classes)

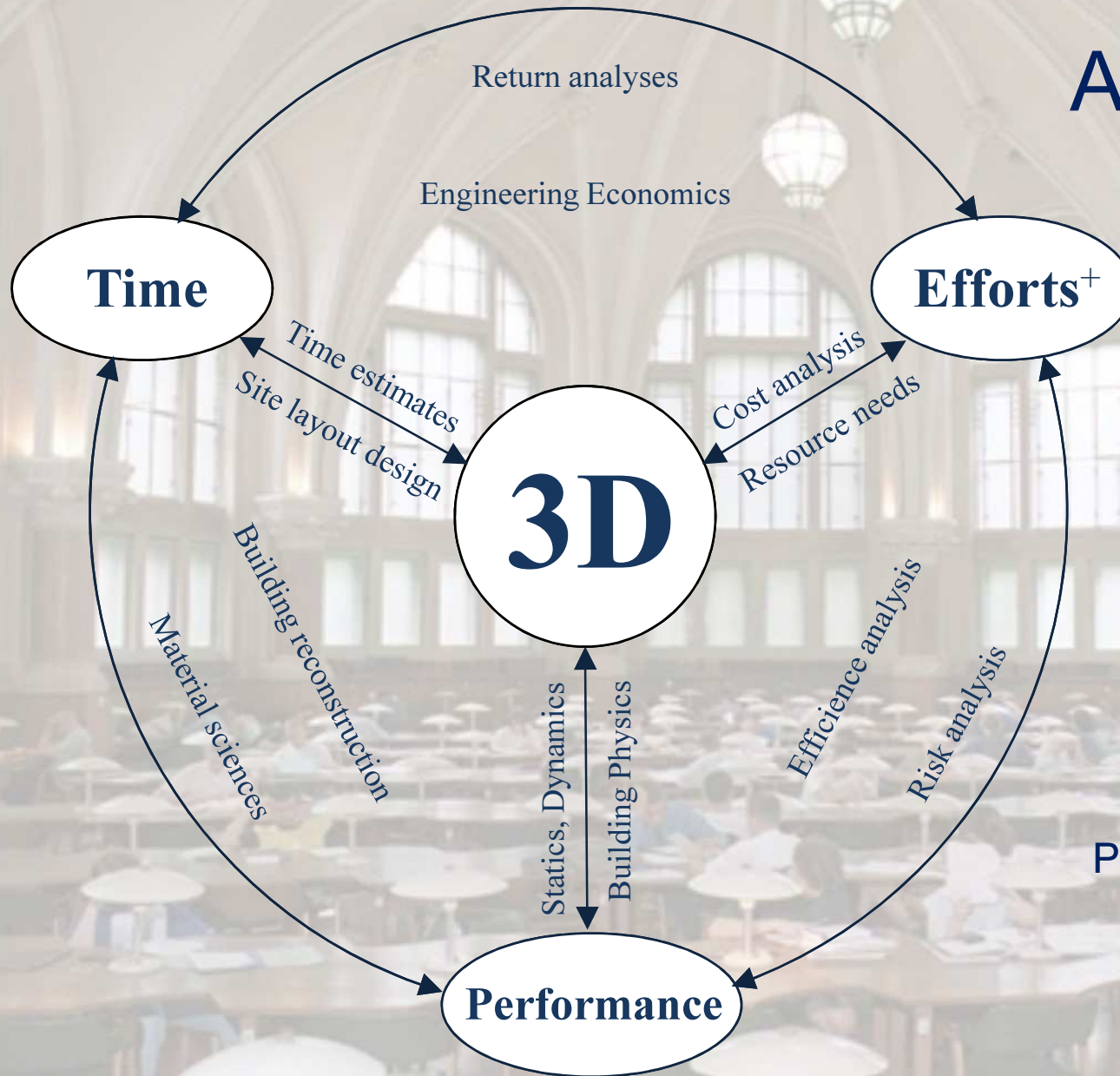
**Original terminology by:** Phil Bernstein, FAIA architect, Jerry Laiserin, Graphisoft „Virtual Building” Graphisoft ArchiCad, 1987

