



# Building Information Modelling

An overview of BIM from the Dutch perspective

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Director Built Environment at TNO





**The current status of technical support for Integrated Design Solutions (IDS) is not strong or ubiquitous. Only limited forms of integration are offered through the BIM-based approaches offered by major CAD vendors. These approaches are typically vendor specific and tie together a small number of design tools (in comparison to the thousands that are available in the marketplace). The set of software tools available through any one CAD system are unlikely to be the set required by any particular grouping of professionals involved in a construction project, creating an immediate barrier to the IDS goal.**



**The Real Estate & Construction Cluster is a highly fragmented industry where most projects are based on low-bid contracts. This leads usually to ad-hoc project teams where most participants focus on minimizing costs and are not interested in developing new collaboration methods or adding value to other participants. However, all project participants have to collaborate and share information. This situation creates a significant challenge to companies who want to be in the leading edge.**



## Technologies: Recommended Actions from CIB IDS 2009 Workshop

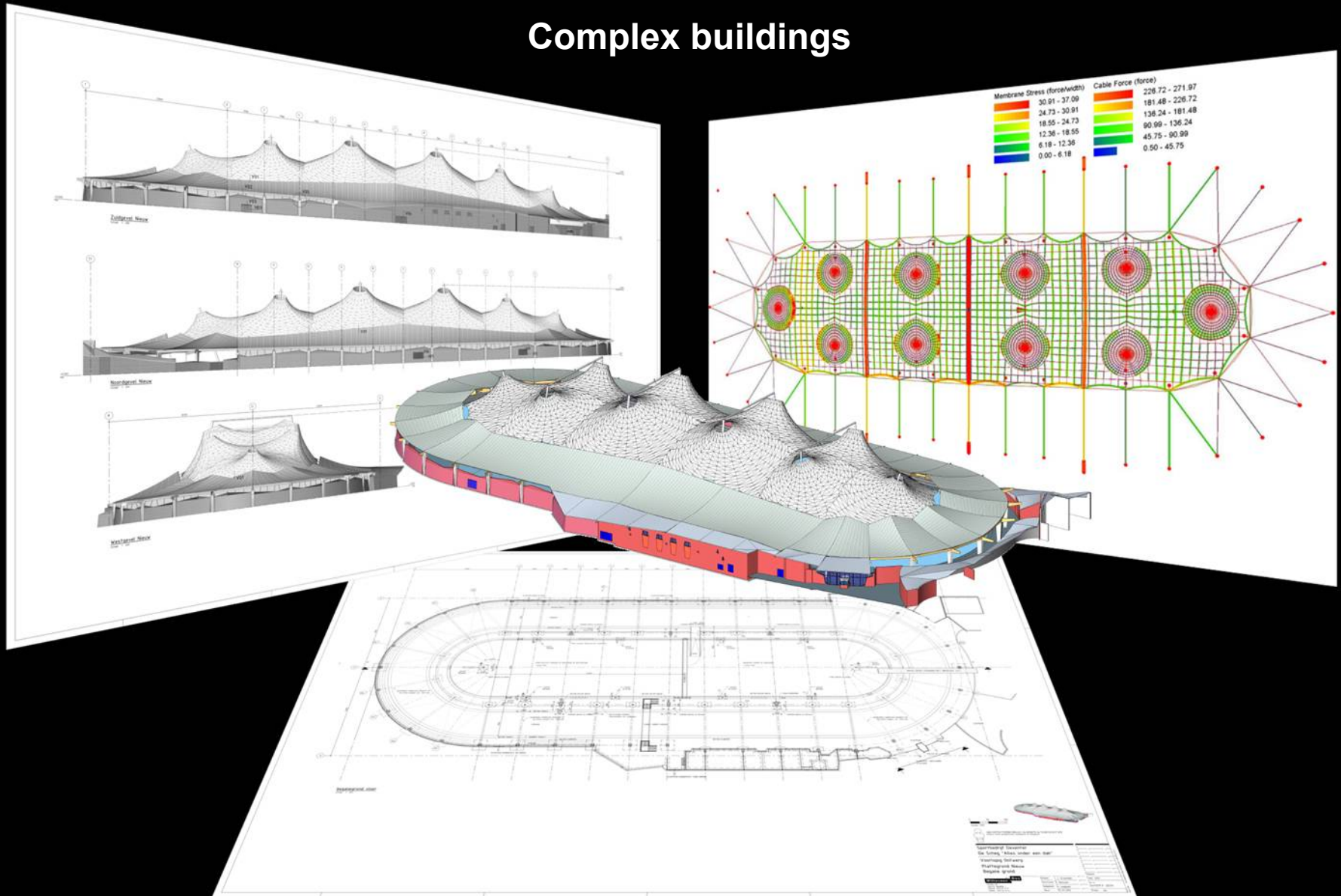
Short Term	Medium Term	Long Term
<ul style="list-style-type: none"><li>•Develop toolkits to allow for experimentation</li><li>•Identify appropriate standards</li><li>•Develop technology and demand for it in parallel</li><li>•Simulation and experimentation</li><li>•Product model</li></ul>	<ul style="list-style-type: none"><li>•Develop modular tools</li><li>•Share standards</li><li>•Standard data models and interfaces</li><li>•Solutions for flexible and adaptable architecture</li><li>•Shared model</li></ul>	<ul style="list-style-type: none"><li>•Develop a holistic framework supporting flexible processes and modular tools (plug &amp; do)</li><li>•Development of technology that interacts with the user</li><li>•Develop interfaces to standards</li><li>•Information models for the Build Environment will support the full integrated decision making over the full lifecycle</li><li>•Open BIM</li></ul>

**Possible Barriers:** personal interests of different vendors, too many standards, too much focus on technology and not construction, short term business relationships, licensing conditions, cost and time of developments, acceptance of open source, legacy solutions

**Required Enablers:** critical mass, demanding client, regulation, structuring and categorising already accumulated needs into rules and functions, collaboration between different stakeholders, convergence of standards, interfaces to standards, experimentalists



