center for produktivitet i byggeriet
center for productivity in construction

Friday April 13th 2012
RESTA 2012

Classification of Construction Information
Agenda

• Classification and properties
• Results from key projects
• Where are we going from here?
The impact of the requirement analysis on cunecos work
The purpose of the requirement analysis

As a basis for the development cuneco wishes to acquire knowledge about:

- Where do the industry require standards for digital data exchange?
- In which areas can such standards create greatest value?
- Which solution scenarios are demanded by the market?

- within the frames of cunecos for areas of focus.
Method

13 focus groups with a total of 72 participants from each link in the construction value chain

• An advantage of this approach is a close dialogue with the participants

• A drawback is that the results are not statistically significant (but 72 participants are quite a lot...)

Our conclusion is that cuneco has had an adequate contact with the users in order to state, that we have identified the basic needs
Analysens tre trin

Trin 1
Requirement 1
June + August 2011

Focus
• Roles

Content
• Background in research
• Main requirements
• Main processes

Trin 2
Requirement 2
October 2011

Focus
• 4 main phases

What
• Issues
• Processes
• Barriers
• Creation of value

Trin 3
Solutions
November 2011

Focus
• Digital scenarios

What
• User scenarios
• Demand
• Value estimates
Status for digitalization

• The digitalization is well on the way!

• But the construction industry is working on very different levels depending on:
  • Place in the value chain
  • Company size
  • Type of projects (new construction vs. renovation)

• Therefor there is a mixed digital praxis with the use of building models alongside 2D drawings, pdf-files and Excel sheets
Barriers for data exchange

• Different levels of IT expertise and implementation between contract partners and internally in the organisations

• Insufficient knowledge of the data needs of project partners

• Inconsistent praxis – structure and standards for data exchange are missing

• Cooperation culture – lack of tradition for open exchange

• The formal description of the services from the consultants does not match the model based approach

• The distribution of responsibility in regard to measurement, quantity take-off and building information models

• EU procurement rules

• Incompatible it-systems

• Lack of it-qualifications
Main requirements within cunecos areas of focus

• Consistent information levels
• Consistency and structure through the entire construction process
• Greater possibilities for reusing data
• Classification
• Property data
Main requirements within cunecos areas of focus

• Consistent information levels
• Consistency and structure through the entire construction process
  • Structure for gathering data from operation and user demands for use in the programming phase
  • Uniform perceptions of areas and spaces
• Uniform use of measurement rules and quantities take-off
• Structure for tendering documents
• Uniform requirements for documentation for operation
• Greater possibilities for reusing data
• Classification
• Property data
Main requirements within cunecos areas of focus

• Consistent information levels
  • We require common clear guidelines for which data is to be exchanged when and in what detail
  • We need a common language which will make it easier for the parties to understand each other and align expectations for deliveries and services
• Consistency and structure through the entire construction process
• Greater possibilities for reusing data
• Classification
• Property data
Main requirements within cunecos areas of focus

• Consistent information levels
• Consistency and structure through the entire construction process
• Greater possibilities for reusing data
  • Architect model → Construction model
  • Procurement with quantities → production planning
  • Delivery of as-built documentation → Operation
• Classification
• Property data
Main requirements within cunecos areas of focus

• Consistent information levels
• Consistency and structure through the entire construction process
• Greater possibilities for reusing data
• Classification
  • There is presently too much work in classification
  • A connection between classification, the building information model and the specifications is missing
• Property data
Main requirements within cunecos areas of focus

• Consistent information levels
• Consistency and structure through the entire construction process
• Greater possibilities for reusing data
• Classification
• Property data
  • Consultants and contractors need structured product information which can be used directly in the building information model, production information, as-built information etc.
  • Building materials aren’t uniquely specified
  • The owners require operation objects and property sets which can be associated with operation and maintenance functions
cunecos design principles

According to the users cuneco must develop standards and products which:

• Are simple and easy to use
• Must work now (but also make sense in 5 years time)
• Helps the industry to take the small steps ahead
• Are relevant for and usable by the whole industry:
  • Large and small companies
  • Front runners and all the rest
  • Owners who use their own buildings and owners who let
  • For both public and private projects
• Are available on the Internet
• Is integrated in the software used in the industry
• Works in an international context
How is the vision carried out?

