Tekes

Finnish ICT Strategies in Technology Development Programs for the Construction and Real Estate Cluster

Vera

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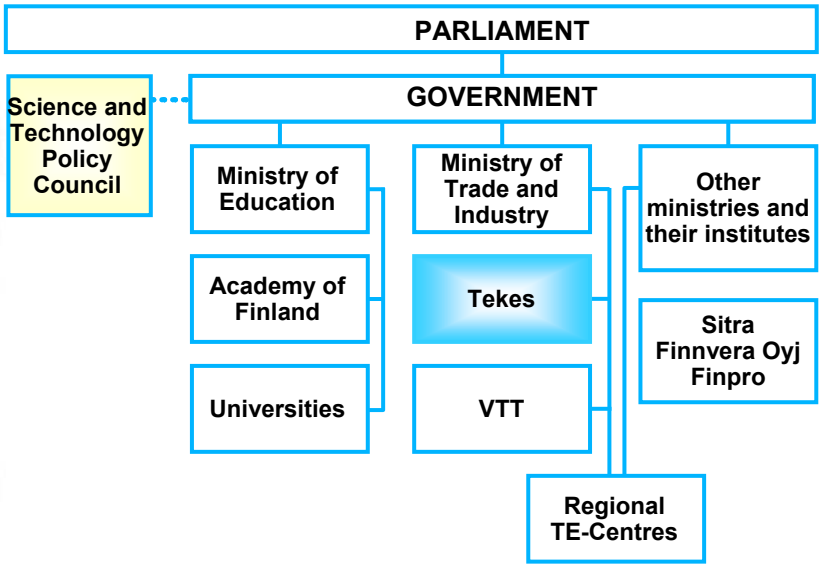
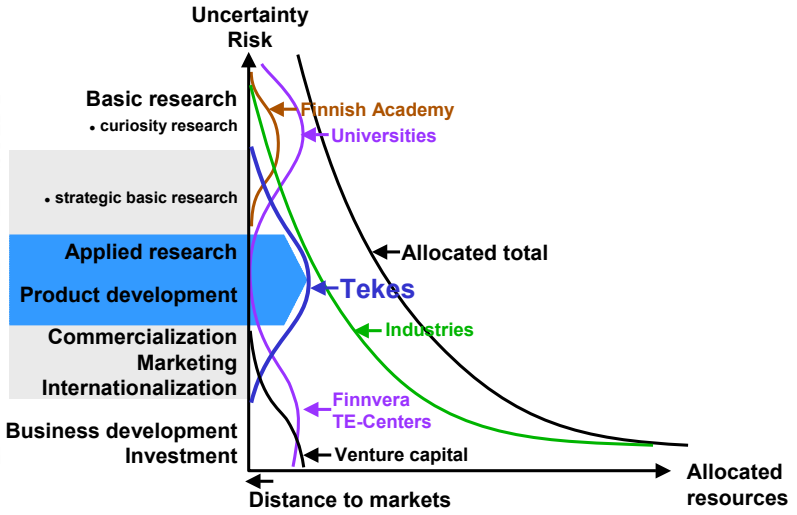
Public Sector R&D Activities in Finland