# Complex buildings



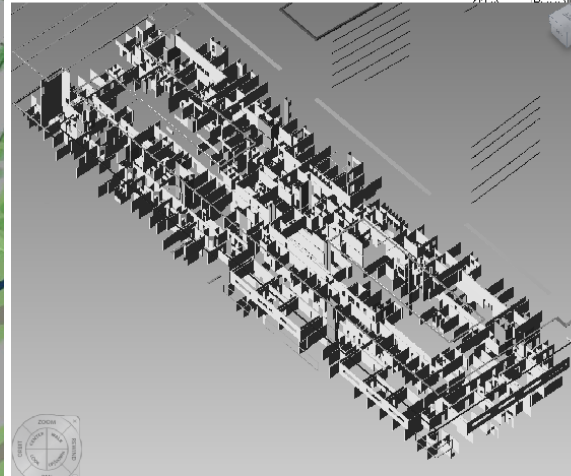




# “Big” Buildings

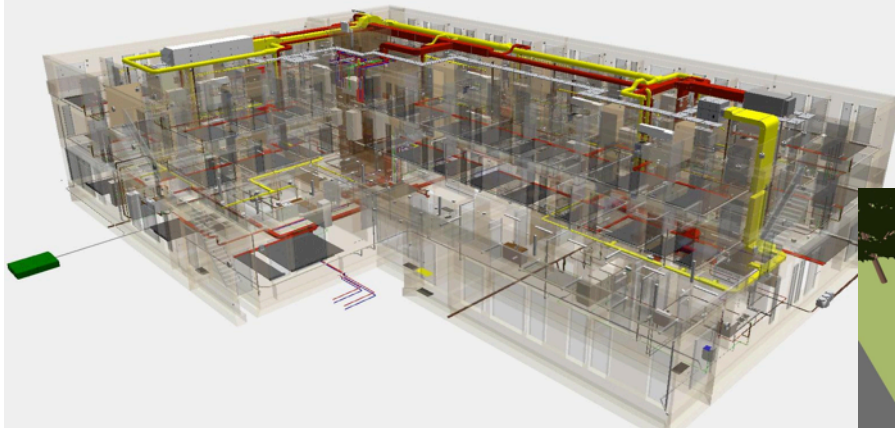
(Meander Medical Centre Amersfoort)

## Bill of Materials

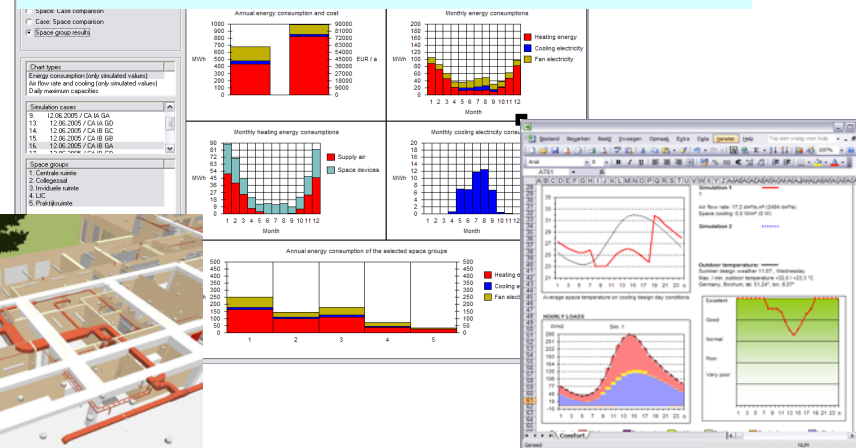


Classificatie v-22 HF Binnenside der Aangeb v C Fari v ard Type	Area	Ccount
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_200mm	56 41	4
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_100mm	1771 47	167
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_150mm	271 2	17
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_200mm	231 27	12
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_250mm	1811 71	93
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_300mm	72 75	6
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_350mm	316 03	14
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_400mm	181 75	16
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_450mm	28 66	7
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_500mm	253 68	18
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_550mm	712 62	48
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_600mm	28 81	2
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_650mm	06 86	10
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_700mm	1109 64	117
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_750mm	42 02	4
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_800mm	510 47	31
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_850mm	1056 97	93
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_900mm	99 46	14
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_950mm	71 79	4
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1000mm	2880 54	714
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1050mm	380 62	89
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1100mm	1721 11	171
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1150mm	1236 01	67
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1200mm	306 21	21
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(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1400mm	1	1
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1450mm	613 66	
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1500mm	77 99	?
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1550mm	28 62	1
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1600mm	24 76	18
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1650mm	0 64	1
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1700mm	30 7	31
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1750mm	23 4	18
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1800mm	300 74	31
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1850mm	34 56	1
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1900mm	570 7	
(22 a) Bess c Wall_ s622_26mm-wal-erich_h_1950mm	21 71	92

## Multi disciplinair



## Returning (energy simulation) results into the BIM model





# BIM Definition

A digital description of all aspects of a physical building / construction / infrastructure supportive for the whole lifecycle.

## Three Worlds:

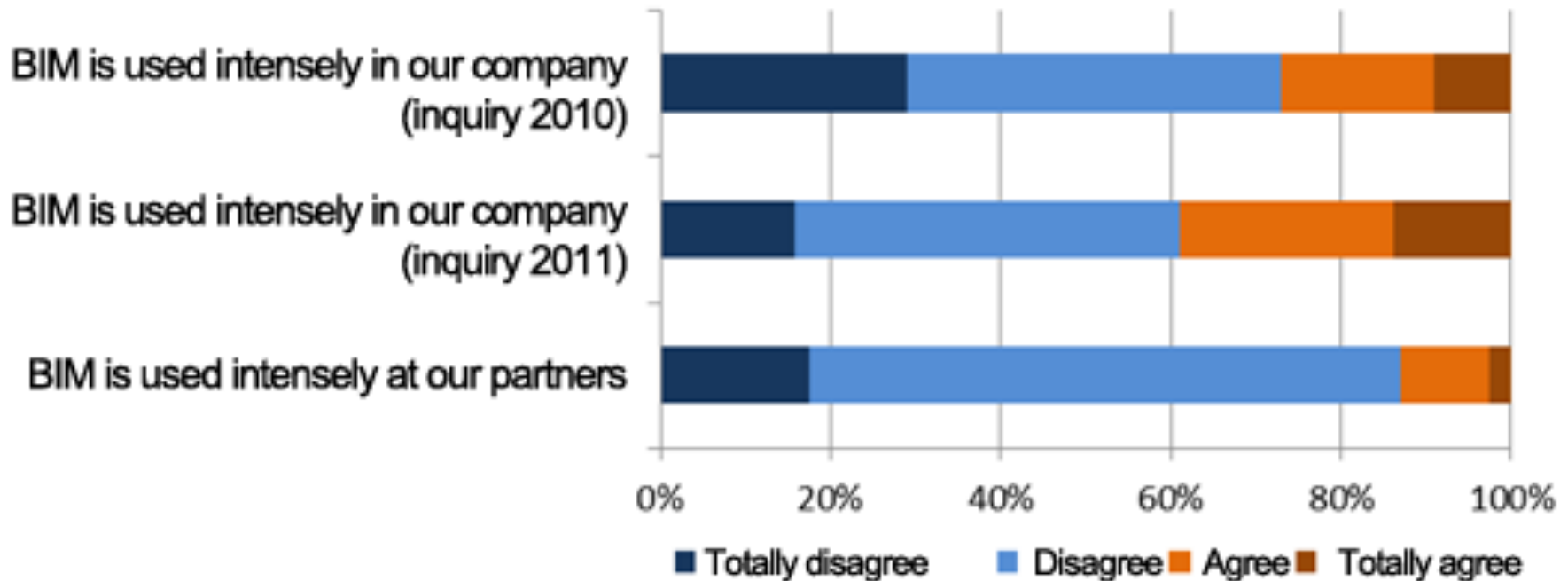
1. **BIM for buildings / constructions**
2. **BIM for (civil) Infrastructures**
3. **BIM for Districts / Sites => “GIS”**