**Creating a responsibility (job):** BIM manager , Virtual Design to Contract (VDC) manager, VDC project manager (VDCPM)

4D BIM, 5D BIM, 6D BIM ..... TEKLA, Building Smart .... JBIM

# A „6D<sup>+</sup>” space

and typical fields of analyses



3D = Building or object itself

Efforts<sup>+</sup> = Resources, inputs

Performance = Effects, outputs

Time = Schedule, era, age



# Construction site 3D model

(Google Sketchup 3D Warehouse)



## Fields of Utilization, Expectations

- Training and Education ( *developing comprehensive thinking* ) ☺
- Design and Architecture ( *extend to completion and temporary conditions* )
- Controlling and Monitoring ( *planned versus actual conditions, deviation* )
- Risk Analyses ( *anticipating potential conflicts, hazards and dangers* )
- Optimization ( *new aspects of optimization, complex production models* )
- Quality and Change Management ( *virtual construction, „what if” analyses* )
- Health and Safety Management ( *health and safety coordination, design* )
- Conflict Management ( *preventing and/or resolving conflicts* )
- Site Management ( *irregular technical solutions, extreme conditions* )

## Research Fields and Targets

Modelling equipment, tools, products and technologies, forming a free database of 3D construction models 😊

Developing standards for modelling and for elaboration of details for to develop effective computer models (considering processing time versus storage capacity)

Analyzing and searching algorithms for modelling temporary conditions and behaviour of structures and equipment for to develop interactive construction modelling systems

Searching data structures to find communication interfaces between software systems