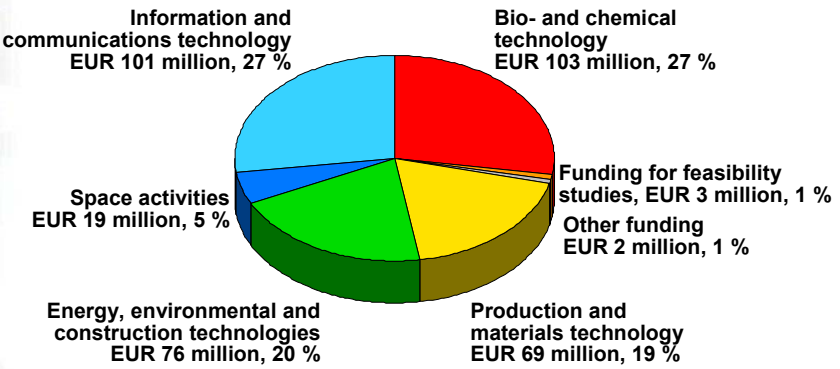


Allocation of R&D resources



Total Tekes R&D Funding in 2000

Total EUR 373 million and
2 297 financed projects



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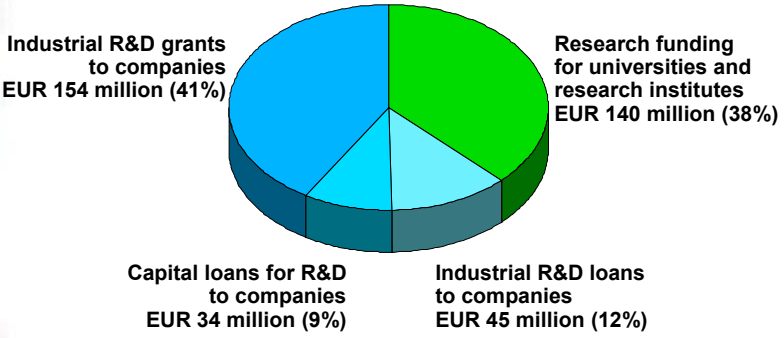
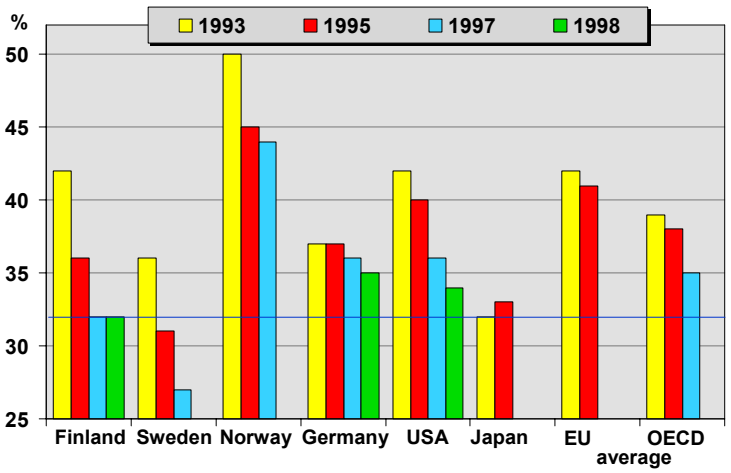
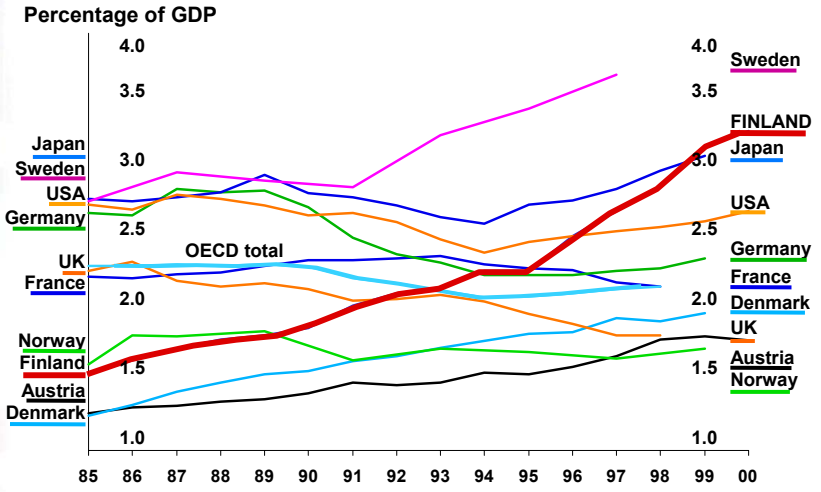


The share of R&D activities funded by the public sector



Source: OECD, Main Science and Technology Indicators, 1999

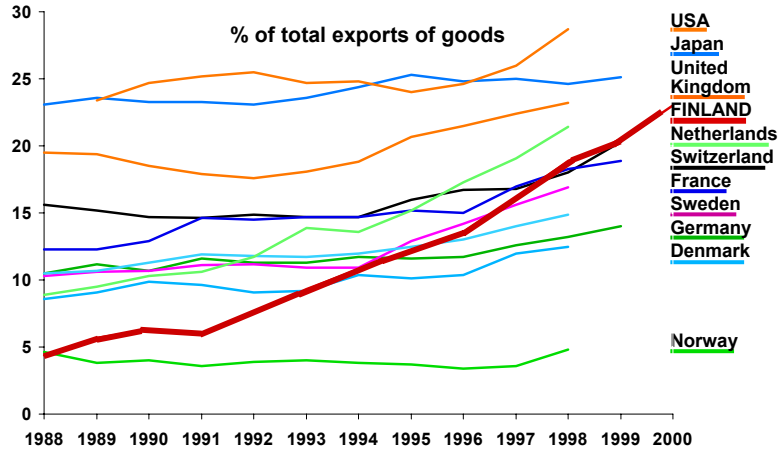
R&D input in some OECD countries 1985 - 2000



Source: OECD, Main Science and Technology Indicators Database

The share of high tech exports

Estimated exports of Finnish high tech products totaled EUR 11 billion in 2000, i.e. 23 % of total exports of goods.