## Five related concepts:

1. **Business Process Modelling (BPM)**
2. **Workflow Management (WfM)**
3. **Systems Engineering (SE)**
  - Modeling and Management of new buildings / constructions
4. **Asset Management (AM)**
  - Modeling and Management of existing buildings / constructions
5. **Geographical Information Systems (GIS)**

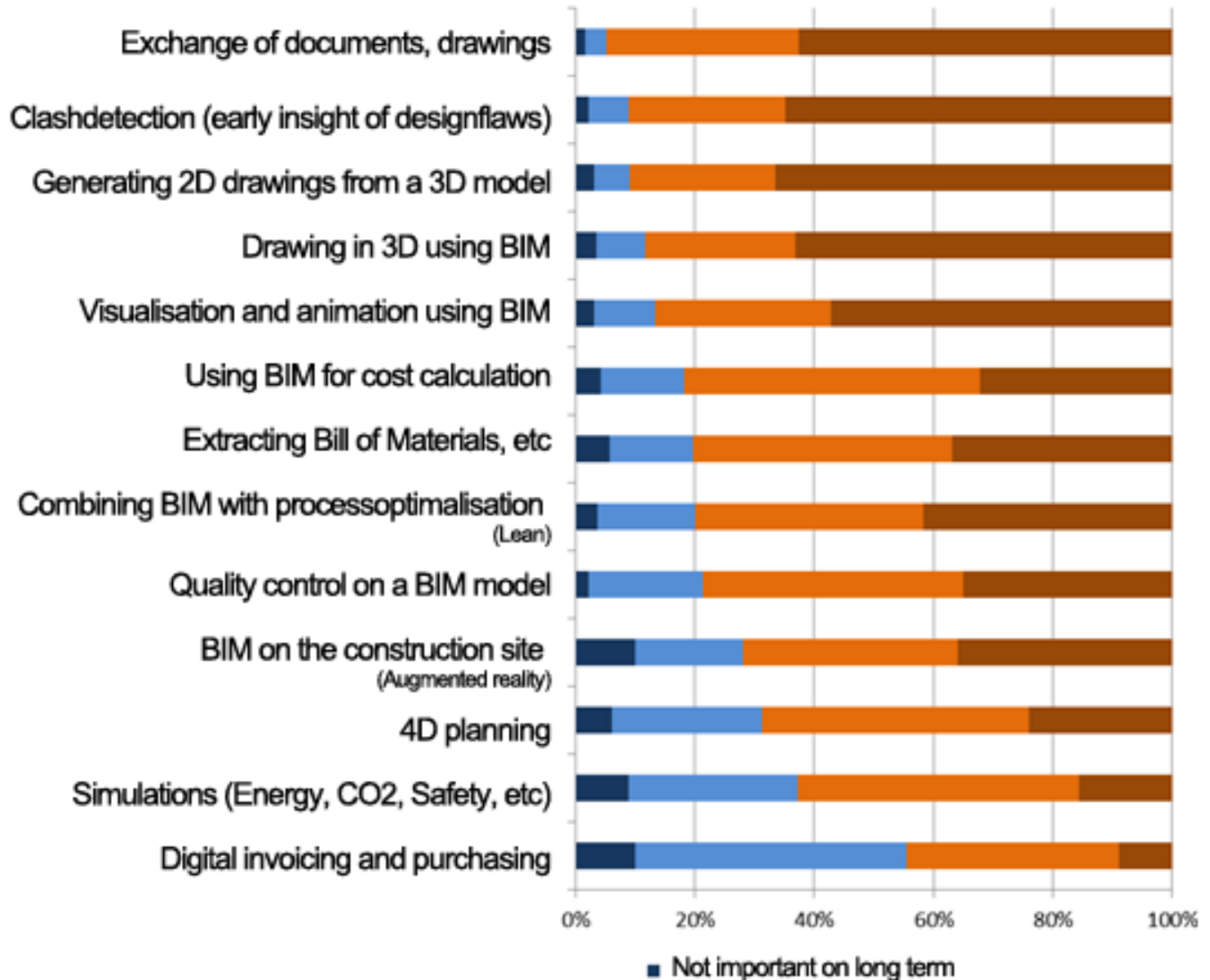


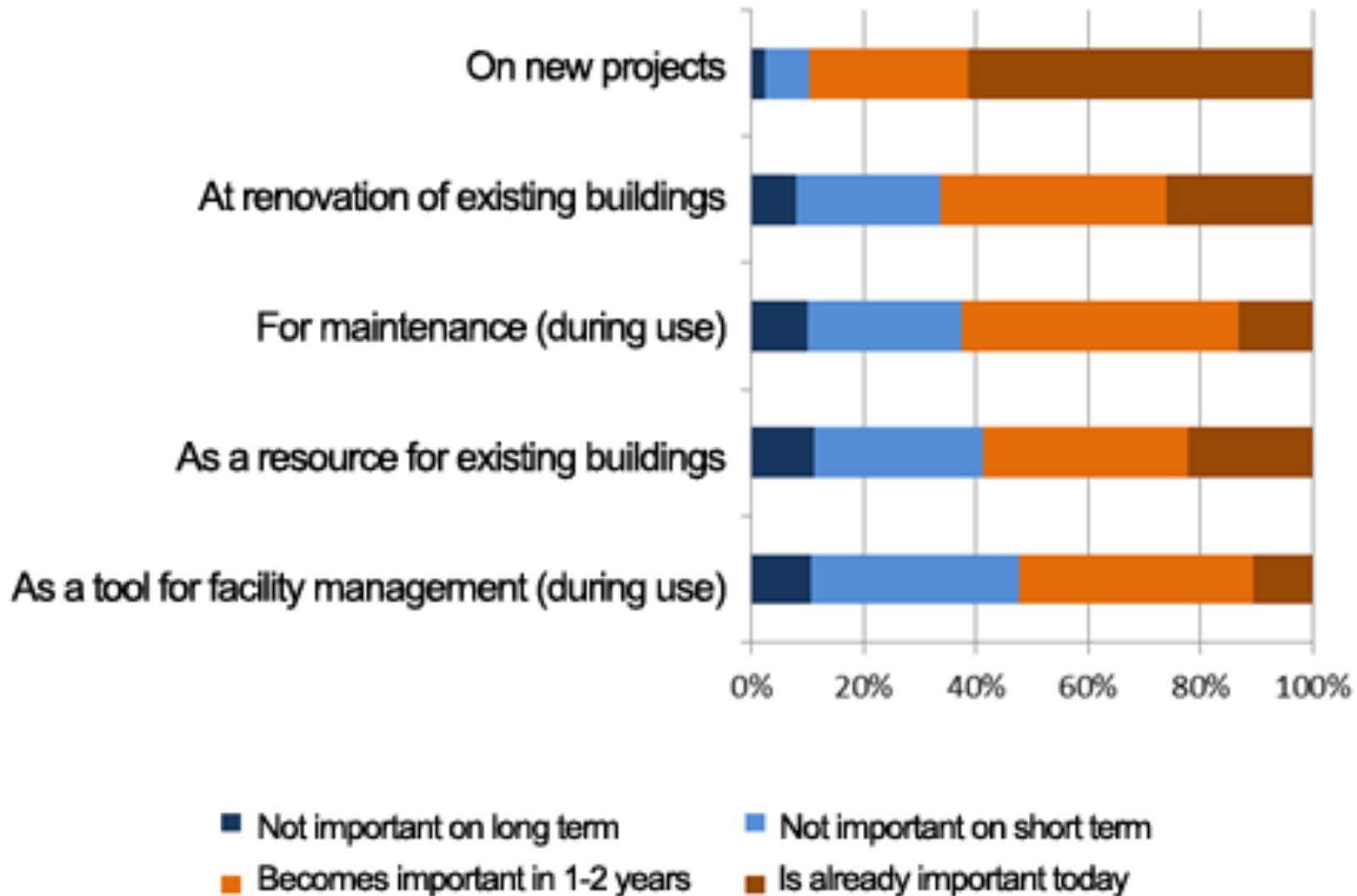
## “State of the BIM”

