Experiences from the BIM-Adoption in Finland and UK
– Clients as the drivers of innovation

Prof Arto Kiviniemi
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Background
BIM is nothing new...

First paper about BIM
Chuck Eastman “The use of computers instead of drawings in building design” (March 1975)

ISO STEP
(Standard for the Exchange of Product Model Data)

ArchICAD
1st BIM software for PCs (Mac)

IFC 1.5.1
1st integrated BIM project
HUT-600 in Finland

Autodesk
Revit

Revit
1st IPD project in USA

1st BIM requirements
GSA (USA) & Senate Properties (Finland)

BIM becomes mandatory in public projects in the UK


Increasing industry interest in BIM

Announcements of UK Government’s BIM requirements

National BIM requirements in Finland


Early BIM research

Building Product Modelling

Building Information Modelling

Same old concept, new name...

IAI
International Alliance for Interoperability, now buildingSMART

1st BIM project
HUT-600 in Finland

1st BIM software
for PCs (Mac)

IFC 2x3
1st integrated BIM project
HUT-600 in Finland

Autodesk
Revit

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Early BIM research

Building Product Modelling

Building Information Modelling

Same old concept, new name...
Construction industry is slow to change
The industry needs a wake up call...

...which usually comes from the public clients
Finland
Early BIM research and adoption
Long history of BIM activities in Finland

Source: Preliminary analysis of BIM Finland-Quebec interviews by Gulnaz Aksenova/ETS
**Vera - Information Networking in the Construction Process 1997-2002**

-**Significant effort**
  - Duration 6 years, in total 161 projects
  - Budget €47 million – in a country of 5 million people
Information lifecycle – project view

- Briefing
- Sketching
- Design, Engineering
- Planning, Cost Information
- Construction
- Facility Management
- Demolition
- Briefing for Changes
Information lifecycle – business view

Client’s core business

FM services

Change adaptation

Building process

New needs

Design

Construction
BIM pilots of Senate Properties 2001-2006

As the result of testing, Senate Properties started to demand BIM in all projects since October 1st, 2007.

- HAKA6
  - Lohipato school
  - Aurora 2
  - Helsinki Music Centre
- TUT Administration
- Upinniemi Central Warehouse
- Tietotalo 2, Oulu
- Didacticum
- Torikatu 36, Oulu
- HU Animal Hospital
- VTT Digi Building
- Canthia
- 2001
- HUT-600
- BIM used only in one phase of the project
- BIM used in all phases of the project
- All participants used BIM
- Only one participant used BIM

2001

HUT-600

Tietotalo 2, Oulu

TUT Administration

Upinniemi Central Warehouse

Torikatu 36, Oulu

HU Animal Hospital

VTT Digi Building

Canthia

Helsinki Music Centre

Lohipato school

Aurora 2

As the result of testing Senate Properties started to demand BIM in all projects since October 1st, 2007.
First integrated BIM project using IFC: HUT-600

Report “Product Model & 4D CAD: Final Report” (TR143)
available at  http://cife.stanford.edu/node/325

Martin Fischer and Calvin Kam / CIFE - Stanford University
ProIT - BIM in industry’s technology strategy

Courtesy of Confederation of Finnish Construction Industries 2002
Main Results of the Vera programme

- **Wide adoption of BIM as a part of AEC industry processes and strategy**
  - Industry consensus about the importance of ICT and about the role of BIM
  - The industry recognised the central role of information management to improve productivity, quality and processes
  - Industry started to use integrated BIM in projects
  - This was at that point, 2002, globally quite unique situation

- **International Networks**
  - BuildingSMART (at that time IAI, International Alliance for Interoperability) has just started and provided an excellent networking platform for Vera
  - Internationally exceptionally good visibility for Finnish companies and research institutes, and Finland achieved global position as one of the leading countries in the BIM development and adoption.