Sources: Statistics Finland, according to the OECD product catalogue defined in 1995

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Competitiveness Scoreboard 1996-2000

International Institute for Management Development

	Total Ranking				
	1996	1997	1998	1999	2000
USA	1	1	1	1	1
Singapore	2	2	2	2	2
FINLAND	15	4	5	3	3
Netherlands	7	6	4	5	4
Switzerland	9	7	7	6	5
Ireland	22	15	11	11	7
Germany	10	14	14	9	8
Sweden	14	16	17	14	9
Canada	12	10	10	10	11
Denmark	5	8	8	9	12
Japan	4	9	18	16	17
France	20	19	21	21	19

Source: IMD (International Institute for Management Development), The World Competitiveness Yearbook 2000. The table contains top ranking and some interesting countries from Finlands point of view.

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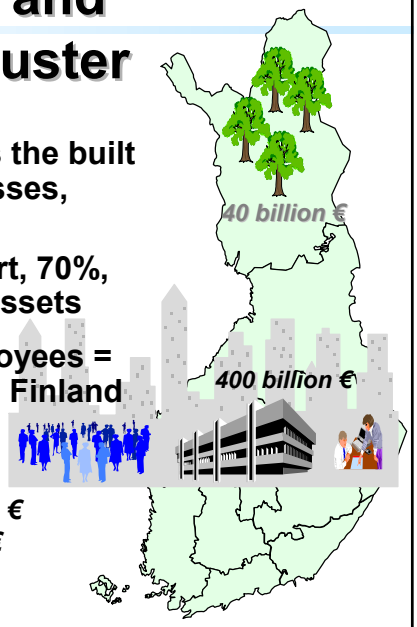
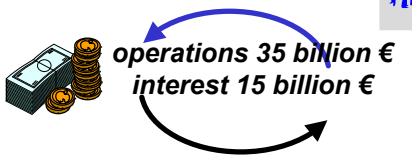
Technology Programs

- Extensive programs initiated by Tekes and consisting of numerous projects
- Focused on a key technology sector
- Implemented in cooperation by companies and research units
- Companies can participate with their own projects or by joining in common research projects
- Projects and results are partially public, but the results of industrial projects are proprietary

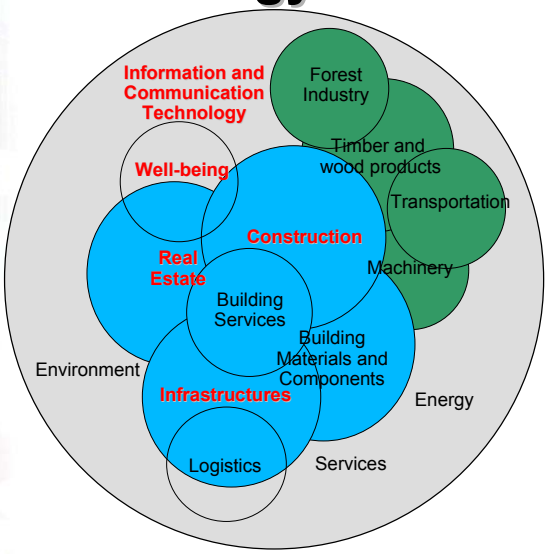
The Real Estate and Construction Cluster

- Produces and maintains the built environment for businesses, services and living
- Constitutes the main part, 70%, of the Finnish national assets
- More than 500 000 employees = 20% of the work force in Finland





Tekes: Construction and Wood Technology Cluster



Tekes mission:
R&D must become a constant part of the normal business also in the AEC/FM industry

Change in the basic philosophy:
We must move from minimizing the costs to maximizing the added value

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Construction and Wood Technology Programs in 2001

		Total budget EUR million	Participating Companies	Participating Research Units
ProBuild - Progressive Building Process	1997-2001	**13**	*42*	*6*
Vera - Information Networking in the Construction Process	1997-2002	**42**	*59*	*9*
Healthy Building	1998-2002	**21**	*105*	*18*
Value Added Wood Chain	1998-2003	**34**	*60*	*15*
Divan - Technology and Development Program for the Furniture Sector	1999-2002	**13**	*55*	*6*
Stone - Technology and Development Program for the Stone Industry	1999-2002	**10**	*110*	*10*
Rembrand - Real Estate Management and Services	1999-2003	**21**	*65*	*5*
INFRA - Civil Engineering and Services	2001-2005	**24**	*1*	*0*