Testing potential utilization of 6D+ models at real construction projects 😊

Testing and quantifying benefits and synergy of multidimensional models





## 6D<sup>+</sup> representation of progression (on a 2D display)

Details from Diploma work of

Viktor Horváth

Faculty of Civil Engineering

BUTE DCT&M, 2010

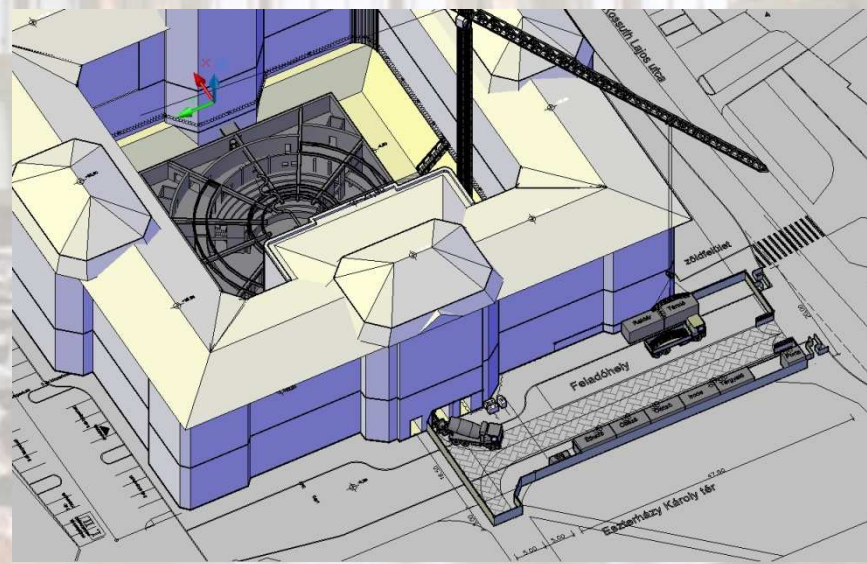
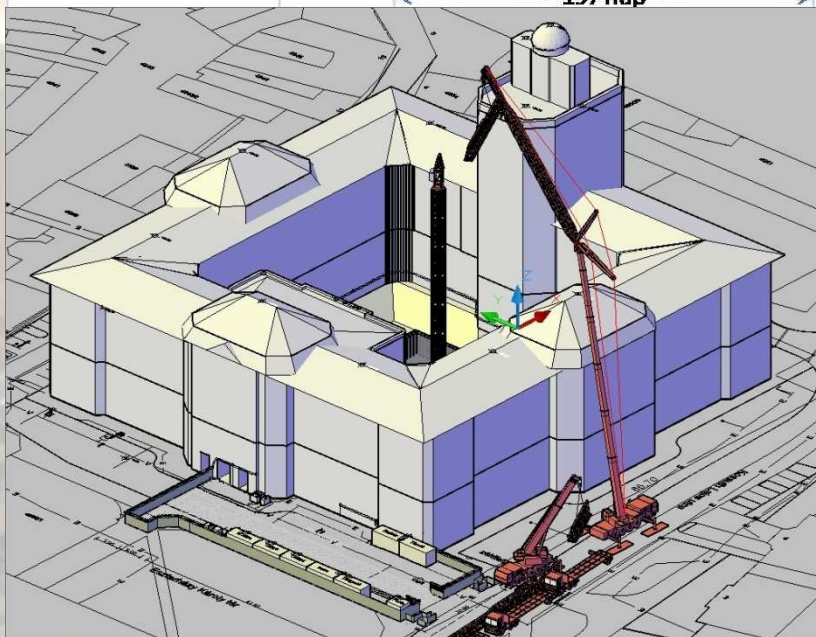
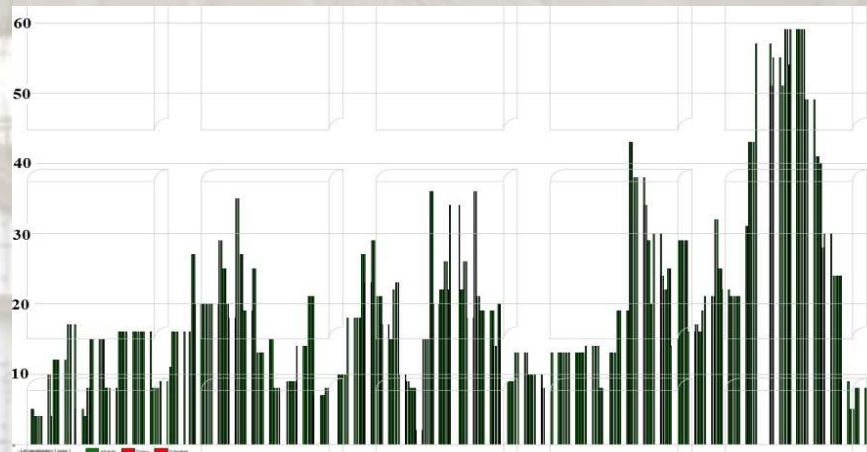
(Original drawing by Graphisoft Archicad)



## „Simulating” a 5D+ model

Felvonulás, Előkészítés	5nap	
Munkagödör határolás	6nap	
Földkitermelés	5nap	
Szerkezetépítés		
Alaplemez	26nap	
Alsó szint	56nap	
Felső szint	74nap	
Belső munkálatok	48nap	
Udvar	37nap	
Elvonulás	3nap	