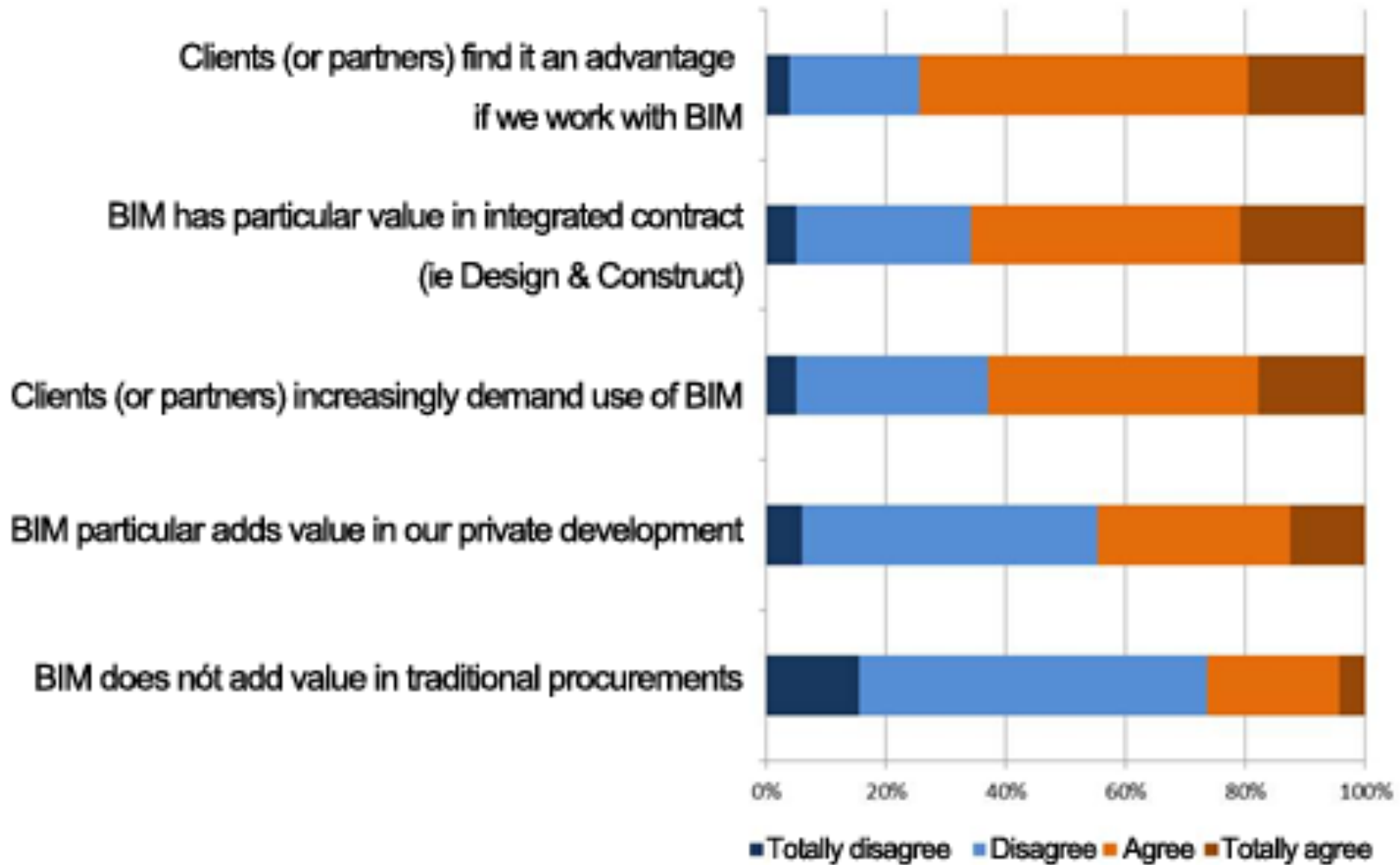


source: Balance&Result BIM inquiry, December 2011

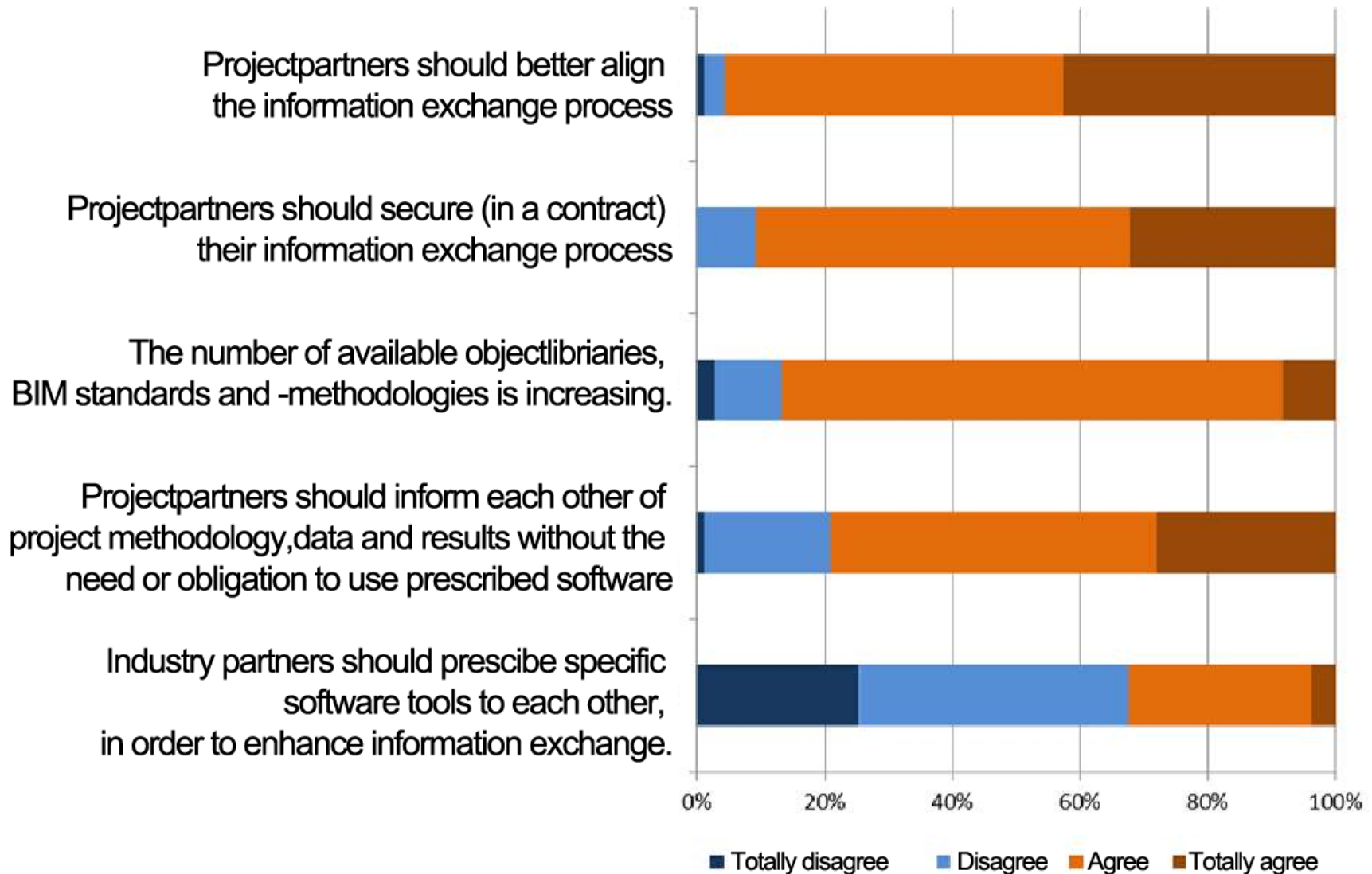














source: Balance&Result BIM inquiry, December 2011





# What is the most popular software among architects in Europe

Top 3 names of CAD software (in % of respondents that use CAD software. N=1099)

					
AutoCAD (50%)	ArchiCAD/ Nemetschek (18%)	AutoCAD (34%)	AutoCAD (64%)	AutoCAD (61%)	AutoCAD (27%)
ArchiCAD (10%)	AutoCAD (16%)	ArchiCAD (22%)	ALLPLAN (8%)	ArchiCAD (10%)	ARKEY (18%)
Vectorworks (7%)	Vectorworks (10%)	ALLPLAN (13%)	Autodesk (2%)	Autodesk (5%)	REVIT (13%)
Do not know (15%)	Do not know (11%)	Do not know (10%)	Do not know (11%)	Do not know (6%)	Do not know (7%)

