

Produkt og Procesmodeller (PPM) i byggeriet.  
Product and Process models in Construction.

## 7. BIM Future

Cand. Scient. Bygningsinformatik.  
Semester 1, 2010.

## CONTENT

The development of BIM up to 2007

Current trends

Vision 2012

Drivers of change and BIM impacts up to 2020

Our emphasis in red.

## From the BIM Handbook



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### 8.1 Introduction

Throughout this book, we have intentionally and consistently used the term BIM to describe an activity (*building information modeling*), rather than an object (as in *building information model*). This reflects our belief that BIM is not a thing or type of software but human activity that ultimately involves broad process changes in construction.

## From the BIM Handbook



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### 8.3 Current Trends

#### BIM Process and Technology Trends

- Owners are demanding BIM and changing contract terms to enable its use.
- New skills and roles are developing.
- In a recent survey, 25% of US architectural firms reported using BIM tools for 'intelligent modeling'
- Successful implementations in construction are leading to corporate-wide uptake by pioneering actors.
- The benefits of running an integrated practice are broadly recognized.
- Construction contractors are implementing sophisticated ERP systems.
- Standards efforts are gathering steam.
- Green building is increasingly demanded by clients.
- BIM and 4D CAD tools are becoming common tools in construction site offices.

#### Technology Trends

- Automated checking for code conformance and constructability using building information models is becoming available.
- Major BIM tools are adding functionality and integrating capabilities of other products, providing even richer platforms for use.
- Vendors are increasingly expanding their scope and providing discipline-specific BIM tools.
- Building product manufacturers are beginning to provide 3D catalogs.
- BIM tools with construction management functions are becoming increasingly available.
- BIM is encouraging the globalization of prefabrication for increasingly complex building sub-assemblies

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### 8.4 Vision 2012

#### 8.4.1 Impact on the Design Professions: Shifting Services and Roles.

This period will see the transition of BIM from early adoption technology to accepted mainstream practice; and the transition will impact all building professionals and the participants. But the **greatest impact** will be on the **individual practitioner** who will need to learn to work, design, engineer; or build with BIM.

....  
 Design firms (with a push from clients) will begin to broaden their scope of **services** to include detailed energy and environmental analyses, operations analyses within facilities (such as healthcare), and value engineering throughout the design process, based on BIM-driven cost estimates; and these are just a few of the possibilities.

....  
 Architecture and engineering firms will face a workplace with **changing roles** and **activities**. Junior architects will be expected to demonstrate **proficiency with BIM** as a condition of employment, in the same way CADD proficiency has been required since the 1990s. Some **downsizing** will occur among staff members dedicated to document producing activities. New roles will emerge with titles such as **building modeler** or **model manager**, requiring design and technical know-how. The model manager will work with the project team to update the building model, guarantee origin, orientation, naming and format consistency, and to coordinate the exchange of model components with internal design groups and external designers and engineers.

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### 8.4 Vision 2012 Cont!

Increased opportunities will exist to provide **freelance** technical technical or very **specialised design services** in response to ever-growing complexity of buildig systems and materials.

...

**Consortia** of specialist design firms are able to **collaborate** around a **common building model**, often achieving outstanding team results in shorter times than was ever possible with drawings.

...

In some ways, we may see an acceleration of the trend described in Section 5.3 and a **similar evolution** of design services that we **saw** over the last **forty years** in **contracting services**. The contracting design forms will do a reduced amount of work but will **coordinate** and **integrate** the work of multiple specialist advisors. These trend are evident today and will grow incrementally to respond to increasing complexity of design services.

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### 8.4 Vision 2012 Cont!

#### 8.4.2 Impact On Owners: Better Options, Better Reliability (p. 294)

In the early project phases, owners can expect to encounter more **3D visualizations** and **conceptual** building information models with programmatic analysis. (see Chapter 5 for a discussion of these tools).

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Since the actual occupants and users are central to assessing and evaluating design, tools that work **integrally** with a BIM system to provide intelligent **configuration capabilities** will become widespread.

