

BIM/VDC præsentation for BIM Aarhus

BIM i COWI - Infrastructure

Magnus J Christensen, BIM chef, Railways, Metros, Roads and Airports



Dagsorden, strategi og organisation

- COWIs BIM strategi
- COWIs forståelse af BIM
- Action plan for COWI infrastructure
- COWIs fokusområder: "De 5 søjler"



Dagsorden, Udvikling & implementering

- Organisering af BIM projekter
- BIM Uses
- Modelstandarder, LOD og features
- Konfliktmatrice og grænsefladehåndtering
- 3D tools
- Digitalisering af virkeligheden.
- Next steps D&V, værktøjer, uddannelse.
- Cases.



Global mega trends shape our industry...



GLOBALISATION



**URBANISATION
AND POPULATION
DEVELOPMENT**



SUSTAINABILITY



**PROJECT
COMPLEXITY
AND SIZE**



DIGITALIZATION

Our enablers to success are...



LEADERSHIP



**BUSINESS
MINDSET**



**OPERATIONAL
EXCELLENCE**



INNOVATION

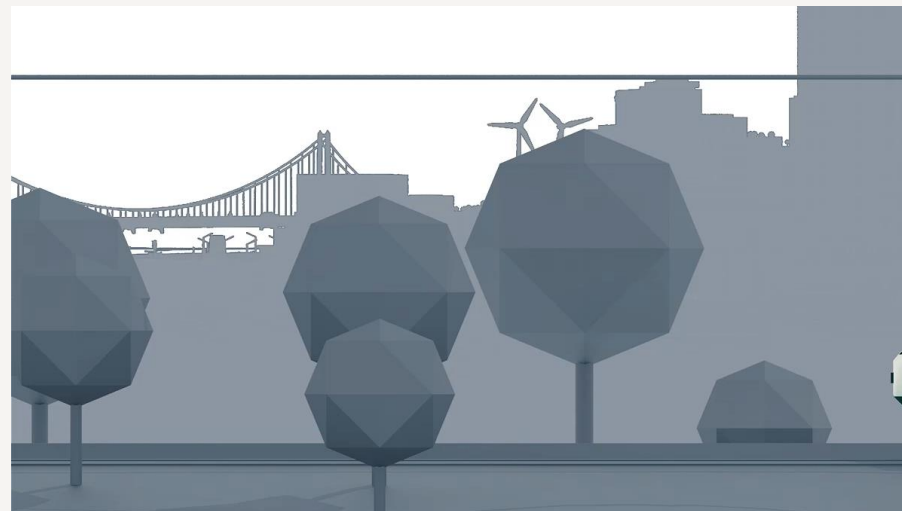
What is BIM?

COWI's understanding of BIM

> Definition of BIM:

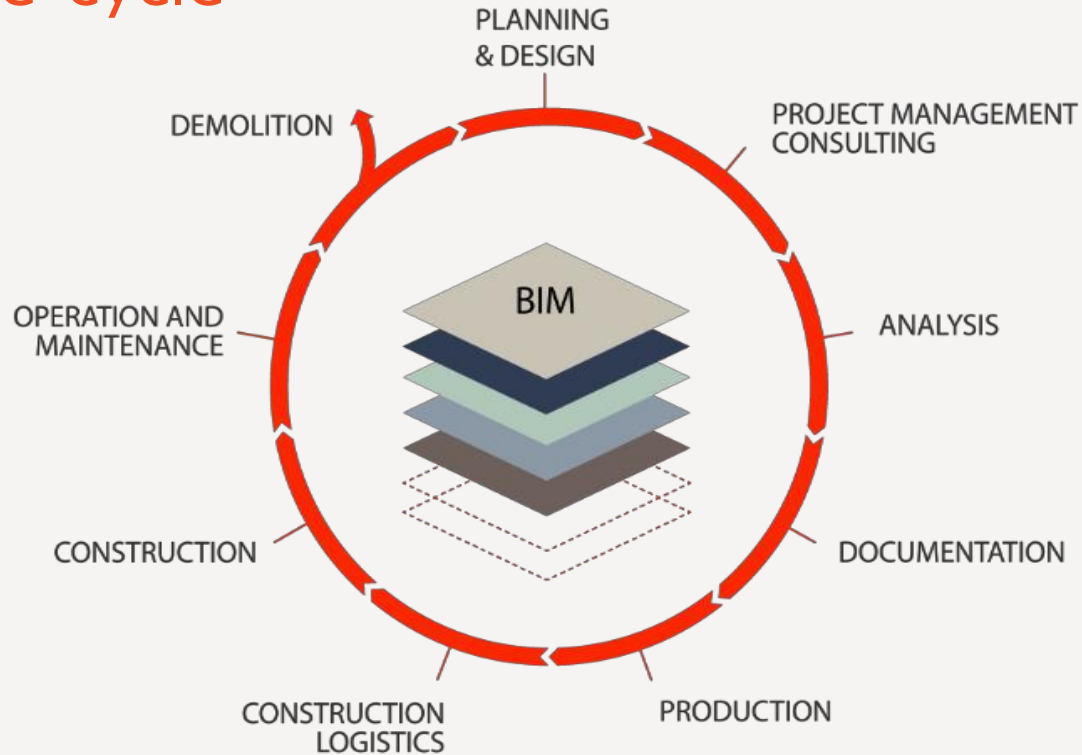
"BIM is the future of construction. It is way of **working, managing information** in a team environment, enabling everyone to **understand** a project through the use of **digital models**."

The **digital models** holds all the information needed to **manage, plan, design, analyze, construct and maintain** that project."



What is BIM?

The BIM life-cycle



BIM is for everybody

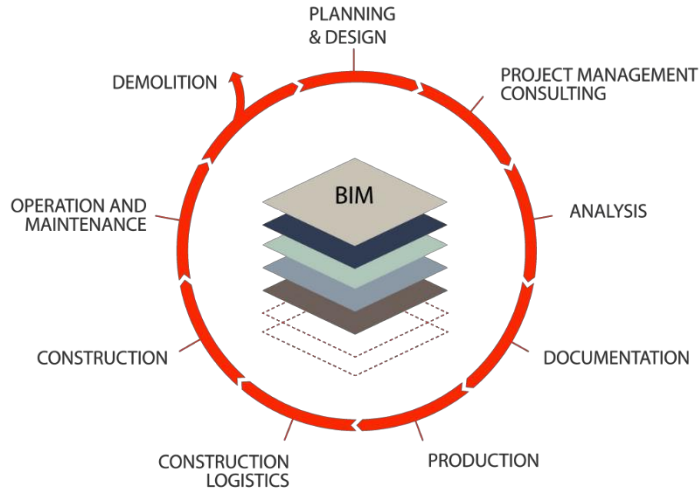
- > BIM is for everybody in COWI, not only for CAD people
- > Substantial investments to develop and implement BIM in COWI
- > First to market with a complete BIM solution = competitive advantage = more exciting projects in COWI
- > Key part of the 2020 Strategy



BCA's BU5

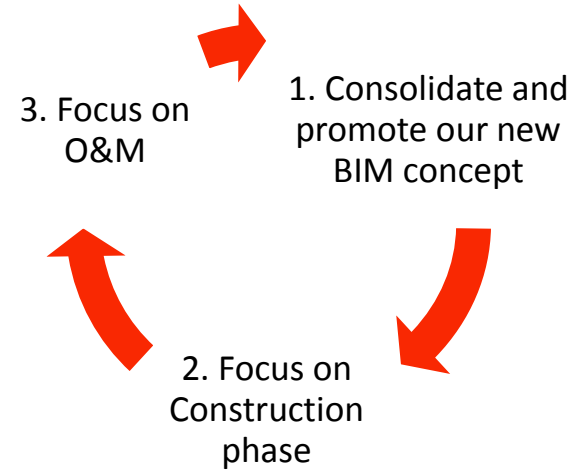
Dept	Count	Pct.	Employee		
1500	0	0%	7	Division Management	
1502	22	13%	173	Railways and Metro	
1514	13	15%	88	Roads, Highways and Airports	
1521	11	12%	91	Region South – DK	
1531	11	12%	91	Region Central Jutland – DK	
1551	9	13%	70	Region North Jutland – DK	
4071	4	18%	22	Wroclaw, Poland	
5026	2	6%	32	Gurgaon, India	
4109	1	100%	1	Dar es Salaam, Tanzania	
4120	1	100%	1	Kampala, Uganda	
BU5	74	13%	576		