In 2009 the highest awareness and experience with BIM was observed among Dutch architects. In 2011, the architects in the Netherlands are still the biggest group who works with and knows BIM.

Source: Arch-Vision





Added value



Can BIM improve collaboration?

The added value from BIM for 'Lean' construction

The added value from BIM for total concept suppliers

The added value from BIM for Green Building

The added value from BIM for Facility Management and maintenance

The link between BIM and ERP

Information

Best practices in BIM

Using BIM in my company, beyond buying software

General overview of BIM developments

"How to"

Shifting roles and responsibilities caused by using BIM

New roles and functions caused by using BIM

Business models for BIM (agreements on profit gains)

Standards and agreements

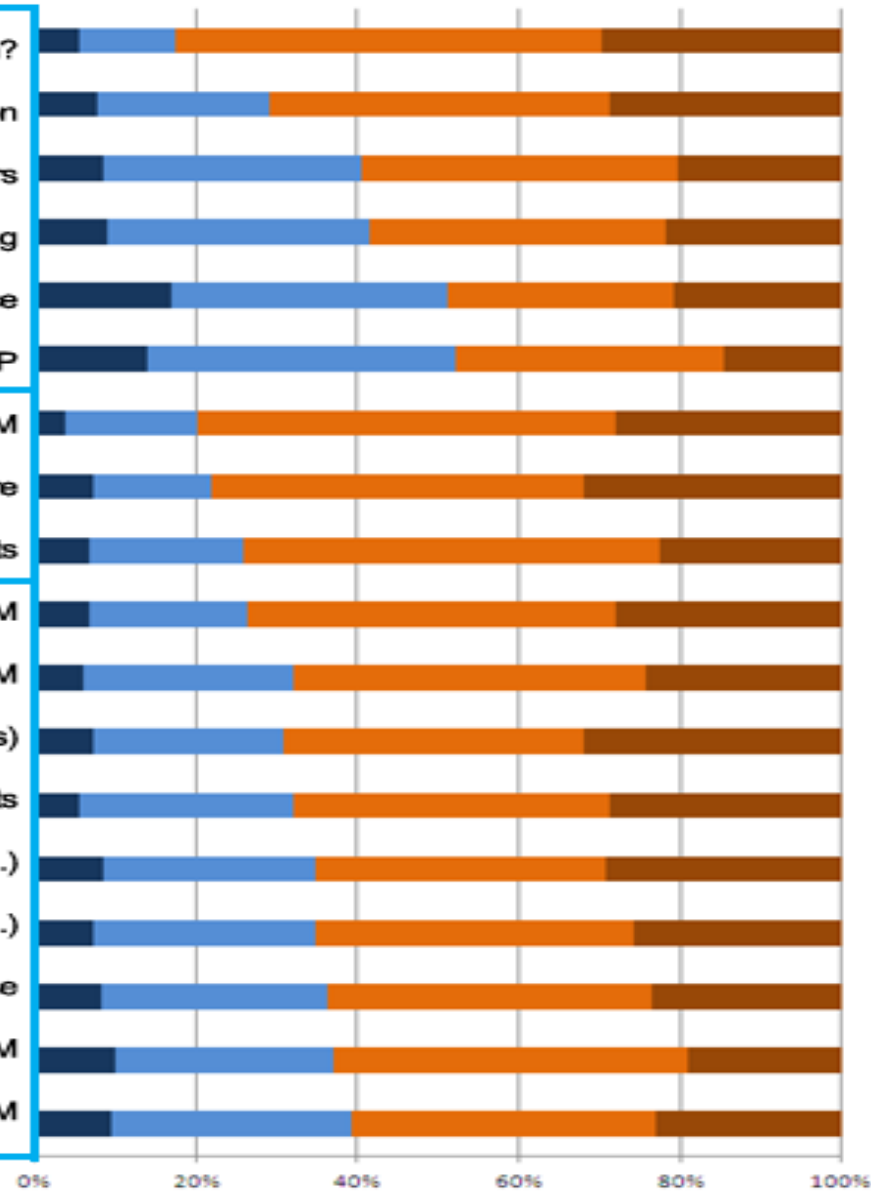
BIM add-ons (energy simulations, code checking, ...)

