Building information modelling BIM

Mon 18.04.2016
Introduction & Conservation

Repair methods of the roofing structures

Repair methods of the window and the door structures

Repair of fire damage

Repair methods for wooden structures

Strengthening of building structures

HVAC-renovation

The use of ICT for condition assessment of structures
BIM talk

Vincent Kuo
BIM is like teenage sex. Everyone claims they’re doing it, but few are really doing it. And for the very few that are actually doing it, they are doing it quite poorly!!!

Do you agree? Why?
View Elefanttikortteli .SMC file

3+ points how it can be useful for the renovation case
Today:

1. Team presentations (15min)
2. Short reflection (10min)
3. BIM in a nutshell (30min)
4. Solibri functions (10min)
5. Discussions (5min)

Total (1hour 10min)
1. Team presentations
BIM

HVAC - group
Everyone claims they are using BIM...
...since they are aware of the advantages
• provides an improved quality of data since common data base, permanent synchronizing
• direct and continuous availability of actual and relevant data for all participants
• improved communication between participants of planning
  → less mistakes in planning
  → easier creation of 3D visualization
  → increasing productivity of planning process concerning costs, due dates and quality

but few are really using it...
• USA: BIM is standard
• other countries: mainly just used by private enterprises, larger architecture offices
• still too much open questions:
  → Who is paying the additional amount of work for the 3D model?
  → Who is liable for the correctness of the input data in the model in case?
  → How does the data exchange between software packages of different producers work?

the very few that are using it, are doing it quite poorly.
• lack of instruction and coordination for the whole personnel
BIM file can be useful for the renovation case

- Enhanced information exchange between professions. (added document control, including sharing models, meeting minutes, project images)

- Detections of places where there are problems, avoid potential requirement of re-design, for example it can show you if the new ventilation tube is passing thru supporting construction or not

- Reduction in remedial works due to enhanced quality control and design coordination

- Increase the accuracy of renovation cost
Sources:

http://de.wikipedia.org/wiki/Building_Information_Modeling

BIM: Building Information Modelling

GROUP: STRUCTURES
Why is BIM such a big deal?

BIM is a fairly new concept in the construction industry. Most companies do not trust the softwares but they use it as a way to satisfy their customers. Most people don’t know how to use but claiming to know BIM adds on to their individual value.

People who may be trained in BIM usually use online tutorials, which does not add on to the knowledge behind the concept but only teaches one to use the softwares.

BIM softwares are often though of as 3D Autocad softwares, due to the lack of knowledge at the theoretical level.
BIM and Renovation

BIM can be used to model the new parts in the existing structures, for example, in Elefantikortteli, BIM was used in modelling the new HVAC system in the attic.

BIM can also be used for conflict checking between the new HVAC layout and the existing structural layout of the building.

BIM can also be used for scheduling the renovation operation, similar in case of a new construction project.
2. Short reflection

Slide 1
1. How many are “doing BIM”? 
2. How well are they “doing BIM”? 

Basically need to address: 
What is BIM? 
What measurable value/goal should BIM achieve? 
   How is (should) BIM be used? 
   How do we measure outcome of BIM? 

Slide 2 
How does the use of .smc file help daily work of engineers realistically
3. BIM in a nutshell
What is Building Information Modelling (BIM)?

Cooperative Research Centre for Construction Innovation, 2009

1. Digital 3D objects

2. Object information /properties beyond graphical representation

3. Methodology, approach, process or philosophy
Construction impressions
BIM is "NOT" merely a software package rendering 3D graphics
Common functions of BIM in construction:

- Visualisation
- Quantity take-off (cost)
- Scheduling (time)
- Clash detection
- Safety planning (construction and operation)
- Rule-based model checking
COST?

Jyrki Keinänen
CEO A-Insinöörit

BIM costs **3-5 eur** more per man hour

Presume engineer earns **3000 eur monthly** about **18,75 eur an hour**

Thus BIM **16%-27%** more

Tekla/Revitt/Navisworks/Solibri/Archicad cost?
Data interoperability?

IFC (International foundation classes)

[Diagram showing the history of IFC releases from 1985 to 2005]
Data interoperability?

Test data exchange IFC:
Data interoperability?

Test data exchange IFC:

*e.g. Turk, Ž. (2008). INTEROPERABILITY IN PRACTICE: GEOMETRIC DATA EXCHANGE USING THE IFC STANDARD.*

“examples revealed several cases of *information distortion and/or information loss* both on the *entity and attribute level*. *Unsatisfying* model handling proved to be characteristic of *all the tested exchange scenarios.*”
## Table

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<th>Entity/Application</th>
<th>Smiley West.ifc</th>
<th>AHUS house.ifc</th>
<th>NHS office.ifc</th>
<th>ResidentialHouse.ifc</th>
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<td>ADT</td>
<td>ADT</td>
<td>ARC</td>
<td>ALL</td>
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</table>

*Origin application.*
Geometric issues

- Geometry distortion – columns and/or walls are not aligned, slab and roof elements are misplaced.
- Required attachments not present (e.g. opening to wall).
- Element connections not correct (wall connection).
- Misplaced window shutters.
- Changed artefact shape (windows).
- Changed (layer) colour of elements presenting the same artefacts.
- Changed material properties (or not preserved).
- Changed position (layer) colour of furniture elements (or not preserved).
- Changed shape/dimension of ambient artefacts, etc.
Owner’s requirement

BIM use in the UK is being driven rapidly by the government mandate requiring BIM use by 2016.