- **New Software Products**
  - One of the key results of Vera was creation of basis for many innovative BIM software products, which have gained strong international position.
What after Vera?
From Senate Properties BIM Guidelines to COBIM 2012

Senate Properties BIM guidelines 2007

- Volume 1: General part
- Volume 2: Modeling of the starting situation
- Volume 3: Architectural Design
- Volume 4: MEP design
- Volume 5: Structural design
- Volume 6: Quality assurance and merging of models
- Volume 7: Quantity take-off
- Volume 8: Using models for visualization
- Volume 9: Use of models in MEP analysis

National BIM Requirements – COBIM 2012
RYM – Strategic Centre for Science, Technology and Innovation

2010-2014

Built Environment Process Re-engineering (PRE)

The just finished PRE program of RYM Oy, the SHOK company for the built environment, strengthens Finland’s position as the global leader in BIM (Building Information Management) research and introduction. BIM can improve construction quality, productivity and customer service radically. The PRE (Built Environment Process Re-Engineering) program carried out in 2010–2014 involved 37 companies and 6 research institutes. With support from Tekes, they invested a total of about €21.8 million in the development of new BIM (Building Information Management) based procedures and business models.

The program consisted of six thematic work packages (driver company in parentheses):

Model Nova – Use of BIM during property’s life cycle from the owner’s perspective (Senate Properties)
NewWOW - Changing nature and requirements of knowledge work and their impact on management of an organization and spaces (Rapal Oy)
BIMCON - BIM-based product data management in the delivery chain of industrialized building (Skanska Oy)
DRUM - Entity data models and standards (Tekla Oy)
Infra FINBIM – Future innovation-based delivery chain of the infra sector (VR Track Oy)
BIMCity - Platform for dissemination, evaluation and development of community-level built environment digital models (FCG Oy)
Identified problems after Vera in 2003 and now

- **Activation of facility owners**
  - One of the central goals was not achieved. Vera Programme could not activate sufficiently the facility owners to participate in the R&D projects.
  - *This is still a big problem; private clients are not actively adopting BIM*

- **Efficiency in dissemination of the results**
  - A common problem in R&D efforts is that each project creates a lot of knowledge and information, which often is utilised by the project participants only.
  - There is clear need to develop methods for more efficient dissemination, which would significantly strengthen the impact of R&D programmes.

- **Development of AEC/FM education**
  - Universities providing education for AEC/FM professions were not actively initiating, nor participating in the projects. The effects of the changes in technology were not recognized in the education.
  - *The situation is now significantly better, but in many universities the AEC education is still based on traditional methods*

- **There seems to be some “battle fatigue” in Finland**
  - *BIM is widely used, but further R&D has significantly slowed down*
United Kingdom
Current world leader in BIM adoption speed
Point of the Departure in UK in May 2010

When I started in UK in May 2010, most people, both in the industry and universities, felt that modelling is not, and will not be, important for AEC professionals in the near future:

”The industry needs people who can make drawings with CAD and our task is to provide those skills. There is no industry demand for BIM and we cannot start teaching it. 3D modelling is too expensive for the industry and too complicated for our students.”
Big Bang: Paul Morrell on 1st October 2010

The government’s chief construction adviser Paul Morrell has indicated that Building Information Modelling (BIM) will become a key part of the procurement of public buildings.

Speaking at Autodesk’s BIM Conference yesterday, Morrell indicated that bidders and contractors on future public building projects would be asked to use BIM.

Construction Strategy 2011: Government will require fully collaborative 3D BIM with all project and asset information, documentation and data being electronic as a minimum by 2016.

...adoption of BIM will put us at the vanguard of the new digital construction era ...

Francis Maude
Minister for the Cabinet Office

http://www.bimtaskgroup.org/
BIM Task Group partners

- BIM4 Steering Group
- Technology Strategy Board
- CIC BIM Regional Hubs
- BIM4LG
- BIM2050 Group
- BSI
- BIM4FM Group
- BIM4 Private Sector Clients
- BIM For Retail
- BIM4SMEs
- BAF
- BIM4SupplySideDelivery

- BIM 4 Infrastructure (UK)
- BIM4RailUK
- BIM4Water
- BIM 4 Data Centres
- Building SMARTUK
- The National Improvement and Efficiency Partnership (NIEP)
- Construction Industry Council (CIC)
- Survey4BIM
- National Institute of Building Sciences US
- BIM4FitOut
- BIM4M2
Current savings and adoption rate

Public Projects at BIM level 2

Approximate value of BIM Projects as September 2014
(1) HA - This equates to £6bn project value
(2) MOJ - This equates to £760m project value
(3) EA - This equates to £900m project value
(4) LA - This equates to £2bn project value
(5) EFA – This equates to £13m project value

Total project value c £9.73bn – Target £20bn
(Returns exclude MOD, DoH, HS2)
BIM Toolkit – Digital Plan of Work (dPoW)

The NBS BIM Toolkit provides step-by-step help to define, manage and validate responsibility for information development and delivery at each stage of the asset lifecycle.