Legal aspects of BIM (liability, IP, ...)

Model contracts for BIM use

Start a project using BIM

Integrated Project Delivery (IPD) with BIM



Is not appealing at all

Is not appealing

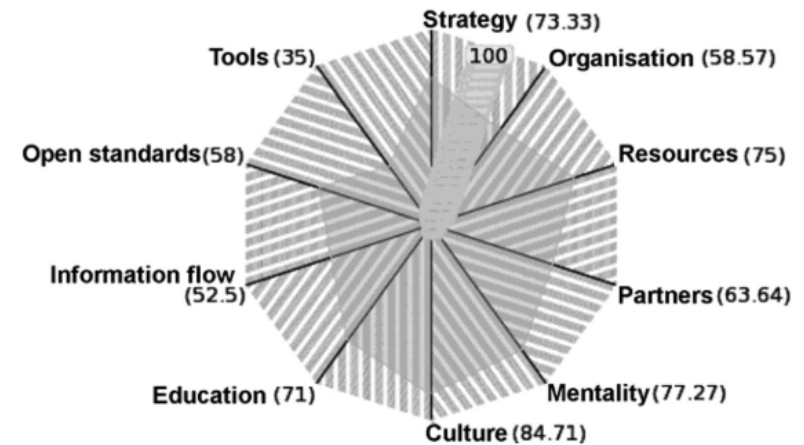
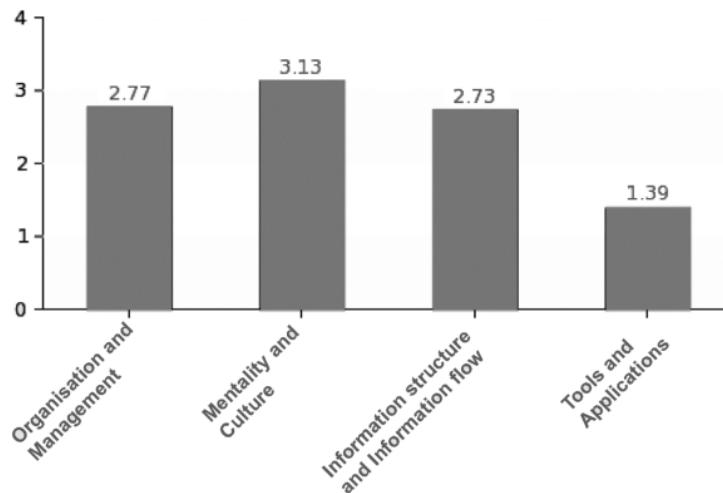
Is somewhat appealing

Is very appealing



## BIM Quickscan

- › 45 Questions about different aspects of BIM
- › Results on: 4 chapters, 7 aspects



- › Goal: show where BIM improvements are possible
- › TNO Goal: Benchmark for BIM level in the Netherlands
- › Certified consultant

### Some first results:

- MEP engineers & construction engineers are frontiers
- Strong focus on strategic issues and process/workflow
- Lots of potential in application and tools



## HoeSlimIsUwBIM?

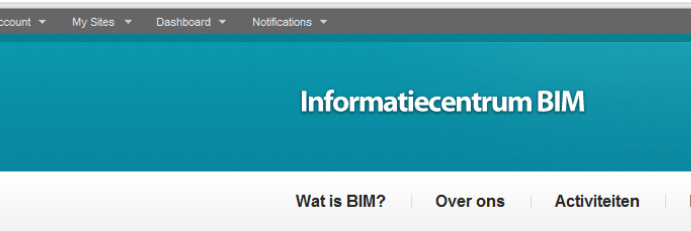
- › => HowSmartIsYourBIM?
- › BIM Model of the year - Yearly contest
- › Goal: Showing the market what is already possible today!  
(and encouraging them into action)
- › Teams (BIG BIM!) send in BIM models + process description
- › Jury (3 or 4 members) decide winner
- › Jury uses Quickscan score
- › Might be an international contest in 2012 (!)



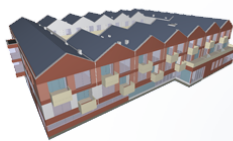


# National Information centre BIM

- Focus on knowledge transfer (openBIM, IFC)
- Publications, events and projects on specific subject
- Initiating half-year projects on specific issues, together with SMEs
- Aggregation of these project leads to “National BIM guidelines”



## Welkom bij het Informatiecentrum BIM



Het informatiecentrum BIM is een initiatief van de brancheorganisaties Bouwend Nederland, BNA, NLingenieurs, UnetoVNI en TNO. Doelstelling van het informatiecentrum BIM is om bestaande kennis van BIM breder te verspreiden in de markt. Dit doen we door mensen samen te brengen, specifieke (kortlopende) projecten te initiëren en door publicatie van nieuws, opinies en een wiki.

[Meer informatie over ons...](#)

### Vind BIM informatie

*Deze site brengt onafhankelijke informatie over BIM.*



### BIM samen

*Vind ander BIMmers om ervaringen te delen.*



### Duik in de details

*Participeer in een project rond een specifiek onderwerp.*



### Over ons

Doelstelling van het informatiecentrum BIM is om bestaande kennis van BIM breder te verspreiden in de markt. Dit doen we door mensen samen te brengen, specifieke (kortlopende) projecten te initiëren en door publicatie van nieuws, opinies en een wiki.