Actionplan 2017 in 3 headings



See BIM
Implementation
action plan for further
info

[BIM IAP](#)



Our goal is to increase the division BIM level. (Efterår 2015)

Tabular BIM Capability Maturity Model

Maturity Level	A Data Richness	B Life-cycle Views	C Roles Or Disciplines	G Change Management	D Business Process	F Timeliness/ Response	E Delivery Method	H Graphical Information	I Spatial Capability	J Information Accuracy	K Interoperability/ IFC Support
1	Basic Core Data	No Complete Project Phase	No Single Role Fully Supported	No Change Management (CM) Capability	Separate Processes Not Integrated	Most Response Info manually re-collected - Slow	Single Point Access No IA	Primarily Text - No Technical Graphics	Not Spatially Located	No Ground Truth	No Interoperability
2	Expanded Data Set	Planning & Design	Only One Role Supported	Aware of CM	Few Bus Processes (BP) Collect Info	Most Response Info manually re-collected	Single Point Access w/ Limited IA	2D Non-Intelligent As Designed	Basic Spatial Location	Initial Ground Truth	Forced Interoperability
3	Enhanced Data Set	Add Construction/ Supply	Two Roles Partially Supported	Aware of CM and Root Cause Analysis (RCA)	Some BP Collect Info	Data Calls Not In BIM But Most Other Data Is	Network Access w/ Basic IA	NCS 2D Non-Intelligent As Designed	Spatially Located	Limited Ground Truth - Int Spaces	Limited Interoperability
4	Data Plus Some Information	Includes Construction/ Supply	Two Roles Fully Supported	Aware CM, RCA and Feedback Loops (FL)	Most BP Collect Info	Limited Response Info available In BIM	Network Access w/ Full IA	NCS 2D Intelligent As Designed	Located w/ Limited Info Sharing	Full Ground Truth - Int Spaces	Limited Info Transfers Between COTS
5	Data Plus Expanded Information	Includes Constr/Supply & Fabrication	Partial Plan, Design&Constr Supported	Implementing CM	All BP Collect Info	Most Response Info Available In BIM	Limited Web Enabled Services	NCS 2D Intelligent As-Built	Spatially Located w/ Metadata	Limited Ground Truth - Int & Ext	Most Info Transfers Between COTS
6	Data w/Limited Authoritative Information	Add Limited Operations & Warranty	Plan, Design & Constr. Supported	Initial CM process implemented	Few BP Collect & Maintain Info	All Response Info available In BIM	Full Web Enabled Services	NCS 2D Intelligent And Current	Spatially Located w/ Full Info Share	Full Ground Truth - Int And Ext	Full Info Transfers Between COTS
7	Data w/ Mostly Authoritative Information	Includes Operations & Warranty	Partial Ops & Sustainment Supported	CM process in place & early RCA implementation	Some BP Collect & Maintain Info	All Response Info From BIM & Timely	Full Web Enabled Services w/ IA	3D - Intelligent Graphics	Part of a limited GIS	Limited Comp Areas & Ground Truth	Limited Info Uses IFC's For Interoperability
8	Completely Authoritative Information	Add Financial	Operations & Sustainment Supported	CM and RCA implemented and used	All BP Collect & Maintain Info	Limited Real Time Access From BIM	Web Enabled Services - Secure	3D - Current And Intelligent	Part of a more complete GIS	Full Computed Areas & Ground Truth	Expanded Info Uses IFC's For Interoperability
9	Limited Knowledge Management	Full Facility Life-cycle Collection	All Facility Life-Cycle Roles Supported	Bus. process sustained by CM, using RCA & FL	Some BP Collect & Maintain Info In Real Time	Full Real Time Access From BIM	Netcentric SOA Based CAC Access	4D - Add Time	Integrated into a complete GIS	Comp GT w/ Limited Metrics	Most Info Uses IFC's For Interoperability
10	Full Knowledge Management	Supports External Efforts	Internal and External Roles Supported	Bus. process routinely sustained by CM, RCA & FL	All BP Collect & Maintain Info In Real Time	Real Time Access w/ Live Feeds	Netcentric SOA Role Based CAC	nD - Time & Cost	Integrated into GIS w/ Full Info Flow	Computed Ground Truth w/Full Metrics	All Info Uses IFC's For Interoperability

The BIM Group activities



Researching
customer needs and
requirements

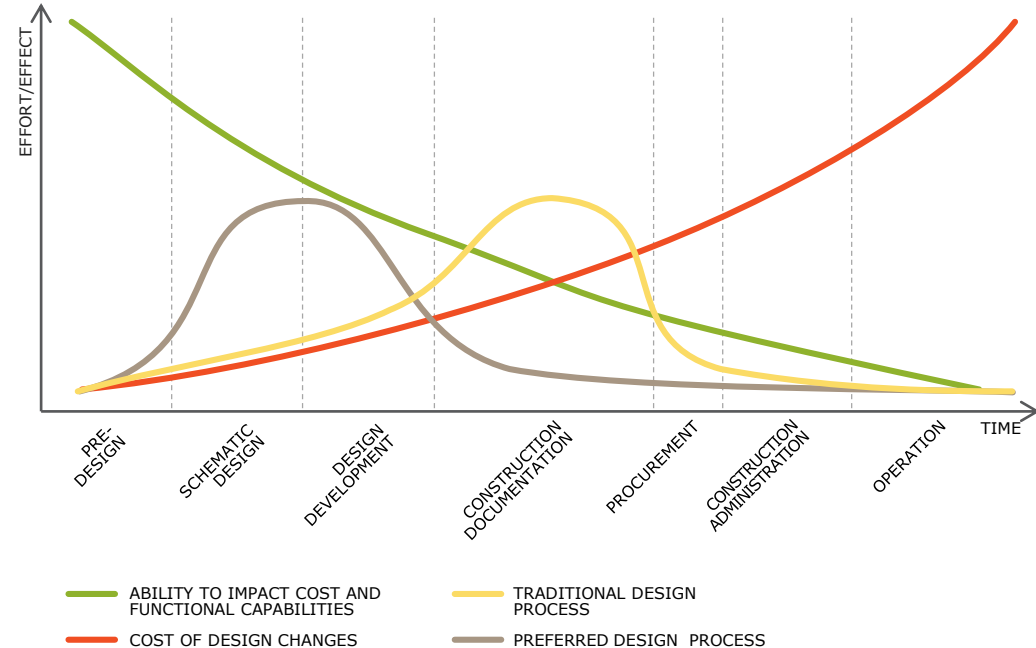
Manages COWIs
internal and
external BIM
promotion

Creating project
processes and roles

Defining BIM
Manual for project
use

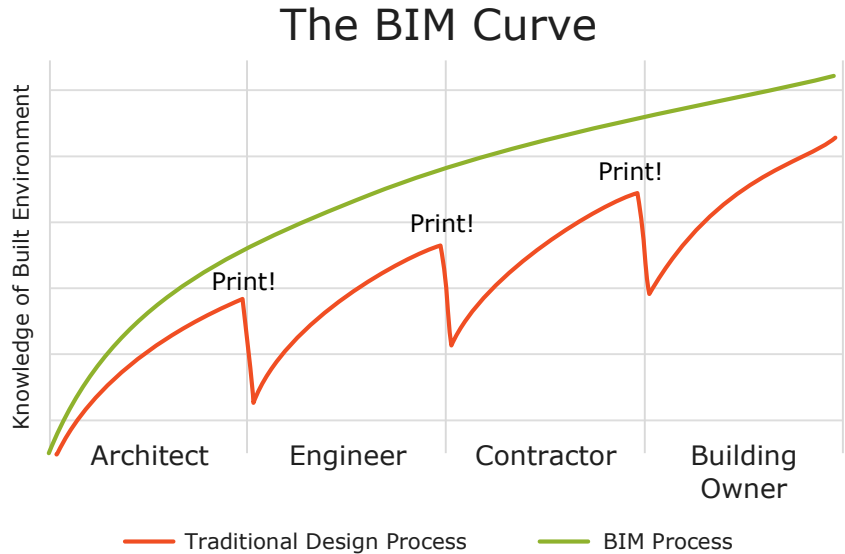
Why use BIM?