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If designers are **not disciplined**, they can develop fairly detailed designs **rapidly** and create building models that **appear** convincing and appealing. If the vital stage of **conceptual design** is **short-circuited**, **premature** production level modeling can lead to a lot of **rework** later in the process.

We will see the first cases of **building information models** integrated with **building monitoring systems** for comparing and analyzing predicted and observable building performance data, which will provide owners and operators with better tools for managing their building operations.

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### 8.4 Vision 2012 Cont!

#### 8.4.3 Impact on Construction Companies: BIM at the Construction Site

This period should see increasingly smoother transitions from design models to **construction models**. Software **wizards** - using parametric templates of work packages with embedded construction methods - will be applied, to **rapidly compile a construction model** from a design model. Ideas like the *recipes* in Constructor 2007 software (Vico Software 2007) are an early indication of what can be expected.

....  
The role of the **building modeler** will be an issue among **contractors** and **fabricators**, due to mixed roles of senior staff and the complexity of some detailing systems. As third party engineering service **detailers** for precast, reinforced concrete, and other systems gain proficiency in BIM, they will become the **de facto building modelers** in the same way as in the steel fabrication business.

Also, BIM sets the scene for the use of automated surveying and other data collection technologies. For example, **laser scanning** can produce *point cloud surveys* of existing physical geometry.



# 3D laser scanning for quality assurance

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**Scanningsplan: Skjernvej 4A**

Dato: 21. april 2009

Scanningsobjekt: Østlige gavl inder og yderside

Antal scanninger: 3 scanninger, 1 indenfor og 2 udenfor

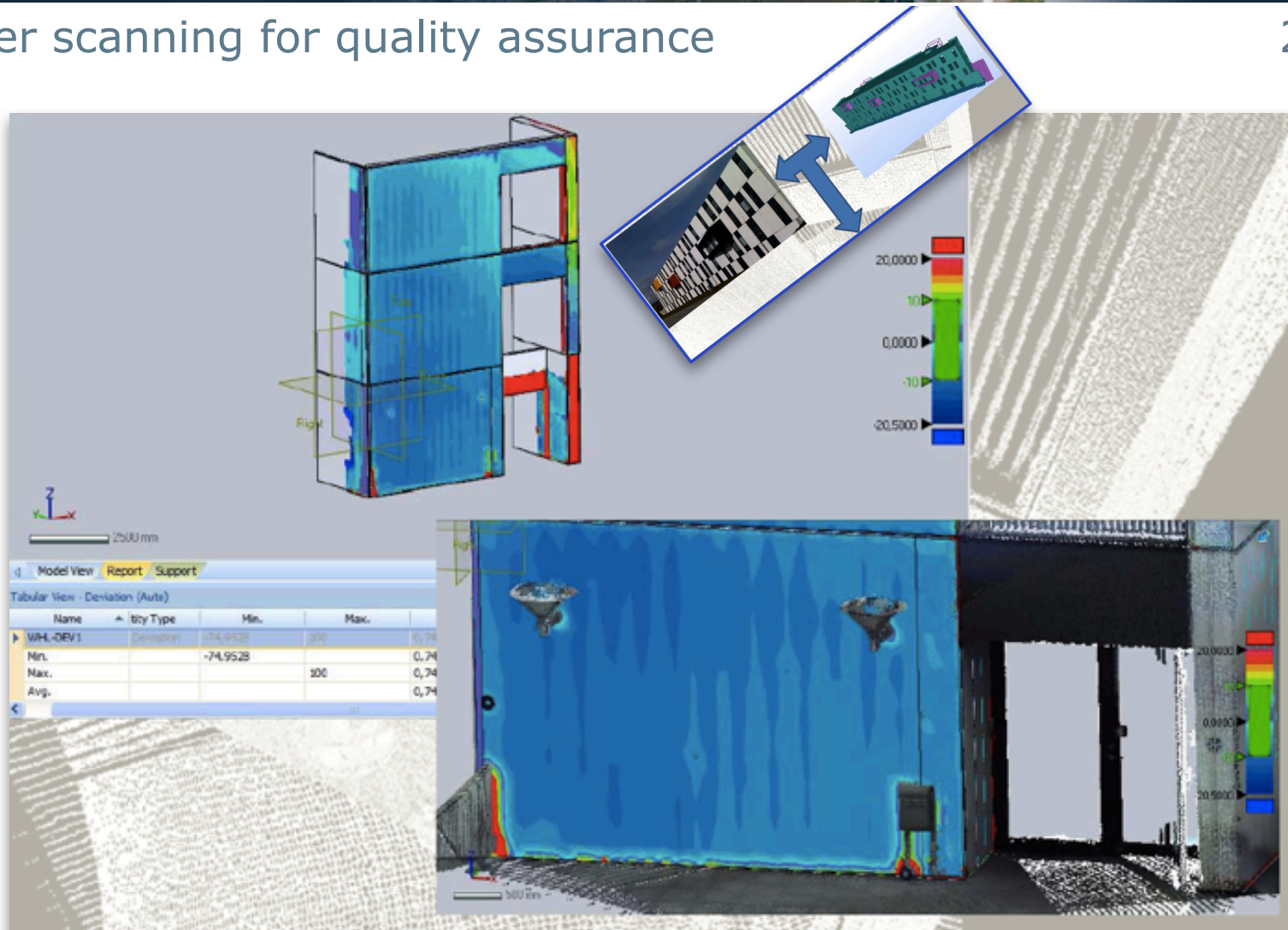
Scanningsopstilling:

Scanning	Afstand til objekt [m]	Opløsning [mm]	Opløsningsvinkel [°]	Antal targets
1	5	10	0,100	4
2	10	10	0,045	8
3	15	10	0,035	4

Vestergaard JM, Rasmussen SM (2009) "Udnyttelse af 3D-scanning til kvalitetssikring i byggeriet". Afgangsprojekt, civilingeniøruddannelsen med speciale i byggeledelse. Juni 2009. (172 pages).  
[http://it.civil.aau.dk/it/education/thesis/2009\\_vestergaard\\_rasmussen\\_3D\\_scanning.pdf](http://it.civil.aau.dk/it/education/thesis/2009_vestergaard_rasmussen_3D_scanning.pdf)

# 3D laser scanning for quality assurance

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### **8.4 Vision 2012 Cont!**

#### **8.4.4 Impact on Construction Contracting: Closer Collaborations Among Designers and Contractors**

#### **8.4.5 Impact on Construction Education: Integrated Education (p.300)**

#### **8.4.6 Impact on Statutory Authorities: Planting the Seeds of Online Access and Review**

#### **8.4.7 Impact on Project Documentation: On-Demand Drawings (p.301)**

..... signing a digital model ..... application no longer support model access ..... Both of these issues have been resolved in other business fields,... (p.302)

## From the BIM Handbook



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### 8.4 Vision 2012 Cont!

#### 8.4.8 Impact on BIM Tools: More Integration, More Specialization, More Information

Increased **integration of analysis interfaces** within design modeling software..

... growing **demand for BIM servers** with the potential for managing projects at the *object* level rather than the file level.

**Model viewer software** such as DWF viewers, Tekla's and Bentley's Web viewers, #D PDF, and others are becoming important tools, due to their simplicity.