### Leden



Newest | Active | Popular

### Projecten

Newest | Active | Popular





*Biggest building on smallest site in the Netherlands:*

- Max. 185.000 m2 !!
- Est. 7.000 rooms (?)
- delivery East: 2012-Q4
- delivery West: 2017-Q1

Fixed completion dates:  
 2012-Q4    2017-Q1



## Endusers as driving forces

- Layout designers **work with online programming tool dRofus**
- Engineers **checking drawings with requirements**
- **Users can check their inventory** (new and re-use)
- Owner will research effect and value of open BIM process
  - *"Increasing **trust and control**"*
  - *"Irreversible to **irresistable** process"*
- Using a Model server... ..the next step?
- **Small steps where the key to succes!!!**



**Erasmus MC**  
 University Medical Center Rotterdam







Rijksgebouwendienst  
*Ministerie van Binnenlandse Zaken en  
Koninkrijksrelaties*

# Rgd BIM Norm



Rijkswaterstaat  
Ministry of Infrastructure and the  
Environment



## RWS Roadmap towards 20% BIM in 2014

### Targets 2011:

- Consolidate BIM ambitions at board level
- Consolidate BIM ambitions at organisational level
- Create BIM awareness and collaboration mindset
- Initiate BIM-approach and information platform
- Gain experiences with BIM in projects
- Start legal integration (NL + EU)
- Define pilot projects (and start [rws.bimlab.nl](http://rws.bimlab.nl))

### 3 tracks of activities:

1. Consolidate BIM within RWS
2. Develop RWS BIM documentation
3. Upscale BIM, along with the industry





Rijkswaterstaat  
Ministry of Infrastructure and the  
Environment

## Information criteria to BIM

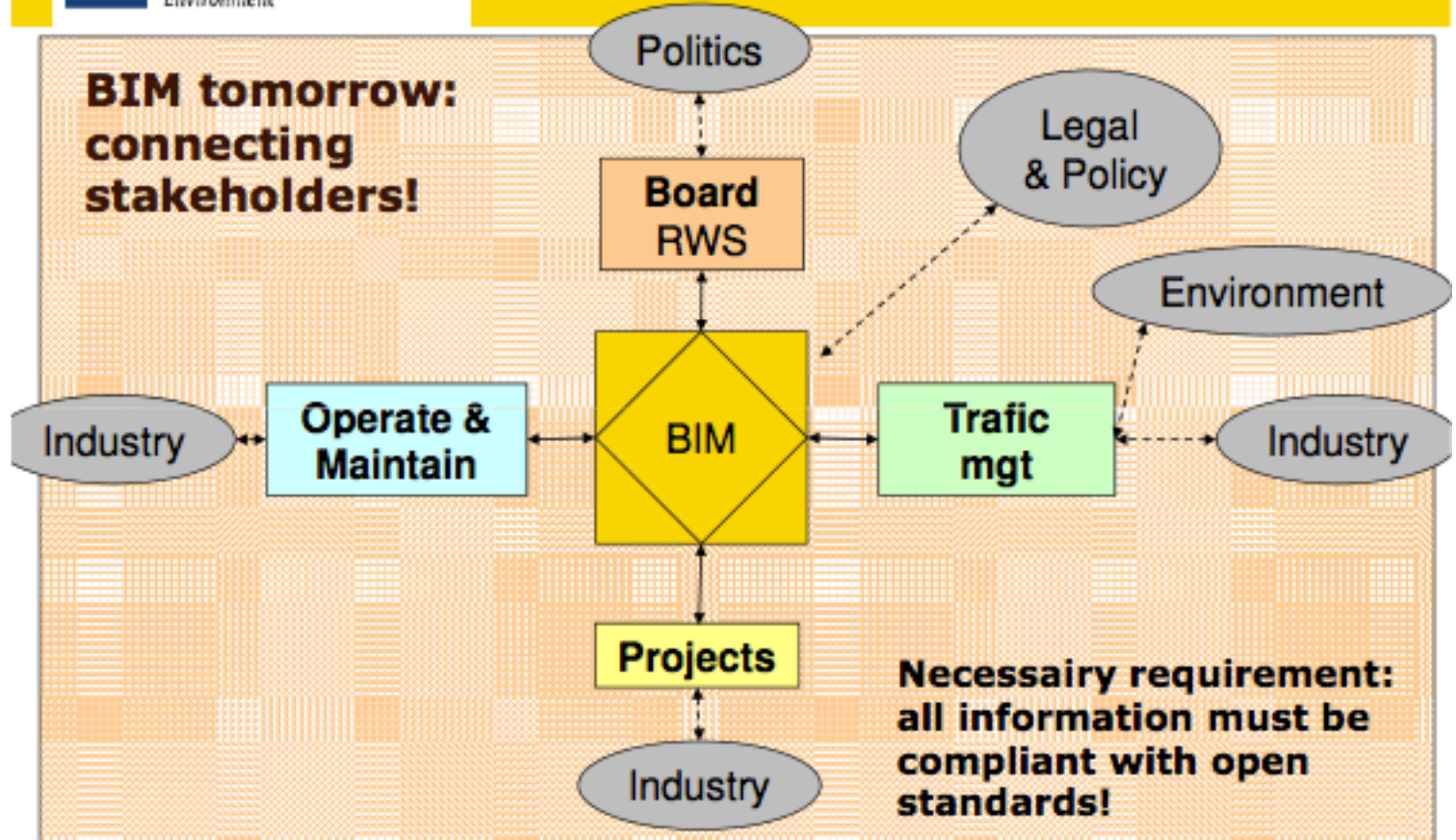


- **Usefull:** relevant, valuable and usefull information for RWS processes and decision making including software tools.
- **Complete:** contain all information required to serve all stakeholders in every discipline in every lifecycle fase.
- **Reliable:** information must be correct, unified and up-to-date
- **Uniform:** follow agreed on information structures en open formats
- **Transparent:** management-information (who, when, why was information created or changed)





Rijkswaterstaat  
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Environment





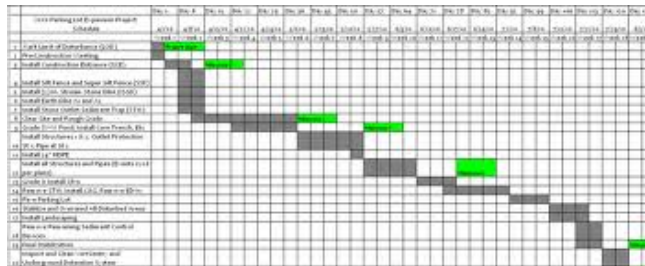
## Government service administrations RGD & RWS

- › The Government Buildings Agency (RGD)
  - › Intent: all major project to use IFC
  - › By November 1<sup>st</sup>, 2011 RGD mandates IFC for DBFMO & DBM
  - › Ambition to extend/improve
  
- › At delivery of the building the BIM and related files must be permanently updated and permanently within reach of the end-users. RGD will set requirements for the IT environment enabling this.