- > A BIM survey from Norway shows that a significant reduction of corrective works in the construction phase can be achieved with BIM usage.
- > Traditional non-BIM projects spend 16% of the construction cost on corrective works – with BIM the number was 8%
- > BIM usage could make the design process **free of charge** – when looking at the estimated savings in total project cost

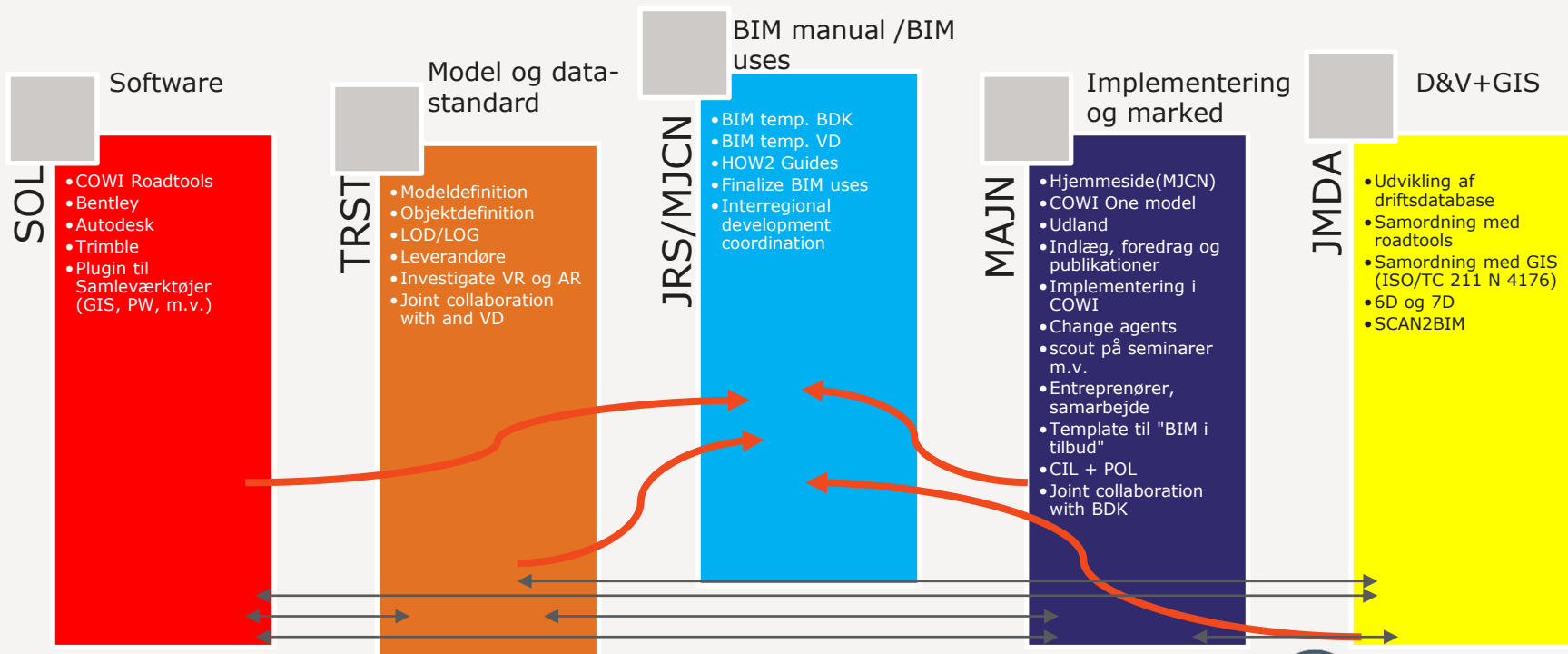


Why use BIM?

- Visualizations is a key driver for information flow between designers
- Reduce errors, keep good workflow through phases, clash detection
- BIM can cover the complete project lifecycle – definition → operation



A057906-0-05_WBS - De 5 søjler 2017

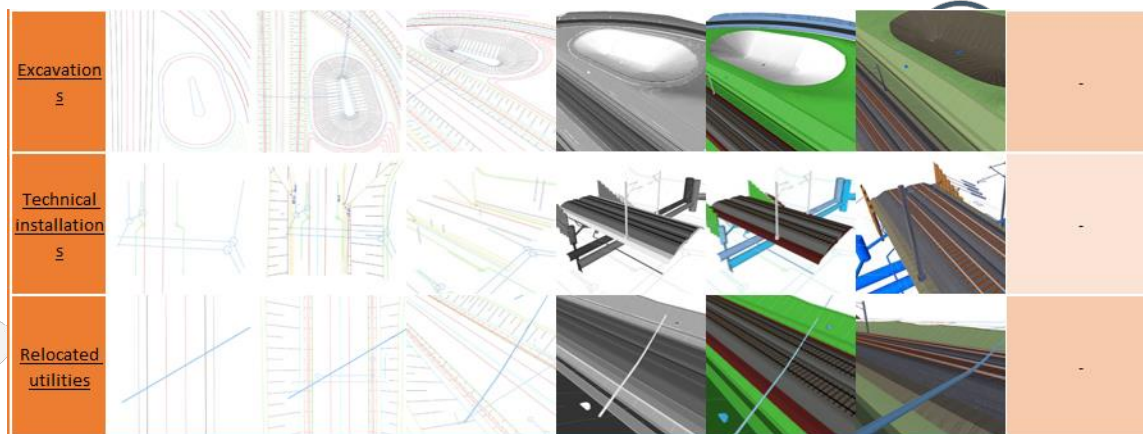


Hvad er vores udgangspunkt?

- NBIMS/Penn State
- BS (britich standards, BIM level 2)
- VD+BDK
- DDA
- Layer based / lack of objectcoding/metadata information requirements