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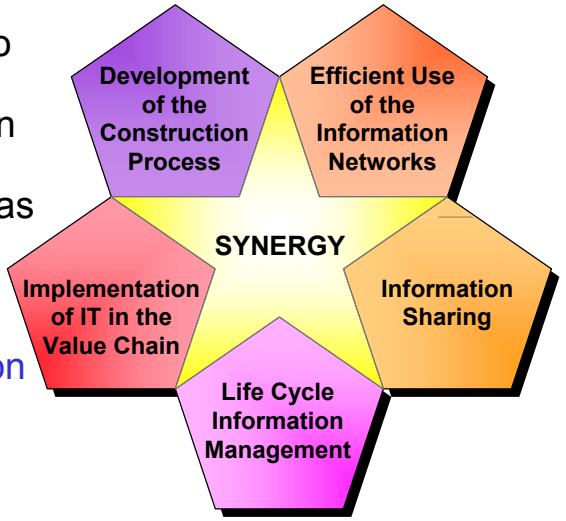
Vera Program Target

The target is to promote the implementation and use of IT and networks as the enabling technologies to re-engineer the construction process



Information Networking in the Construction Process

Vera Program Volume

- Schedule - six years; 1997 - 2002
- Volume

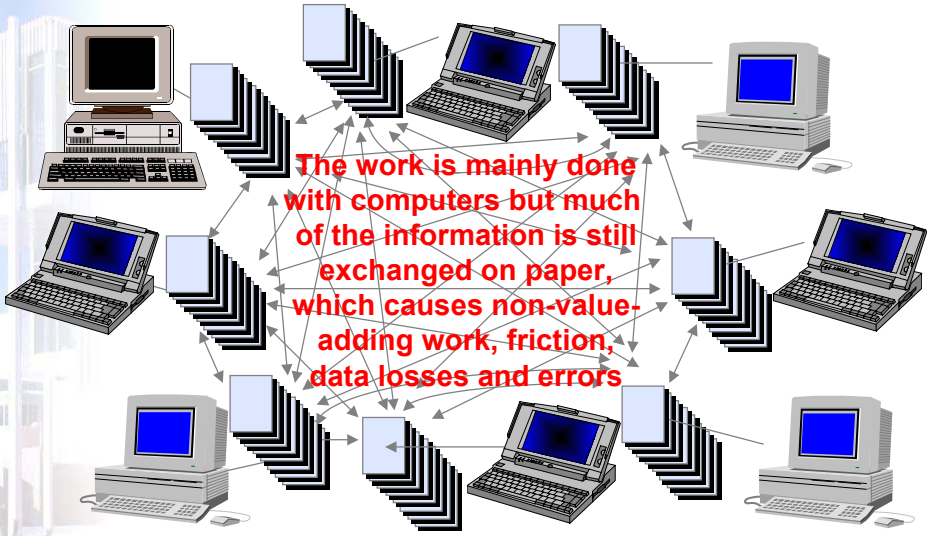
Original budget	*170 million FIM*	*(28.5 million €)*
Current budget	250 million FIM	(42.0 million €)
45 % by Tekes	115 million FIM	(19.3 million €)
55 % by the industry	135 million FIM	(22.7 million €)

- Current project allocation

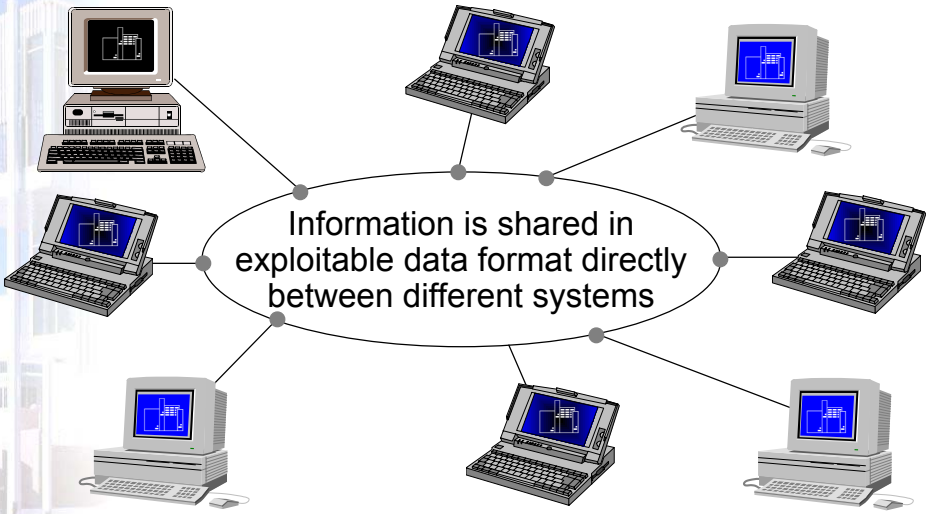
Research projects:	37 / 22 million FIM	(3.7 million €)
Industrial projects:	89 / 170 million FIM	(28.6 million €)
Total:	126 projects / 192 million FIM	(32.3 million €)