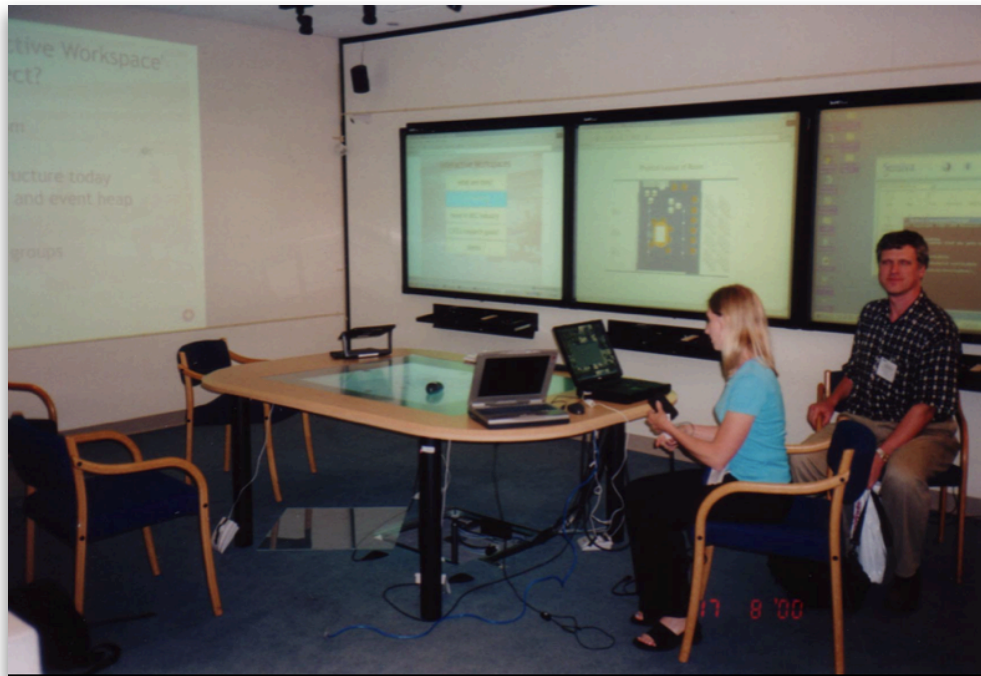
New tools for locating an inserting building products and assembly models, called *building element models* (BEMs) (Arnold 2007), are under rapid development. Two development issues are **semantic searching and compatibility of BEMs to multiple BIM platforms**.

.....  
AEC practitioners should look forward to tools that leverage BIM semantics to organize content in several ways and provide users with the ability to develop **customized semantic searches**. (p.303)

.... information visualization will become central to the overall work process. Multi-display environments or interaction information workspaces (Liston et.al 2000, 2001) will become common in the office and onsite



# iRoom



CIFE , Stanford, 1980



## From the BIM Handbook



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### 8.4 Vision 2012 Cont!

#### 8.4.9 Impact on Research: Models analysis, Simulation, and Work Processes

While academic research has a role to play in defining new concepts and measures of information flow that promote integrity and value, it is likely that trial-and-error efforts by **industry pioneers** - driven by practical imperatives - will be the **primary source** of new BIM workflows.

Unfortunately, in the short term, interoperability tools like the IFCs will **not** support coordination beyond visual inspection and the identification of physical clashes in geometry. Managing **changes across different systems** - involving loads (structural or thermal) or other performance relations - will be an important limiting problem.

## From the BIM Handbook



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### 8.5 Drivers of Change and BIM Impacts up to 2010

#### 8.5.1 Economic, Technological, and Societal Drivers.

The value of building models for **maintenance and operations** is all likely to initiate a snowball effect, where clients demand the use of BIM on their projects. (This is already happening at the GSA) [U.S. General Services Administration, <http://www.gsa.gov/>]

Among the societal and cultural drivers, the demand for **sustainable construction** may be the most significant factor.

# From the BIM Handbook



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## 8.5 Drivers of Change and BIM Impacts up to 2010 Cont!

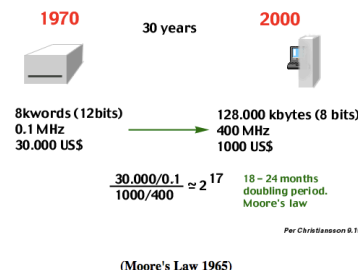
### 8.5.2 Obstacles to change.

... there are numerous obstacles to progress that BIM faces. These include: technical barriers, legal and liability issues, regulation, inappropriate business models, resistance to changes in employment patterns, and the need to educate large number of professionals.

BIM tools and IFC formats do not yet adequately address support for the management and tracking of changes to models; nor are contract terms sufficiently developed to handle these collective responsibilities.