BIM MANUAL

MANUAL/GUIDELINES



APPENDICES

Appendix A - IKT/BIM organisationsdiagram

Appendix B - Rollebeskrivelse

Appendix C - BIM Uses

Appendix D - LOD

Appendix E - Objekt database

Appendix F - Konflikt og konsistensmatrix

17 | 1. JUNI, 2017
BIM AARHUS

Clash Check Form

1/1

COWI	Projekt navn	ATR
	E2001-2 Ringsted - Nykøbing Falster	A086076

Udfyldes af disciplinlederen

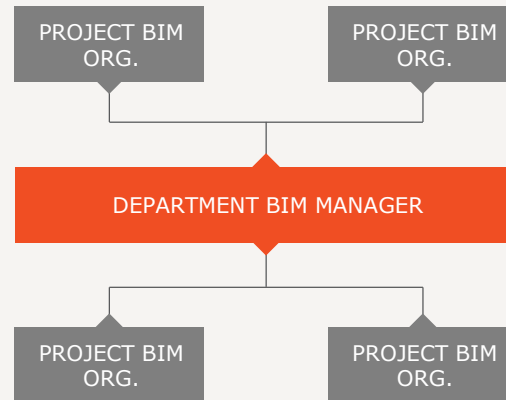
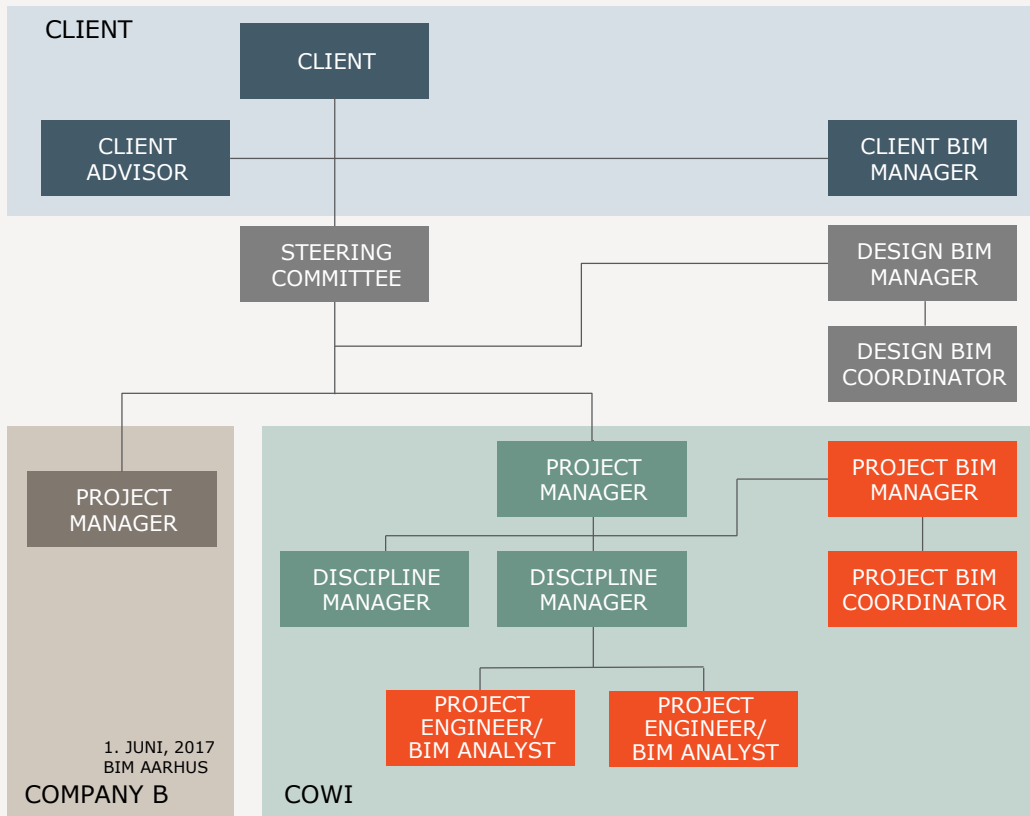
Fra	Dato	Til (tjekker)	Deadline
			6. september 2016

Fagmodeller der konflikt tjekkes imod

Projekteret Færdsels- og vejvisningstavler (D_ANC_TAV) for DP-04 Næstved
M201V_02_89200_8_APT_003.idgn

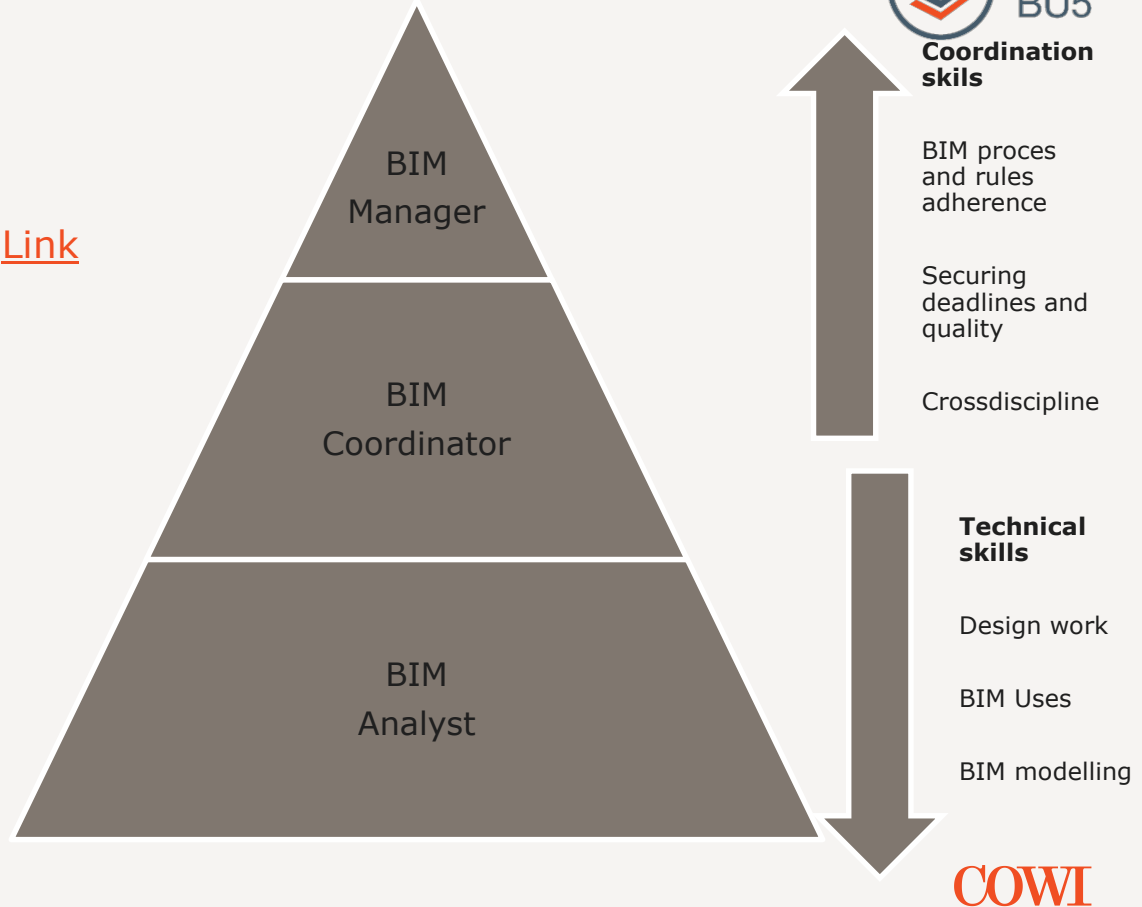
Kontrollér konflikter med disse discipliner		Fagmodeller der konflikt tjekkes imod	OK Ingen konflikter/ ikke	Projekt konflikter. Link til rapport	Aktion (Initialer)
E_BAS_DRA	Eksisterende Afvanding	M201A_02_89200_8_EKS_001			LAD
E_BAS_STR	Eksisterende Bygværker	M201K_02_89200_8_EKS_001			LAD
E_BAS_UTI	Eksisterende Ledninger	M201F_02_89200_8_EKS_001			LAD
D_ANC_BAR	Projekteret Autoværn	M201V_02_89200_8_APT_001			JRS
D_ANC_FEN	Projekteret Hegn	M201H_02_89200_8_APT_001			MBP
D_ANC_LTG	Projekteret Belysning	M201V_02_89200_8_BEL_001			XXX
D_ANC_SLG	Projekteret Signalanlæg	M201V_02_89200_8_TRF_001			XXX
D_RDA_FPV	Projekteret Fritrumsprofil vej	M201V_02_89200_8_FRP_001			JRS