- Short project presentations in the web http://cic.vtt.fi/vera/english.htm

Current Problem in AEC/FM



Goal in the Future



Requirements for Networking

- Infrastructure
  - high-capacity networks
- Common information language
  - standardized/agreed data structures
  - software support for data sharing
- Tools and processes
  - computers connected to the networks
  - software support for collaboration
  - deployment of eBusiness
- Culture
  - will to collaborate
  - sufficient ICT know-how

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IFC - the Common Information "Language"

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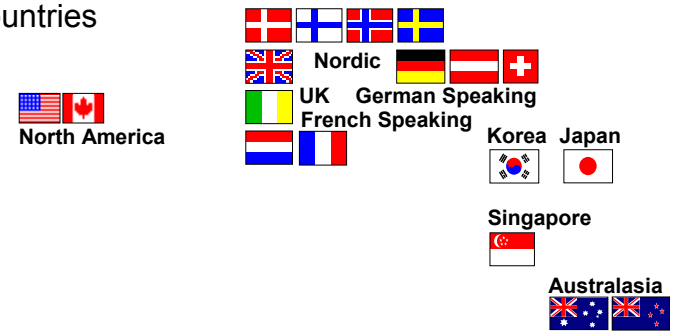
IAI - International Alliance for Interoperability

- Defining IFC (Industry Foundation Classes) - an industrial product data model describing buildings
- First commercial IFC implementations available
- 9 Chapters, more than 650 member organizations in 20 countries



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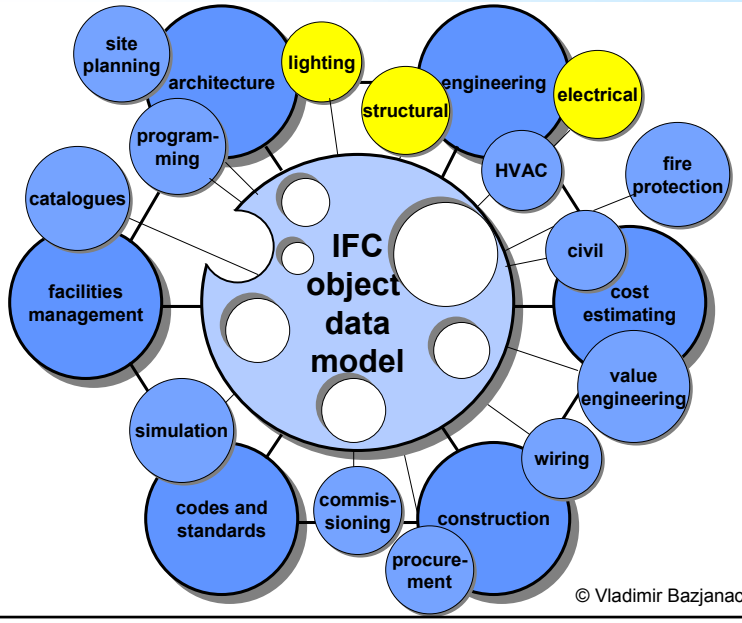
Current Status of IFCs