# From routine or incident-driven maintenance and repair...



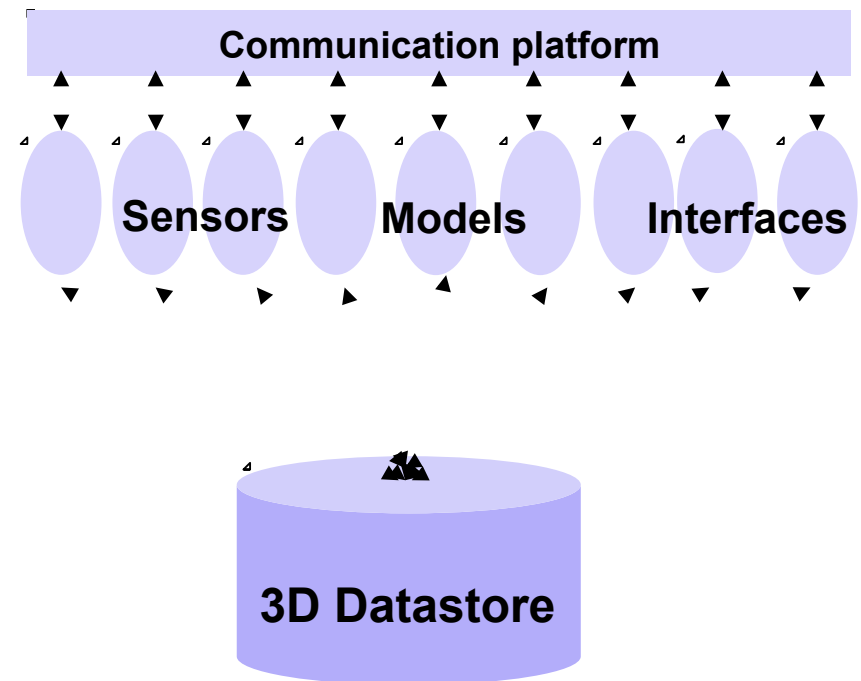
**.. towards interfaces with information for planned, knowledge-based prevention by the infrastructure operator.**





## The ambition \*)

Starting with how-built info, update, integrate, enrich, share and use information to enable knowledge-based asset management by the infrastructure operator





## with improved maintenance toolbox!

### Site specific residual capacity assessment

### Repair materials & methods, e.g.

capture chloride & release inhibitor  
short term electrochemical techniques



### Improved existing technology, e.g.

cathodic protection (25+ year life!)  
preventive measures (hydrophobic treatment)





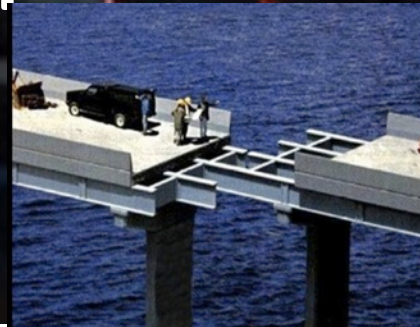
**The solution to suboptimal work planning, ...**

**construction failures (grotesque and lesser)**

**..as well as other problems related to  
lack of information and communication, has...**

**.. an easy part -input of infrastructure design data, and-..**

**.. a difficult, complex part-  
integrate, share, enrich and use information.**

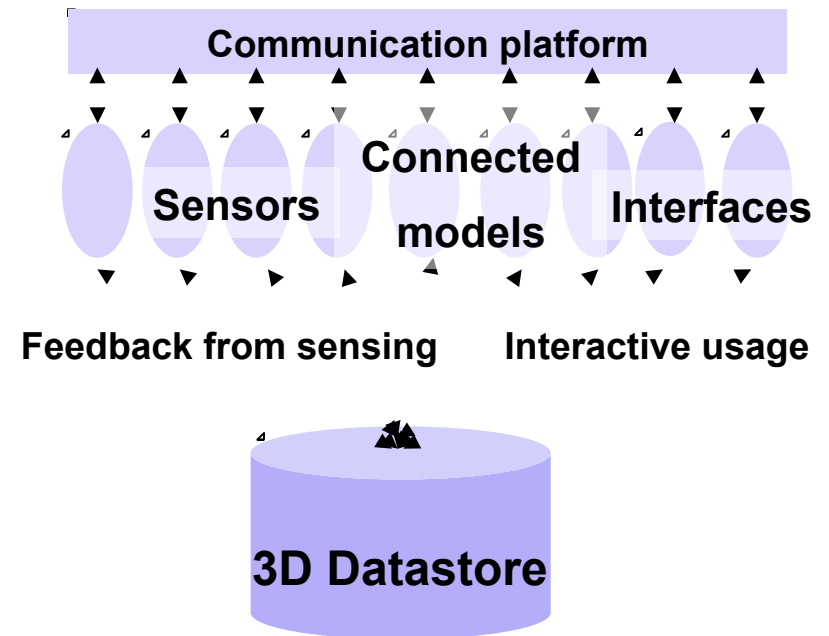
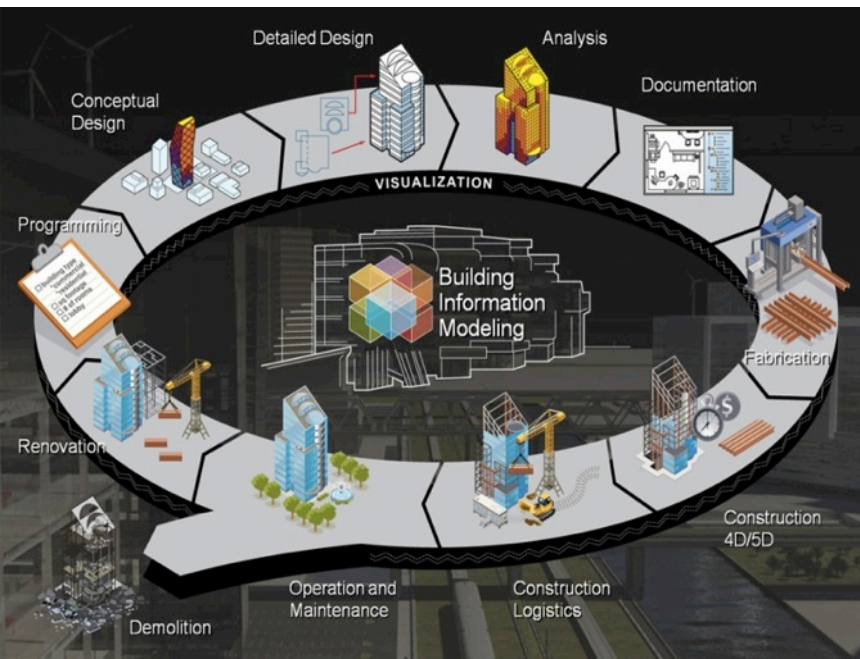




# Is the ultimate ambition

**Collect, integrate, enrich, share and use information to optimise:**

- > design phase (constructional safety, fire safety, sustainability, noise&vibration, clash detection, practicability, cost, ...)
- > building phase (work planning, logistics, mismatch-with-design detection,...)
- > operational phase (how-built info as basis for maintenance)







## Practical use of BIM in the Netherlands:

- › Very high level
- › Very detailed
- › Very wide range of applications/use
- › Very different kind of buildingtypes/projects
  
- › Safe to say:
  - › Almost all complex projects are engineered using BIM
  - › Experienced BIM users almost only use BIM (for every project)
  - › Increasing gap between leading group and peloton