BIM roles, infrastructure



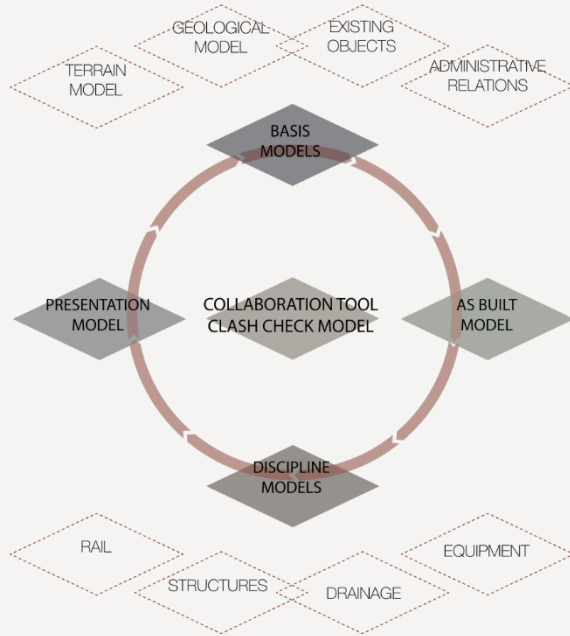
Organization

- > 3 key BIM roles on the projects. [Link](#)
- > BIM Analyst
- > BIM Coordinator
- > BIM Manager

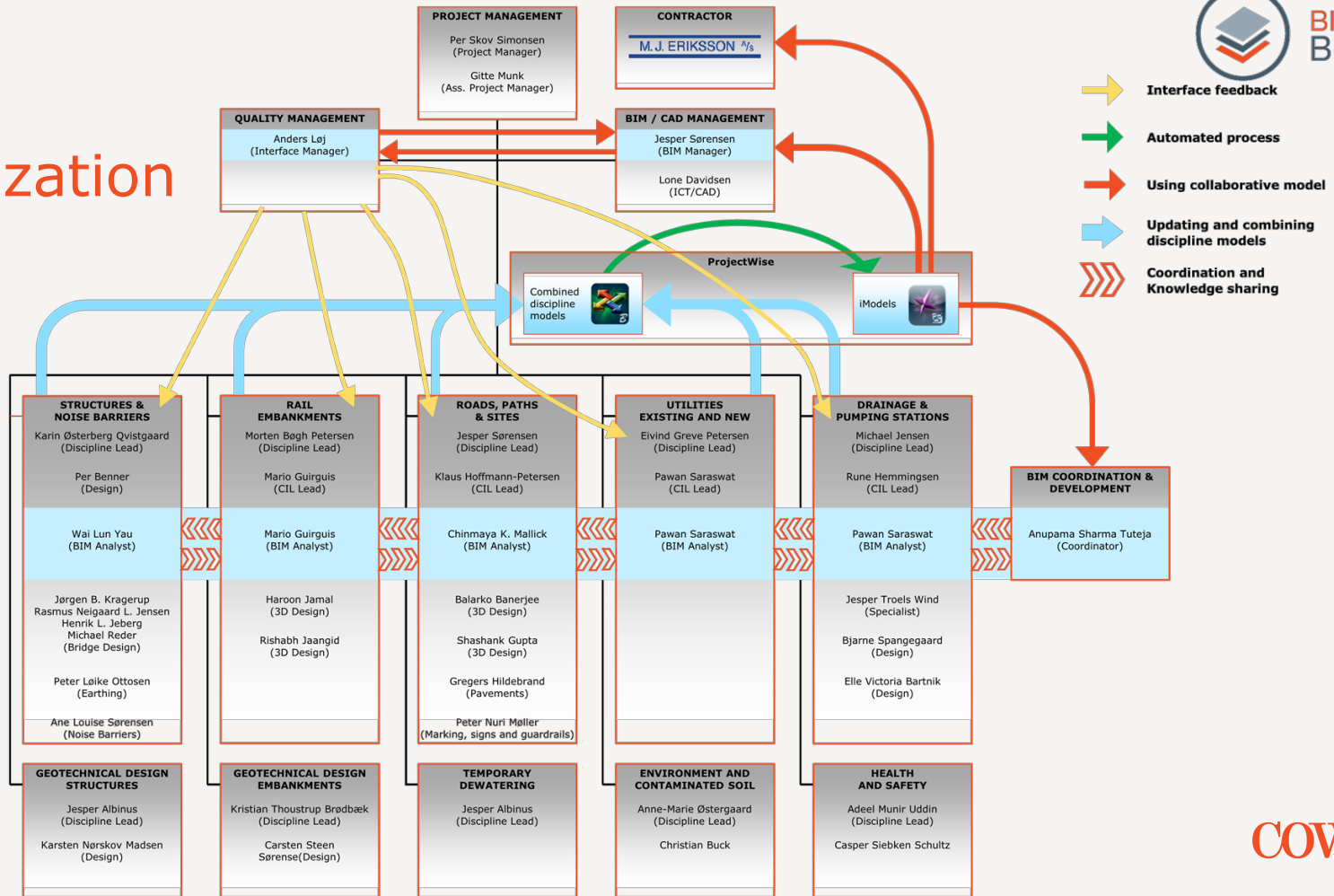


What is BIM?