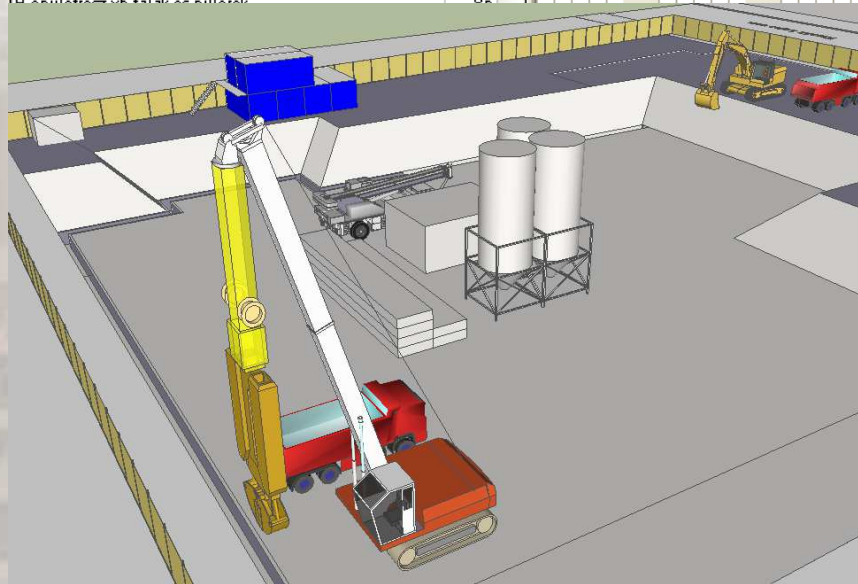
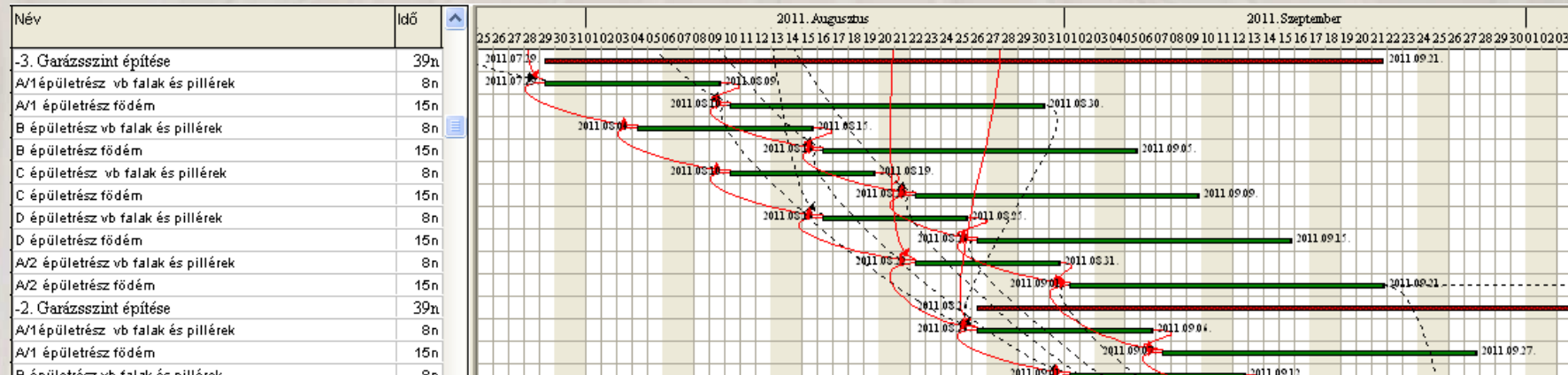
197 nap



Details from Diploma work of Tibor Bajkai, Faculty of Civil Engineering, BUTE DCT&M, 2010

(Original drawing by AutoDesk AutoCad)

# „Simulating” a 4D model



Details from Diploma work of Beatrix Strauss, Faculty of Civil Engineering, BUTE DCT&M, 2011

(Original drawing by Google Sketchup, equipment downloaded from Google Sketschup 3D Warehouse)

## **Resistance, uninterest, misbelief**

Necessitating extra staff with extra expences ( who would pay for it )

Associating increased overhead costs ( price rising effect, hard competition )

Would generate permanent work load ( necessary actualizations )

Adverse parties ( either client or contractor, disadvantegous parley position )

Computer Industry ( both hardware and software ) has its own interests

Frequently changing or missing plans and decisions ( enormous bulk of data )

What a new information could be gained ( experiences would be devaluated )

**Multi-dimensional models must never be the aim but tools of problem solving**