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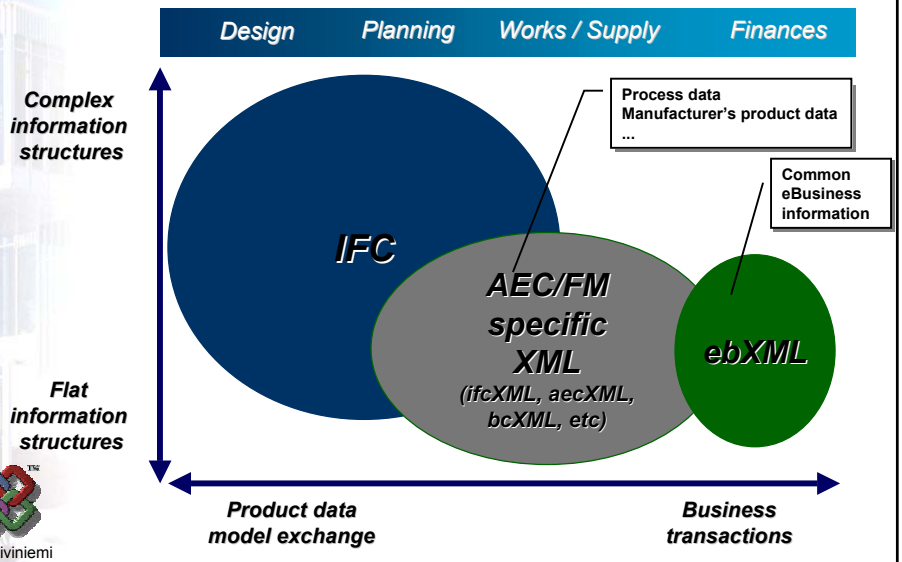
IFC and XML - One possible interpretation



Current IFC Implementations

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IFC R1.5.1 Software

1. Autodesk (USA) - ADT
2. Data Design System (Norway) - DDS
3. Graphisoft (Hungary) - Archicad
4. H.A.N. DATAPORT (Germany)
5. Nemetschek (Germany) - Allplan FT
6. Olof Granlund (Finland) - BSPro

IFC R2.0 Software - BLIS

1. Claire project (France) - IFC Viewer
2. Eurostep (Finland) - WebSTEP
3. Graphisoft (Hungary) - Archicad
4. LBNL (USA) - EnergyPlus
5. Microsoft Corporation (USA) - Visio 2002 Professional

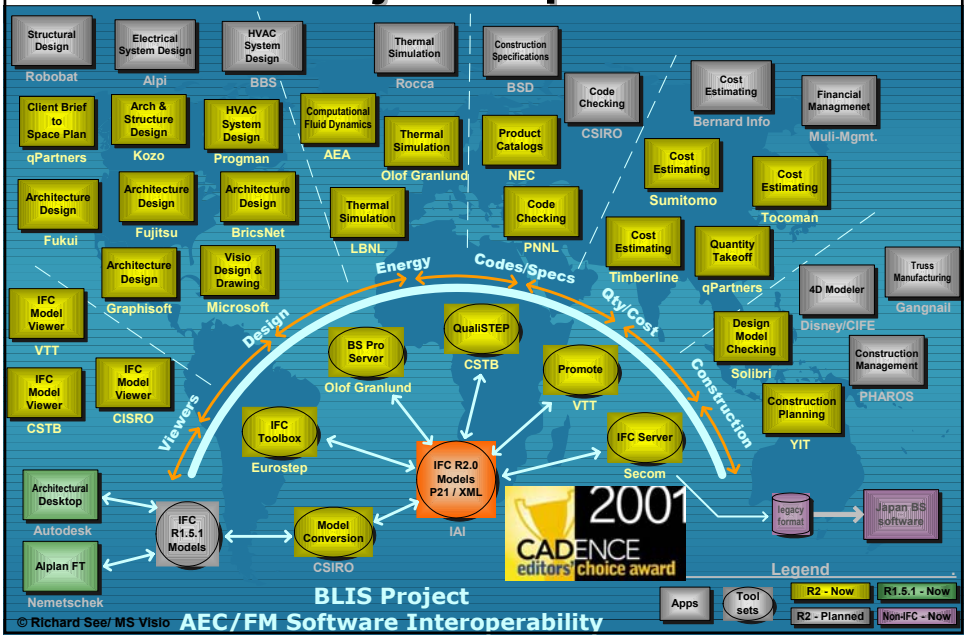
IFC R2.0 Software - BLIS ...