COWI One Model

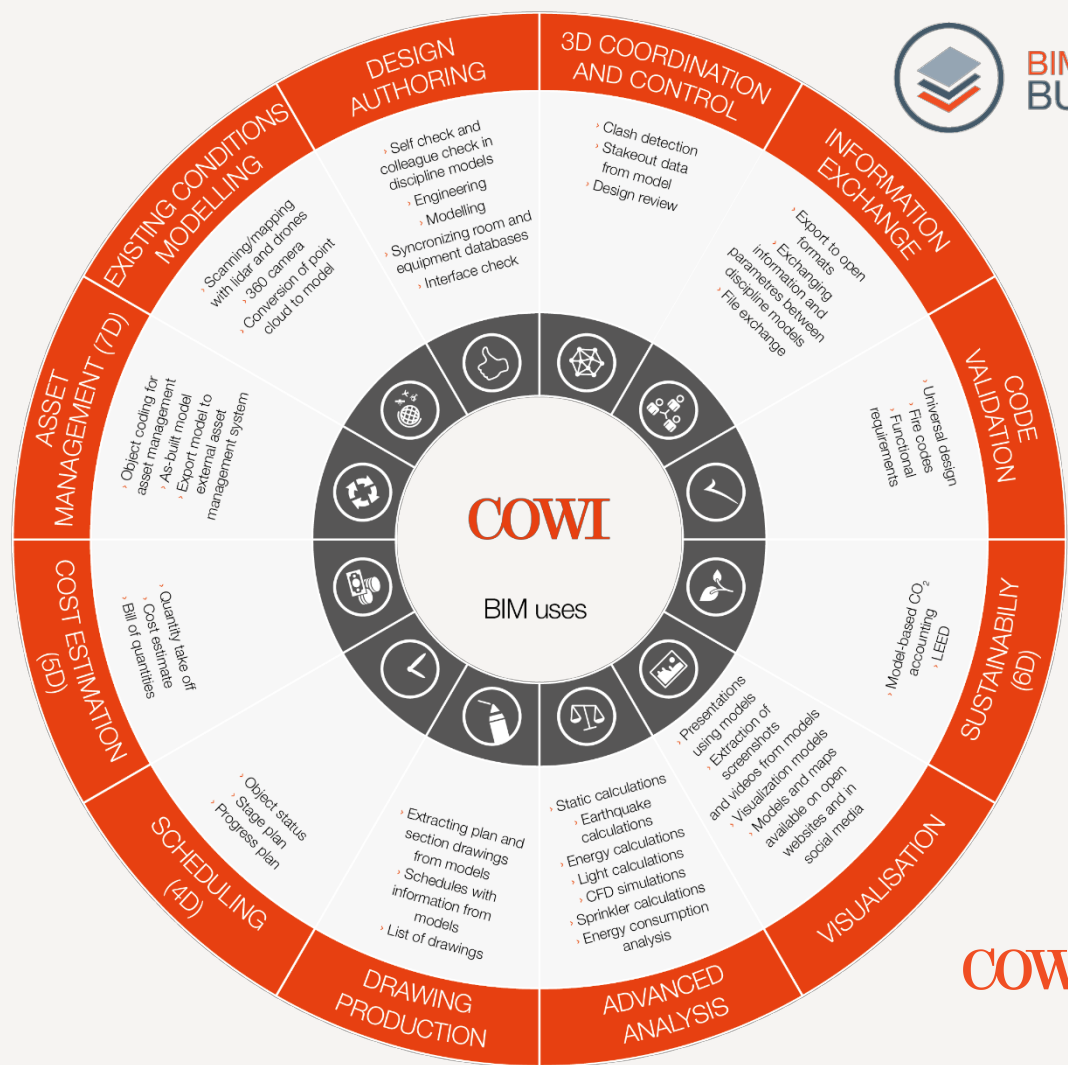


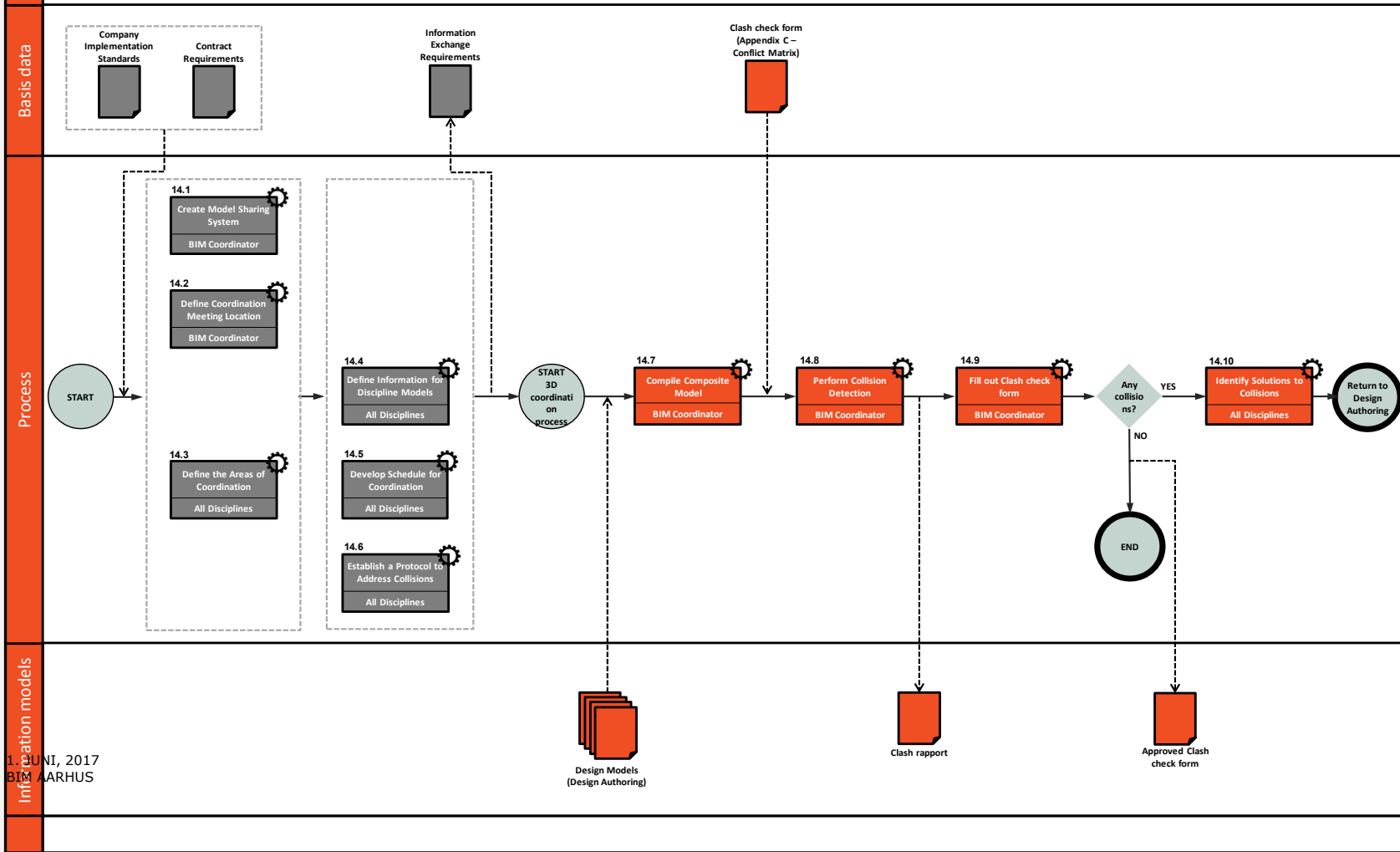
BIM Organization



BIM uses

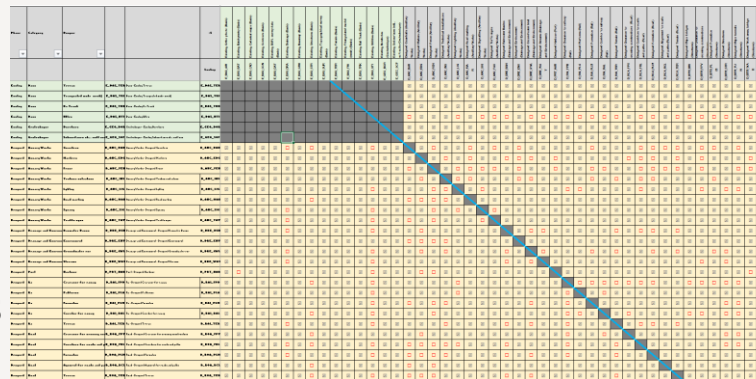
- › Uses of COM
- › 24 Uses
- › 7 Uses with high focus
- › Description, requirements and workflow chart for each use





Interface check, 3D coordination

- Check form, predefined
- Execute 3D coordination
- Discipline managers resolves clashes
- Execute 3D coordination
- Ad to protocol
- Ready for construction

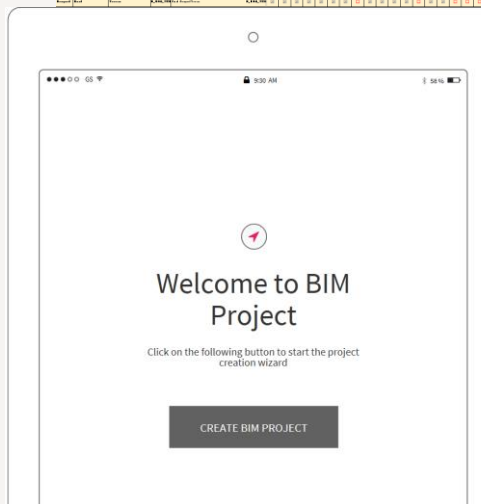


Traffic signs D_ANC_TAV

ATR

linator) Deadline

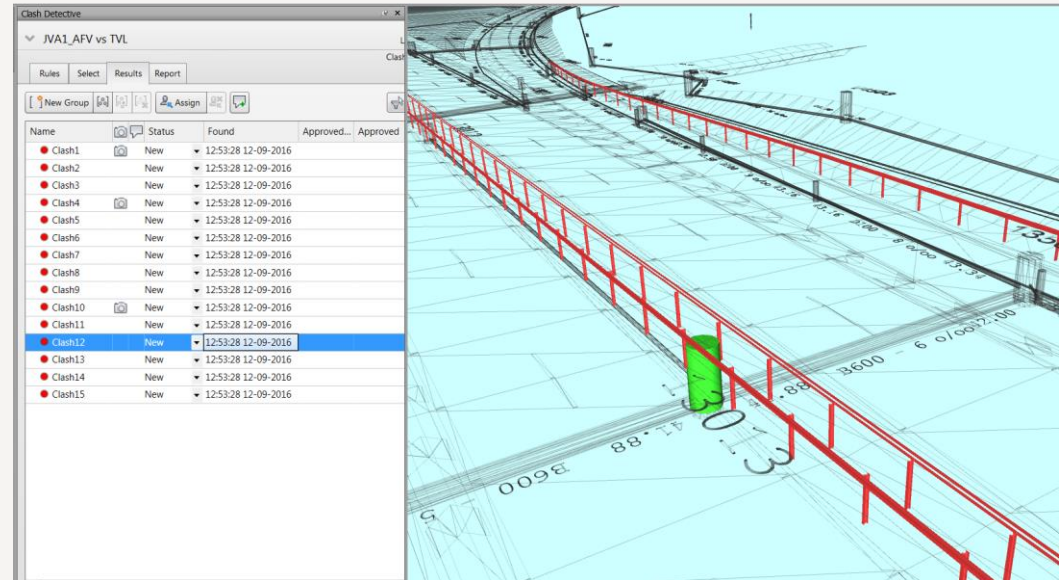
Check prior to submission



Works - Designed Traffic signs				
on against below	Disciplin models	OK No clashes / not relevant	Design clashes. Link to clash- report	Action (Initials)
g Drainage (Basis)				
g Utilities (Basis)				
ed Guardrails (Ancillary Works)				
ed Fence (Ancillary Works)				
ed Signalling (Ancillary Works)				
ed Utilities (Utilities)				

Interface check, 3D coordination

- Clash detection help finding errors
- Clash detection does not prevent errors
- Contractor expects model without errors



Modelstandards, LOD and Features?