Relevant usable products:
› Qualified project participants
› Testing of the products in the industry
› Close contact to the users

Internationalization:
› cuneco works on the international perspective through the work on the ISO-revision and cooperation with buildingSMART

It-suitability:
› Close contact with the software vendors
› Software representatives in the cuneco project groups
› Software representatives in bips’ it-forum
› The cuneco-server will make cunecos products available on the Internet and easy to access for users and software applications
The cuneco development process

According to the users cuneco must:

• Communicate openly in a language that everyone understands
• Make use of experiences in the business
• Align the development to other development projects
• Successively test the products
• Have an open eye for barriers outside cunecos own scope of interest
Future perspectives for the analysis

Requirement analysis
User needs
Fall 2011

Specification of requirements in cunecos development projects
Spring 2012

Value analysis in the cunecos test-projects
Fall 2012

**CCS standards**

When data is exchanged between actors property sets, which specify selected properties for the object, are used.
Unformat Detailed Classification (UK)

72 options Wall
Structure and syntax for Classification of Results

Finding your way around information
Construction elements

Spaces
Sharing information
stable

classification and identification
objects

... the construction elements and spaces we are working on
Object occurrence
eg. “door”

Object individuals
specific make of door
aspects

... in order to make the information sharp, exact and accessible to you
Aspects – a certain way of “looking” at the information
Other aspects
Aspects for CONSTRUCTION ELEMENTS

- Classification
- Simple product
- Function
- Structural product
- Location
Aspects for SPACES

%% Classifikation

## Simple product

== Function

-- Structural product

++ Location
CCS coding rules

PREFIX
CLASSIFICATION
NUMBERS

% # - = +
A B C D ...
1 2 3 4 ...

%% ## -- == ++
A B C D ...
1 2 3 4 ...

IDENTIFICATION
numbers 1, 2, 3…

... are to be used within a project
classification A, B, C...

... makes it possible to recognize objects across projects
Three different aspects of doors

%JB1          Door type 1

#JB102        Door no. 102

-MB3.JB2      Wallsystem no. 3 .Door no. 2
Revision of ISO standard

Experiences and learning from
• the DBK ”part of” classification work in Denmark
• Swedish reports on evaluating the Danish DBK result and of mapping between the DBK and the Swedish BSAB classification
• Initiatives in other countries

The need for further development
• ISO 12006-2 – theoretical and conceptual work has to be done after the discovery of ”a missing link”
• DBK – in the cuneco-project by bips, Denmark
• Harmonization of new classification efforts across countries
The domain and interface of a classification system according to ISO 12006-2 and to object based information.
1st challenge: The object and its information over time

Instead:
It might be named as a construction entity part or a construction element with all its information as properties grouped in P-sets for the creation and reuse of the different parties according to IDM and MVDs...
Model- and object oriented structuring in relation to BIM

We used the Reference Designation System technique for organizing of Elements according to IEC/ISO 81346
Project plan

- Task force is established - housed by Danish Standards
- Henrik Balslev is convenor for the revision
- Finland, Norway, England, Sweden and Denmark is currently participating in the work
Structure for Property Data

Bygningsmodel
Type: #AA01
U-værdi: 1,2
Ekstern: True
Materiale: Tegl

Energiberegning

<table>
<thead>
<tr>
<th>Bygningsdel</th>
<th>Navn</th>
<th>Beskrivelse</th>
<th>Enhed</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Pnom</td>
<td>Nominel effekt</td>
<td>Watt</td>
<td>EN87625</td>
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<tr>
<td>AA (Væg)</td>
<td>U-værdi Varmeledningsevne</td>
<td>W/m²K</td>
<td>EN43721</td>
<td></td>
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The property data concept

Diagram:
- Væg
- Tykkelse
- Egenskab
- Objektklasse
- Væg1
- Objekt
- Egenskabsdata
- Tykkelse = 150 mm
Issues

- Naming conventions
- Classification
- User defines properties
- Versioning of properties
- The classification property
- Metadata for properties
- Properties at different stages
- The ‘State’ property
- The property database
Classification of properties

• The properties can be placed in a classification structure.

• The description for the property is searchable.
User defined properties

- Local properties, which are specific for a project
- Suggestions for global properties to be evaluated by cuneco

Egenskaberne Lokal_egenskab_1 og Lokal_egenskab_2 kan godt have samme navn uden at komme i konflikt med hinanden, da de er defineret indenfor rammerne af adskilte projekter.
Versioning of the property database

Other properties are selected for the project as they are used and linked to a certain version of the database

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<td>Dimension</td>
<td>mm</td>
<td>DS1586</td>
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<tr>
<td>BJK (Bjælke)</td>
<td>Material</td>
<td>Materiale</td>
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<tr>
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<td>Varmeledningsevne</td>
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<td>Varmeledningsevne</td>
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<tr>
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</tbody>
</table>
The "Classification" property