6. Olof Granlund (Finland) - BSPro
7. Olof Granlund (Finland) - Riuska
8. PNNL (USA) - ComCheck EZ
9. Skanska Construction (Sweden/Finland) - Facets
10. Solibri (Finland) - Model Checker
11. Timberline Software (USA) - PECAD
12. TOPS (Japan) - VRML Viewer
13. YIT Construction (Finland) - COVE

IFC Toolboxes (R1.5.1 & R2.0)

1. ECCO (Germany)
2. Eurostep (Finland)
3. Jotne EPM (Norway)

BLIS Project Implementations



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IFC is only a part of the solution

- IFC is only an enabling specification; a component for solution development and implementation
- Solution components:
  - Enabling technologies
  - ICT infrastructure
  - Enabling specifications
  - Software applications
  - Processes
  - People

Common ICT development

⇦ IAI/IFC (+ others)

⇦ Software industry

AEC/FM industry

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Effects to the Tools, Roles and Processes in the AEC/FM Industry

Design and Engineering Processes

- Models can contain complex rules for behavior and relations between objects
  - (semi)automated design integration and code checking
  - easy and cost efficient evaluation and simulation at any project stage
    - thermal, lighting and performance simulation
    - more accurate cost estimation
- New service areas for designers/engineers
  - LCA/LCC services
  - information maintenance
  - FM services...

Construction Process

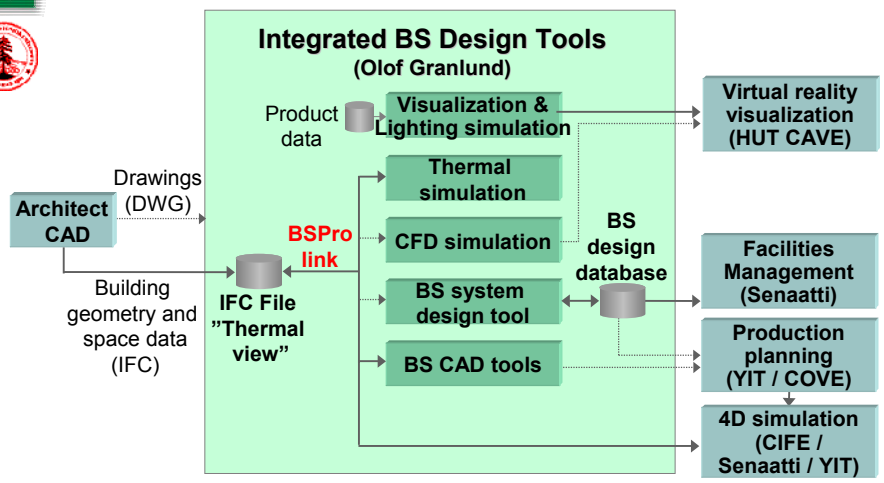
- Information as a part of the product:
  - building maintenance database based on as-built information
  - product information as a part of eCommerce
  - product libraries with direct interface to design and procurement software and building data models ⇨ IFC compliant XML
- Change requires:
  - tools supporting new processes
  - real partnering
  - sharing the benefits through the AEC/FM industry