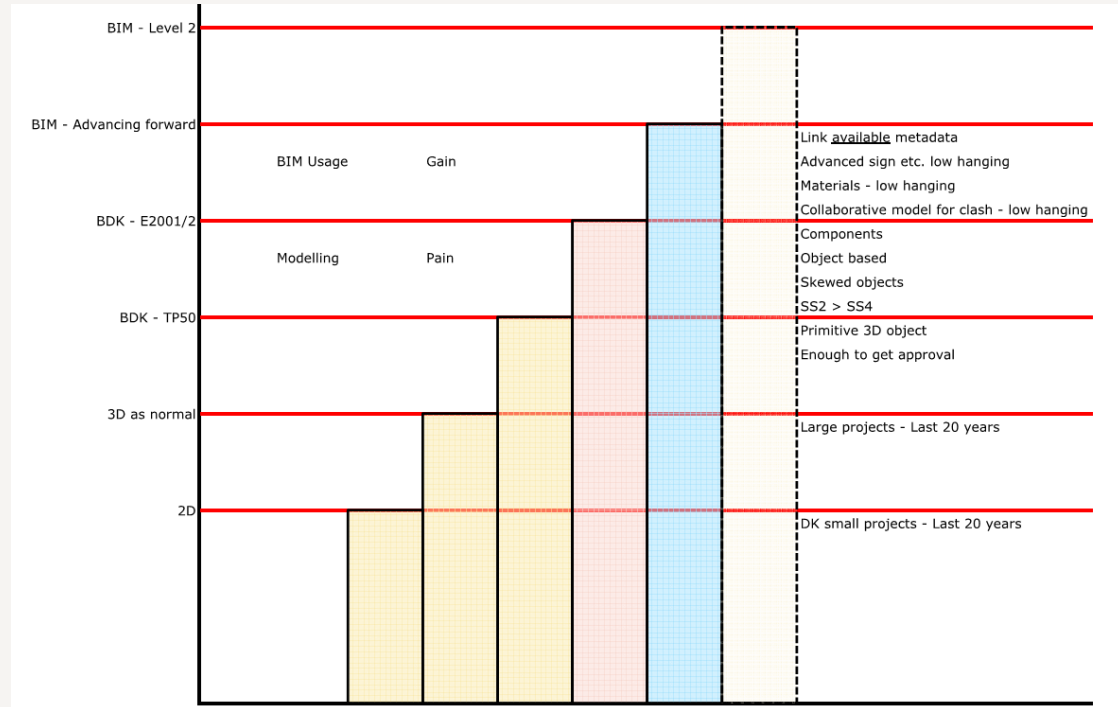
- > LOD on all categories (Level of detail = LOD)
- > Simple sheet is to be defined in corporation with the client.
- > Lack of open source for feature coding/object information in level 7

Traffic signs							
LOD	1	2	3	4	5	6	7
Illustration				-			
Geometry	- 2D - Grafisk illustration og overordnet placering	- 2D - Grafisk illustration og detaljeret placering	- Sempel 3D - Mastsignatur drapet til vejoverflade	-	- 3D objekter - Solid inkl. fundamenter	- 3D - Detaljeret med f.eks. beslag og bolte	- 3D inkl. informationer til drift
Object information	- Lag - Tavletekst	- Dimensioner (Skilteportaler)	- Koordinater inkl. koter	-	- Lag med materiale beskrivelse og dimension	- Intelligente objekter - Historik for objekter til brug i drift	- Refleksionsklasse - Galvaniserings-tykkelse - ProduktionsID
Drawing materials	- Skilteplan	- Skilteplan	- Skilteplan	-	- Skilteplan - 3D modeller og visualisering - Sempel 3D-PDF	- Skilteplan - Detaljeret visualisering - Intelligent 3D-PDF	- Som udført
Application	- Grundlag til projekteringsmøder - Grundlag til detailprojektering	- 2D Afsætningsdata	- 3D Afsætningsdata	-	- Detaljeret kollisionskontrol - Mængdeudtræk	- Mængdeudtræk direkte fra objekter - Grundlag for møder f.eks. borgermøder	- Driftdatabase

Why use BIM?

3D tools – Modelling = cost, Use = free

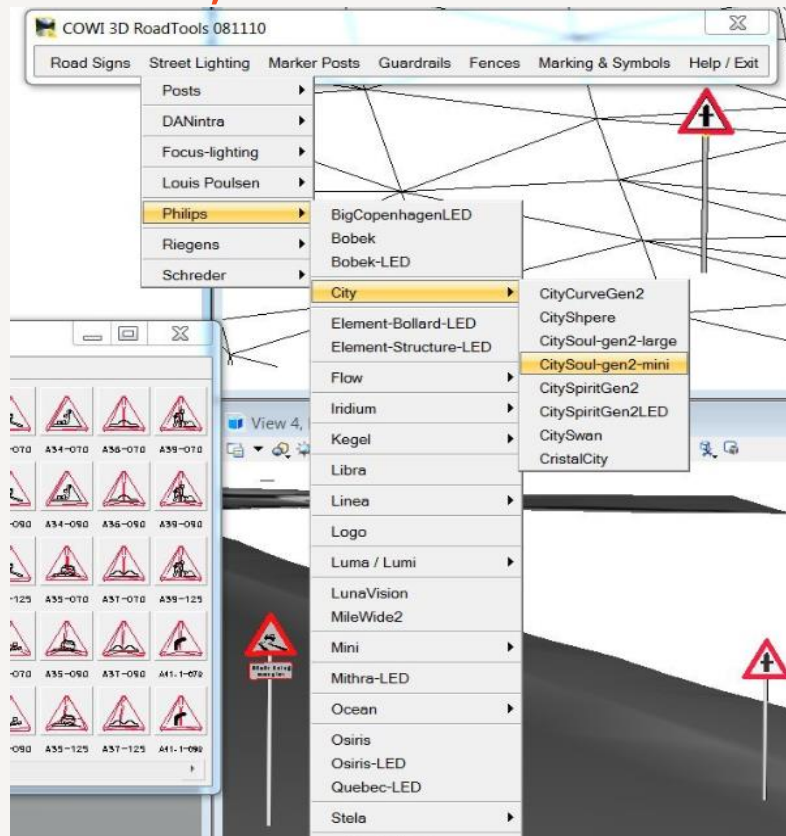
- > Demands from clients and contractors are present, so why not use these to optimize own production? 3D modelling is where the costs are located, Use the models to harvest low hanging fruits.
- > Set requirements on BIM uses / model uses. E.g. 3D coordination, 4D, 5D, design review, design authoring, Quantity take off, stakeout data etc.
- > New ideas on model standards.



Why use BIM?