The major payoffs will go to contractors and owners. A mechanism does not yet exist for rewarding designers that provide rich information models. Nonetheless, BIM developers cater specifically to design professions.

While Moore's Law in practice suggests that hardware will not be a barrier, the development of standards has been slower than expected; and the lack of effective interoperability continues to be a serious impediment to collaborative design.



(Moore's Law 1965)



## From the BIM Handbook



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### 8.5 Drivers of Change and BIM Impacts up to 2010 Cont!

#### 8.5.3 Development of BIM Tools.

..... improved import and export capabilities ..... each BIM authoring tool will expand its repertoire of **applications** ..... owners are able to **virtually 'build'** their dream buildings or apartments ..... movement away from desktop applications **to internet-based interactions** that employ BIM and integrate Web-based content, from services to building element models and analysis tools.

#### 8.5.4 Role of Drawings

If and when digital display become sufficiently cheap and flexible to suit conditions of work onsite, paper printouts of drawings are likely to **disappear**.

In the design domain, **visualization formats** will replace drawing types, with different formats developed for each of the parties involved: owners, consultants, bankers, and investors, and potential occupants.

## From the BIM Handbook



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### 8.5 Drivers of Change and BIM Impacts up to 2010 Cont!

#### 8.5.5 Design Professions: Providing New Services

.... provide the integration environment needed for modern practice. This includes: **multi-screen** conference rooms, supporting **parallel** projection of physical design, schedules, procurement tracking, and other aspects of planning.

Better coordination tools will be available for maintaining **consistency** across federated model sets, but the role of *model manager* will be as essential as any other professional service. Models will support a growing number of **analyses** run on **derived views** for energy, structures, acoustics, lighting, environmental impacts, and fabrication.

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### 8.5 Drivers of Change and BIM Impacts up to 2010 Cont!

#### 8.5.6 Integrated Design/Build services and Agreements

Another possible area of innovation is a more **explicit definition of workflows** for supporting project **development** and **completion**. An option provided by the workflow exchanges defined in the **National BIM Standard** is that they will be referred to in contracts - describing which information flows will be used, at what stages of the project, and who they will be exchanged between - based on working process agreed to during contract negotiation.

#### 8.5.7 Building Product Manufacturers: Intelligent Product Specs

The basic challenges for realizing **high levels of semantic search** will have been addressed, and new capabilities that allow for searches based on color, textures, and shape will become available.

#### 8.5.8 Construction Regulation: Automated Code-Checking

#### 8.5.9 Lean Construction and BIM

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### 8.5 Drivers of Change and BIM Impacts up to 2010 Cont!

#### 8.5.10 Construction Companies: Information Integration

The next step for construction will be the **integration** of specialized enterprise resource planning (**ERP**) software with construction building information models.

Once building information models integrated with ERP systems are commonplace, the use of **automated data collection technologies**, such as LADAR (laser scanning), GPS positioning, and RFID tags, will also become common, both for construction and work monitoring and logistics.

Globalization trends along with BIM-enabled integration of highly-developed design and commercial information - facilitating prefabrication and pre-assembly - will cause the building industry to be closer aligned with **other manufacturing industries**, with a minimum of activity onsite. This does **not** imply mass production but lean production of highly customized products.

## From the BIM Handbook



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### 8.5 Drivers of Change and BIM Impacts up to 2010 Cont!

#### 8.5.11 BIM Skills and Employment: New Roles

Drafting is the laborious act of expressing ideas on two-dimensional media, whether paper or screen; modeling is akin to actually building the building. Therefore it makes sense for skilled architects and engineers to **model directly**, rather than instruct others to do it for them only as a matter of record.

BIM appears fairly intuitive to /undergraduate civil engineering/ students, and it more closely resembles their perception of the world. If **undergraduate** engineering and architectural schools begin teaching BIM skills **within the first years of professional training**, it will only be a matter of time before **design professionals** are **able** to create and manage **their own BIM models**.

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