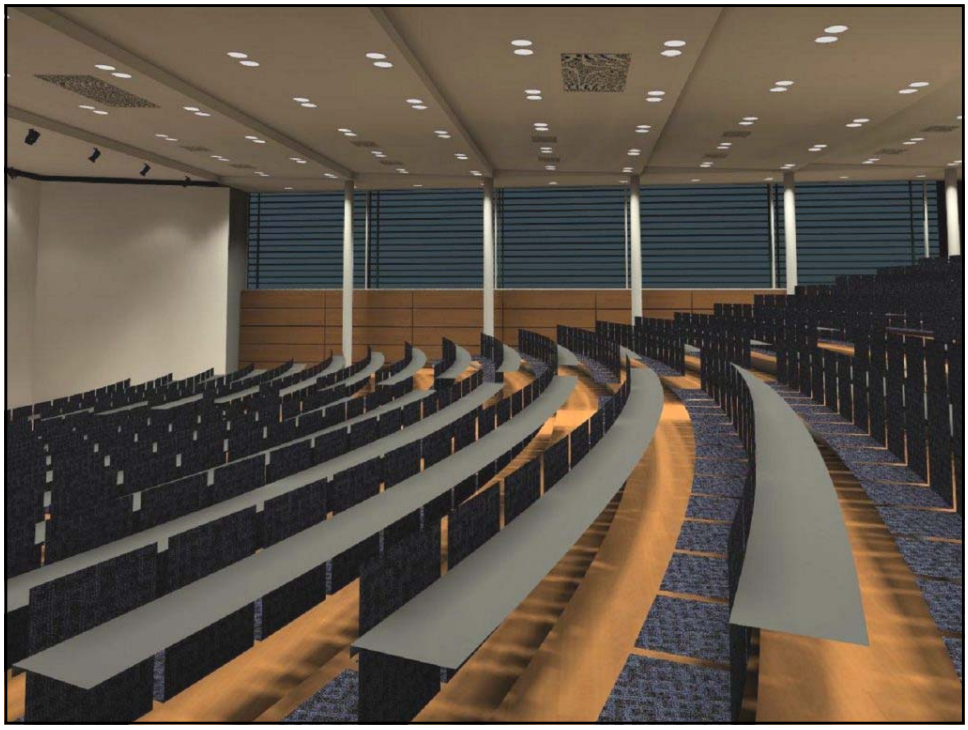
Lifecycle Management

- Key people are the clients; building owners and facility managers.
  - they will have the most benefits
  - they can set the requirements
- Better tools for early decision making
  - LCA/LCC and environmental evaluation tools
  - maintenance simulations
- Better tools for FM/PM
  - more accurate budgeting
  - better utilization of buildings and resources
  - better management for preventive maintenance
  - lower costs for maintenance

Real Pilot Project Using IFCs

PM4D Project / HUT 600 Auditorium Case





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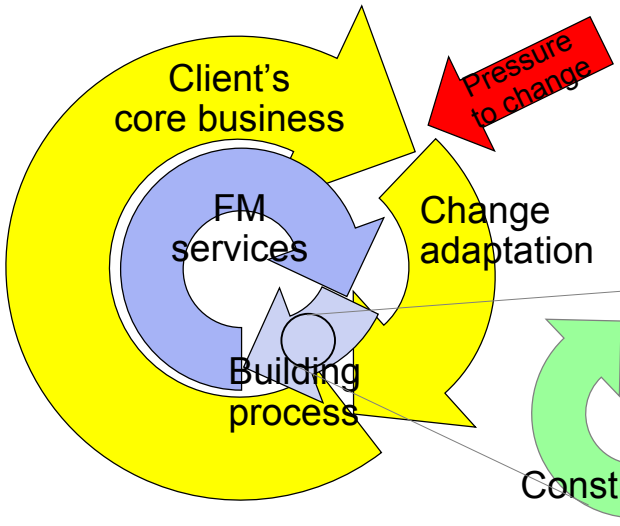
Real Life Cycle View ?



Where are the real benefits of information sharing and eBusiness?

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Culture in AEC/FM Industry ?

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Barriers to the Change

- The change to data sharing is not only technical - it is much more cultural
  - New processes and tools supporting them
  - Real partnering and sharing the benefits through the whole AEC/FM industry
    - Investments and benefits do not always meet
  - Sufficient ICT skills
    - Pre-study for the Vera program in 1996-1997 indicated that the lack of ICT skills and know-how is the main barrier to the wider implementation of ICT in the AEC/FM industry

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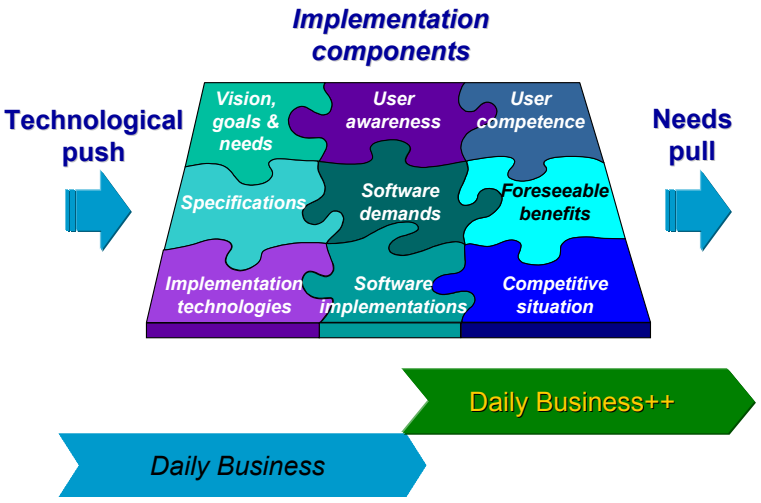
Implementation of technological leaps



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New Business Concepts

- ”Drafting" ⇨ information management
  - Paper document ⇨ digital information
  - Traditional documents ⇨ product models
  - “Document” ⇨ a view of the model from a specified angle at a specified moment
  - Still many technical and juridical problems
- Information will be produced for:
  - Decision making and production
    - Early LCA/LCC & environmental evaluation
  - **Use and maintenance of buildings**
- Minimizing the cost ⇨ maximizing the added value through the whole building life cycle