3D tools – Modelling = cost, Use = free

- That's why we have developed "3D tools" for MicroStation.
- 3D Signs
- 3D Lighting
- 3D Marker posts
- 3D guardrails
- 3D fences
- 3D Markings and Symbols
- more 3D cells to come



Ringsted Femern Banen

BIM uses on E2001 & E2002



Ny bane København- Ringsted,

Projektet er inddelt i 11 afleverings pakker
(Delivery Packages, DP-01 – DP-11)

Alle pakker afleveres i som foreløbigt projekt og som detailprojekt (PD og DD).

Der afleveres en gang internt og to gange eksternt i både PD og DD:

- grænsefladekontrol
- til entreprenøren for kommentering
- til Banedanmark som endelig aflevering

I alt 66 afleveringer over projekteringsperioden på ca. 1 år!

ALT projekteres i fuld 3D **ALT... - som i "EVERYTHING" :-)**

Periode: 2015-2028

E2001 Anlæg Ringsted-Vordingborg og
E2002 Anlæg Falster



E2001 Jord- og afvandingsarbejder, Ringsted-Vordingborg

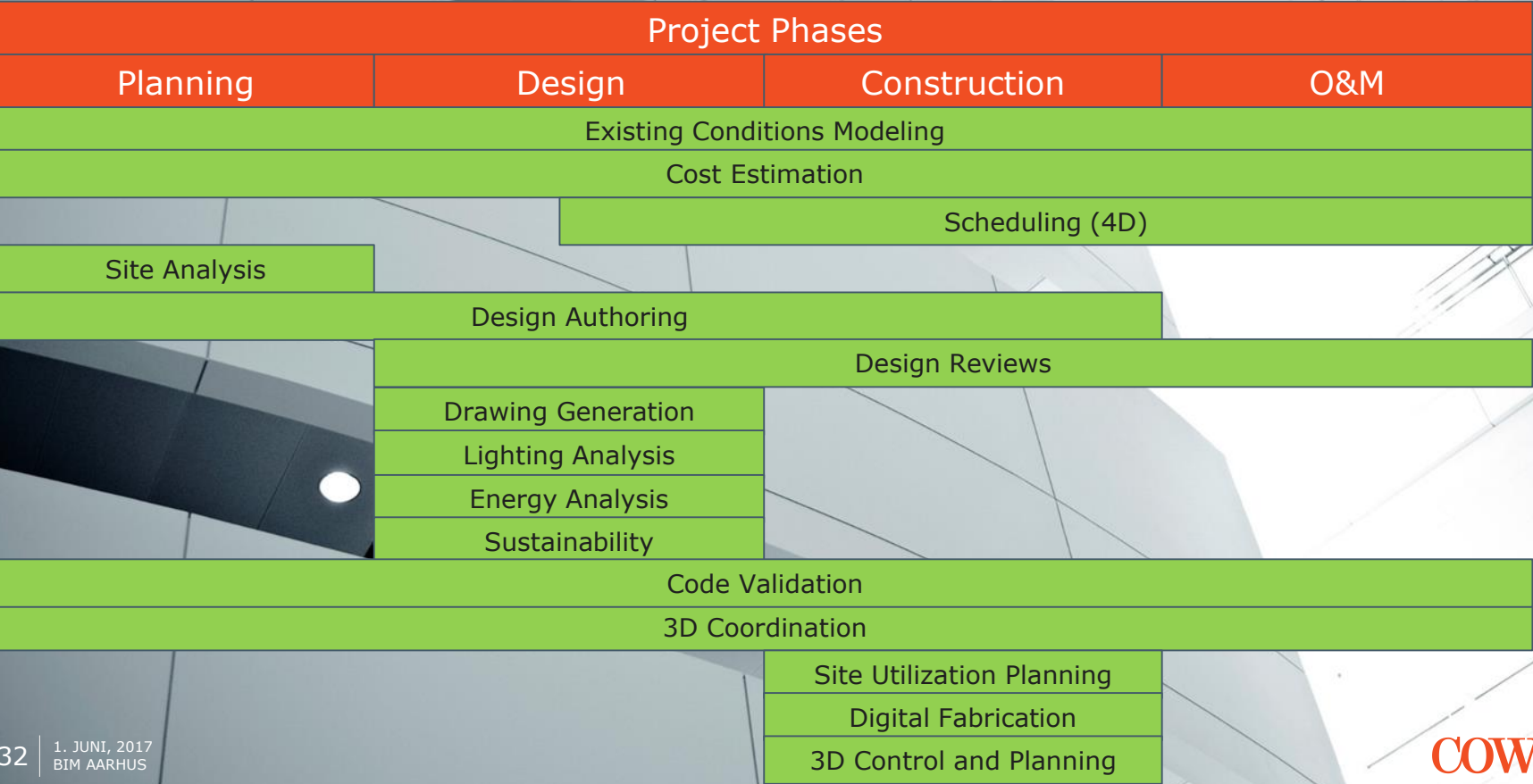
- > Nyt banetracé på ca. 4,5 km nord for Glumsø
- > Underballast og ballastskærver til 7 cm under svelleunderkant
- > 5 kurveudretninger mellem Glumsø og Næstved
- > 2 kurveudretninger mellem Næstved og Lundby
- > Støjskærme
- > Dæmningsudvidelser/forstærkninger
- > Erstatningsvandhuller
- > Vandløbsunderføringer/faunapassager

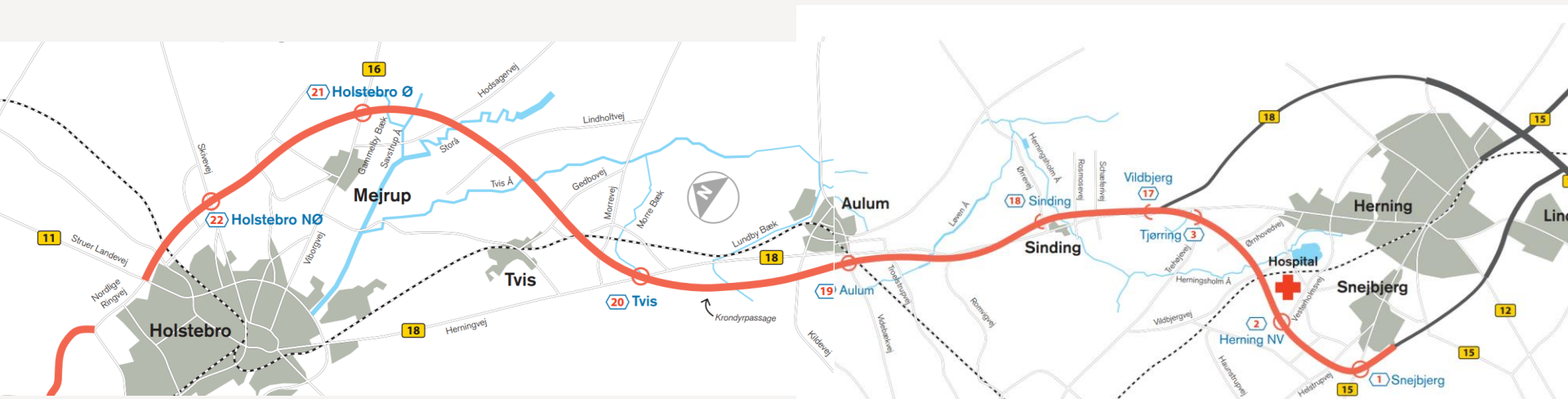
E2002 Jord- og afvandingsarbejder, Orehoved-Nykøbing F

- > Nyt spor ved siden af eksisterende
- > Kurveudretninger
- > Støjskærme
- > Erstatningsvandhuller
- > Vandløbsunderføringer/faunapassager

Udførelsesperiode: 2016-2021

Jord- og afvandingsarbejder Lolland udføres efter 2021





BIM uses applied to the project

- > 3D coordination
- > Design review
- > Existing conditions modelling
- > 4D
- > 5D
- > Design Authoring
- > 3D control and planning
- > VR and visualization



LIVE demo



Spørgsmål?



MJCN@COWI.com