By contrast, US government BIM policies only exist at a few agencies and have not had the same effect.

Owners Are Aware of Core Team BIM Usage, But Less so for Other Team Members
**Owners’ Ratings of BIM Benefit Statements**
(Those With a High or Very High Level of Agreement)


<table>
<thead>
<tr>
<th>Statement</th>
<th>US Owners</th>
<th>UK Owners</th>
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<tbody>
<tr>
<td>BIM Visualization Enables a Better Understanding of the Proposed Design</td>
<td>66%</td>
<td>98%</td>
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<tr>
<td>There Are Fewer Problems During Construction Related to Design Errors,</td>
<td>53%</td>
<td>85%</td>
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<tr>
<td>Coordination Issues or Construction Errors</td>
<td></td>
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<tr>
<td>BIM Analysis and Simulation Capabilities Produce a More Well-Reasoned</td>
<td>50%</td>
<td>92%</td>
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<td>Design</td>
<td></td>
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<tr>
<td>The Use of BIM Generates a Beneficial Impact on Project Schedule</td>
<td>49%</td>
<td>85%</td>
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<tr>
<td>The Use of BIM Generates a Beneficial Impact on Control of Construction</td>
<td>44%</td>
<td>72%</td>
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<tr>
<td>Costs</td>
<td></td>
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</table>
BIM ROI for Users by Level of Engagement


- Negative or Break-Even
- Very Positive (Over 25%)
- Moderately Positive (Up to 25%)

Low Engagement:
- 64% Negative or Break-Even
- 33% Moderately Positive
- 20% Very Positive

All BIM Users:
- 37% Negative or Break-Even
- 36% Moderately Positive
- 27% Very Positive

Very High Engagement:
- 37% Negative or Break-Even
- 37% Moderately Positive
- 67% Very Positive
Levels of BIM Adoption in North America


- **2007**: 28%
- **2009**: 49%
- **2012**: 71%
Perceptions of BIM in Finland today

What are the best practices enabled by BIM in construction?
Interviews

- Design
- Design
- Design & Construction
- Design & Construction
- Construction
- FM/maintenance
What is BIM?

- Tomi Henttinen (CEO of Gravicon&Chair of buildingSMART Finland)
  “BIM is process-related; BIM means IFC – open shared data.”
- Jarmo Laitinen (Professor of ICT in Construction, TUT)
  “BIM means Building Information Management, a supporting element which enables lean construction.”
- Leif Granholm (Senior VP at Tekla)
  “A communication technology that conveys information in the processes.”
- Ilkka Romo (VP, R&D at Skanska Finland)
  “A tool to help and make the processes more reliable and efficient.”
<table>
<thead>
<tr>
<th>Practices</th>
<th>Times mentioned</th>
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<tr>
<td>Collision/Clash detection</td>
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<tr>
<td>Visualization</td>
<td>6</td>
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<tr>
<td>Quantity take-off (counting)</td>
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<tr>
<td>Scheduling</td>
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<td>Energy Simulation</td>
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<td>Reporting and checking</td>
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<td>Continuous performance measurement</td>
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<td>Mobile apps</td>
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<td>Safety planning</td>
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<tr>
<td>Alternatives testing</td>
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<tr>
<td>Identify function system</td>
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</tbody>
</table>
1. Clash detection
1. Clash detection

“This is the answer you are going to get from everywhere” – Pauli Jantunen, Gravicon
2. Visualization

“Better shared understanding”
2. Visualization

Client Communicate with design teams

Alternative design proposals

“We are doing totally stupid things, because the client doesn’t know what he is buying.” – Ville Pietilä, MAD
2. Visualization

Site supervisor and construction workers
Get familiar with the project, plan work beforehand, monitor ongoing construction work

“More than 150 Ipads are used on site by site supervisors in Finland from Skanksa, which contain all the BIM 3D models”
– Ilkka Romo, Skanska
2. Visualization

Marketing

a) Web marketing supported by 3D renderings & videos

b) Mobile applications
3. Quantity take-off

Traditional cost estimation methods:
Total cost = cost per square meter x total project area
= cost per unit x number of units

“How many times they calculate the same quantity/do the same searching from the building during its construction? The average is 11 times.” - Ville Pietilä, MAD
4. Scheduling
4. Scheduling

An example
Color codes: orange = completed/installed, blue = this week, green = next week, yellow = scheduled, in over two weeks, purple = scheduled, in over two weeks and a different contractor (Source: SRV, Flamingo project, Vantaa)
Solibri
Schools of thought about BIM

Why is BIM not compellingly delivering on it’s (theoretical) promises?

1. People are using it wrong

2. BIM is just a hype and a money-making scheme

3. So-called BIM tools need drastic improvements

4. BIM is indeed the greatest!

4. All of the above
My recommendations

Be wary of:
BIM consultants, BIM experts, BIM researchers, BIM evangelists

Don’t resort to “religious debates” about BIM

Trust in critical engineering reasoning

Challenge ideas and play devil’s advocate (but don’t be a douchebag!)

“It is the mark of an educated mind to be able to entertain a thought without accepting it”
– Aristotle
Stay in touch!
I’m happy to chat anytime over coffee/tea/beer/whiskey/whatever

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# Summary

## Lecture summary

- Introduction
- BIM in a nutshell
- Solibri functions

## Next Lecture:

- 25.04.2016
- Heating, Ventilation, and Air Conditioning (HVAC) Renovation