"The NBS BIM Toolkit will allow the industry to enforce a discipline and rigour across building design and delivery that doesn't exist at present." — Alistair Kell from BDP

WHO IS INVOLVED?

The BIM Toolkit project was initiated by HM Government's BIM Task Group and funded by Innovate UK.

Development was provided by NBS in association with the BIM Academy, RICS, Microsoft, BDP, Mott MacDonald, Newcastle University and Laing O'Rourke.

Support was provided by APM, BIFM, CIBSE, CIOB, ICE, IStructE, RIBA and RICS.
BIM Toolkit – Digital Plan of Work (dPoW)
BIM is not about buildings only!

Case Crossrail, London
Crossrail: Route Across London

Source: Malcolm Taylor, Head of Technical Information, Crossrail, June 2013
Contractual Complexity
Cost Savings

- Finding information – from our “single source of truth”
- The creation of non-CAD deliverables e.g. reports, lists, mailings, databases
- The creation of models and drawings

At Farringdon Station
- 3D model linked to the delivery programme
- cost £120k but saved over £8million from risk contingency (interfacing complexity)

Source: Malcolm Taylor, Head of Technical Information, Crossrail, June 2013
Crossrail Vision

A responsive, efficient, flexible railway that adapts to variations in demand and perturbations

Engaged motivated, valued people with tools to diagnose, predict and advise

Central Data Hub

Asset Information
Intelligent Assets that manage themselves and require minimal human intervention

User Applications

SERVICE

Predictable 24/7
Seamless - Bin to train
Comfort
Safety to your destination

ASSETS

Stations
Rolling Stock
Infrastructure

Source: Malcolm Taylor, Head of Technical Information, Crossrail, June 2013
## Conclusion

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<th>£14,800,000,000</th>
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<td>1,250,000</td>
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<td>e-Documents stored – so far!</td>
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<td>Individual CAD users – so far!</td>
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<td>61</td>
<td>Main Construction Contracts</td>
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**It would all be much harder without BIM!**

Source: Malcolm Taylor, Head of Technical Information, Crossrail, June 2013
The change will not stop in 2016...

**Construction 2025**

- **Lower costs**
  - 33%
  - Reduction in the initial cost of construction and the whole life cost of built assets

- **Faster delivery**
  - 50%
  - Reduction in the overall time, from inception to completion, for newbuild and refurbished assets

- **Lower emissions**
  - 50%
  - Reduction in greenhouse gas emissions in the built environment

- **Improvement in exports**
  - 50%
  - Reduction in the trade gap between total exports and total imports for construction products and materials

**Built Environment 2050**

A Report on Our Digital Future
UK Government as the client
BIM has woken the industry up
Why is UK now bypassing Finland?
Industry interest in BIM development in Finland

(\textit{my personal view})
What crucial is missing from the Finnish discussion?

Preliminary NVIVO analysis of BIM Finland-Quebec interviews by Gulnaz Aksenova/ETS
The question is **NOT** about the technology!
How do we procure services, select and incentivise the team?

Is the team capable to do the things we want it to do?
If you want the winning team, do you select the cheapest players or do you select players with the right skills for every position?
Major challenge both in Finland and UK: Changing the education
Are we educating for the past or for the future?

What is needed in the future?
What can be excluded?
How to get the universities to change their curricula?
Conclusions

• **Rapid BIM adoption has always started from the demand by the public clients or government;** not only in Finland and UK
  • When industry is forced to use BIM, they start to see the benefits
  • To get the private clients interested we must be able to **quantify the lifecycle benefits to the clients** more clearly.

• **When the BIM development and adoption started in Finland, the situation was significantly different** than today.
  • 18 years ago tool development was crucial for the programme, but although it is not so important any more, the **focus in Finland seems to be still there.**

• **BIM is not a technological but process and business issue**
  • The BIM adoption requires active change management in organisations.
  • New collaborative contractual and process models are crucial for full benefits.

• **Education lags easily behind the industry needs** in the rapidly changing situation; this is a problem both in Finland and UK
Thank you for your attention.

Any questions?