Classification properties are associated with all objects:

- CCS code (CCS_code)
- Alt. RDS-kode (AltRDScode)
Naming conventions for properties

• According to ISO/IS 10303-41:1994 like IFC, SPie and IFD

- Pset_ThermalLoadDesignCriteria
  - OccupancyDiversity (Diversity factor that may be applied to the number of people in the space)
  - OutsideAirPerPerson (Design quantity of outside air to be provided per person in the space)
  - ReceptacleLoadIntensity (Average power use intensity of appliances and other non-HVAC equipment in the space per unit area)
  - AppliancePercentLoadToRadiant (Percent of sensible load to radiant heat)
  - LightingLoadIntensity (Average lighting load intensity in the space per unit area)
  - LightingPercentLoadToReturnAir (Percent of lighting load to the return air plenum)
Metadata for properties

In time metadata for properties should be implemented; the notation could be:

property.unit
property.reference
property.status

Default values should be used so when e.g. the metadata ‘unit’ isn’t set the default value is ‘mm’.

In the short term deviances can be handled by creating new properties using the notation:

"property_reference"
Properties at different stages

Requirement doc.
Design doc.
Production doc.
As-built doc.

The development of the project

Documentation
Respons.: XXX
Stage: XXX
Infolev: XXX
Date: XX-XX

*RUM-OBJEKT*
Navn: Auditorium
Areal: > 100 m2
Temp: 21-24 °C
Lamper: som PH2

*RUM-OBJEKT*
Navn: Auditorium
Areal: 108 m2
Temp: 21,5-23 °C

*LAMPE-OBJEKT*
Navn: som PH2
Effekt: 100 W
Farve: Sort
The development of the project
The cuneco property database
Access to the cuneco property database
Test project - DNV Gødstrup
Test project - DNV Gødstrup

Bygherre:
Region Midtjylland

Totalrådgiver:
CuraVita
Arkitema Architects + AART Architects + NSW Arkitekter & Planlæggere A/S
Grontmij A/S
Moe & Brødsgaard A/S + Arup
Hospitalitet A/S

DNV Gødstrup – Det Nye hospital i Vest
Test project - DNV Gødstrup

Samlet areal ca. 135.000 m²
1. etape ca. 85.000 m²
2. etape ca. 50.000 m²
Samlet anlægssum 3,15 mia DKK
Test project - DNV Gødstrup

Tidsplan
1. etape

DNV GØDSTRUP

Programmering
Dispositionsforslag
Projektforslag
Hovedprojektering, start
Ibrugtagning, akutområde

Juli 2013
Test project - DNV Gødstrup

Tidsplan
Efterfølgende etaper

Programmering
Ibrugtagning

Primo 2014
2018 - 2020

DNV GØDSTRUP
Test project Gødstrup

• The organization behind the DNV-Gødstrup hospital project has demanded that the consultants on the project used the digital standards from cuneco.
• The reason for this was solely to get a smoother building process and more value for money.
• cuneco has cooperated with DNV-Gødstrup in order to make templates for the agreements in this regard.
Project organization for full scale test of cuneco standards

Participants in the test are:
- DNV-Gødstrup
- Curavita
- cuneco
- IT-vendors

A steering group is formed with a representative from DNV-Gødstrup as chairman.

A work group is establish in order to coordinate with the IT-vendors.

cuneco handles the coordination between the participants.
The test method

The test method is cyclical as the standards are being adjusted while the test is ongoing.
Finalizing activities

When the testing is done all the experiences will be processed into a report which will be published.

DNV-Gødstrup will continue to use the cuneco Digital Standards through stage 2 of the project.
Information about the test will be shared through the cuneco website as well as conferences and press material.
IT-vendors

The role of the IT-vendors is to:

• Implement the cuneco standard in the IT-solutions, which are to be used in the project.
• Test the implementation in the Curavita and DNV-Gødstrup IT-solutions.
• Successively adjust the IT-implementation according to the adjustment in the cuneco standards.
• Support Curavita and DNV-Gødstrup in the use of the IT-implementation of the standards.
• Share the experiences regarding the implementation of the standards with cuneco.
• Contribute to the external communication (articles and conferences) regarding the implementation experiences.
Next steps?

• Establishing an online database with properties
• Define common properties and making it possible for users to define and suggest new properties
• Making tables with classification tables available online
• Creating user interfaces for properties and classification
• Making web services to enable the support in IT-solutions
• Continue working on classification tables, property sets and information levels
• Suggesting adjustments to the buildingSMART and standardization communities