



# Vera - Information Networking in the Construction Process

Finnish National Construction IT Programme 1997-2002

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## Technology Programmes

- Technology programmes are means of creating new technological know-how through the co-operation of companies, research institutes and universities
- The programmes promote technological development of a specific field of technology and/or industry
- Funding comes partly (usually ~40%) from Tekes (the National Technology Agency of Finland) and partly (~60%) from the industry
- All projects are public on the headline level (*name, subject, main partners*), but the results of industrial projects are proprietary





## Main Functions of Tekes

-  Framing and preparation of national technology policy
-  Preparing, financing and coordination of national technology programmes
-  Financing applied technical research and risk-intensive industrial R&D projects
-  Financing and coordination of international technological cooperation
-  SME advisory services in technology transfer and exploitation



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Total budget for Tekes funding ~2.4 billion FIM / year (600 million AUD)



## The Problem

Information Networking  
in the Construction Process



TEKES



# Information Management

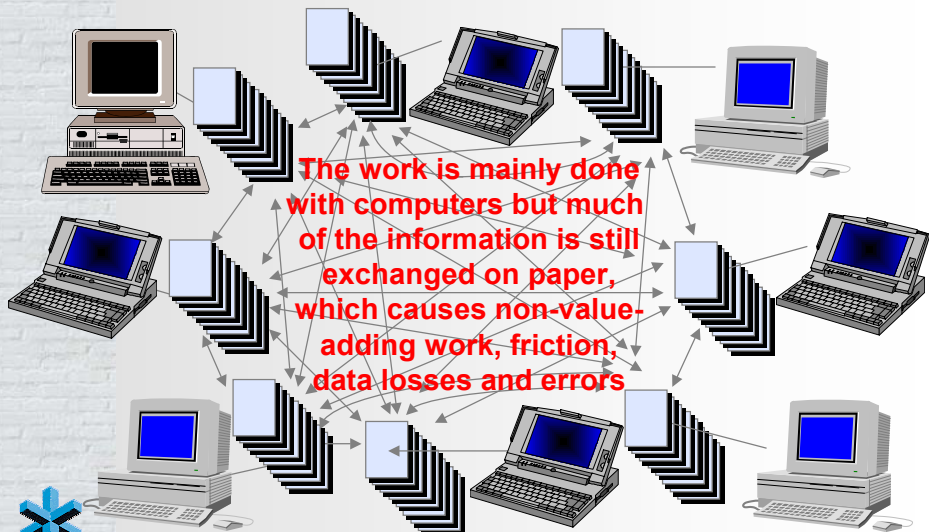
- AEC/FM industry is an information intensive branch:
  - all design and engineering activities
  - procurement and delivery control
  - call for bids, making offers and comparing alternatives
  - contract management
  - cost and utilisation degree control
  - maintenance planning and budgeting
  - technical and security system control in buildings...



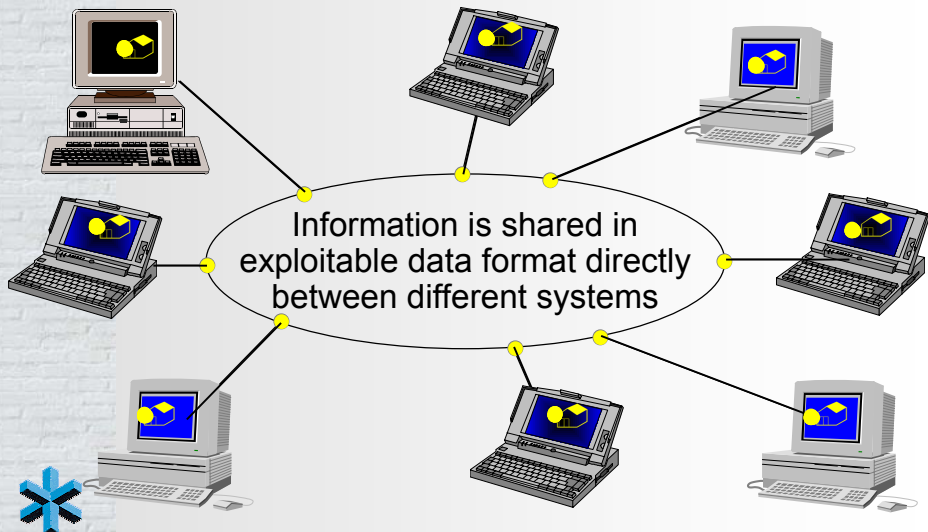
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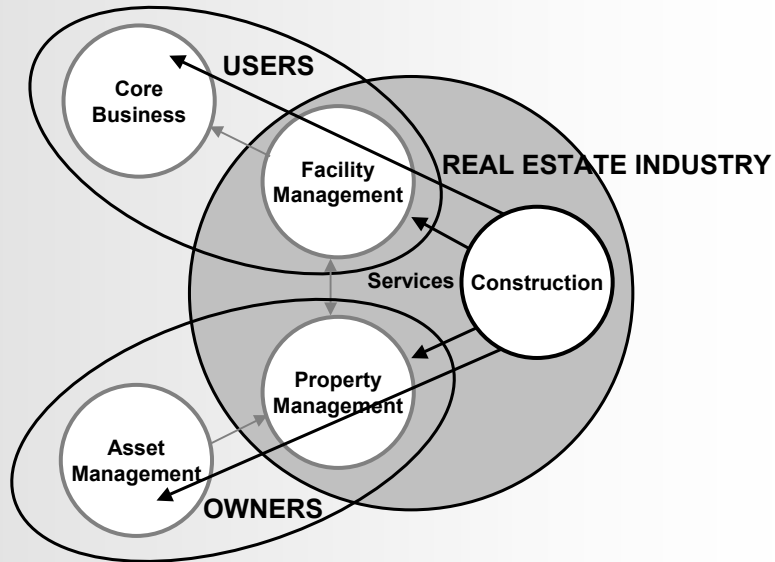
# Current Situation



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- Facility and property management:
  - more complex requirements for buildings
  - more accurate information for FM activities
  - more profit for the investments in buildings
    - inflation does not help as it used to do
  - environmental and life cycle issues are coming more and more important
- The need to improve productivity
  - removal of non-value adding work
  - re-use of information
  - better process and information management



- Software technologies
  - product model development - IFC, STEP
  - object oriented software
  - middleware, model servers, data repositories
- Information networks
  - virtual workgroups
  - project data access
  - product data access
  - information management through web
  - Internet commerce





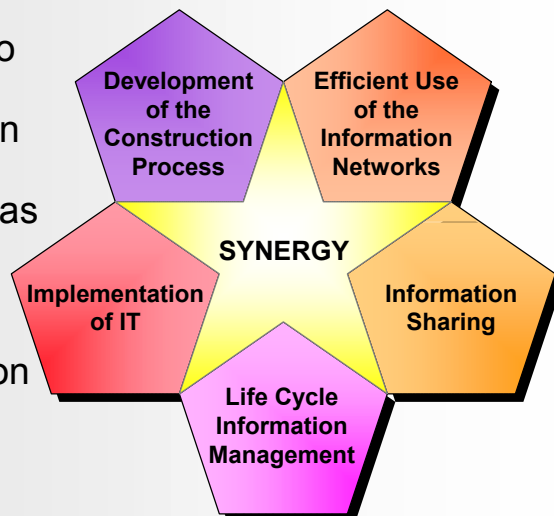
## Goals and Resources

Information Networking  
in the Construction Process



## Vera Programme Components

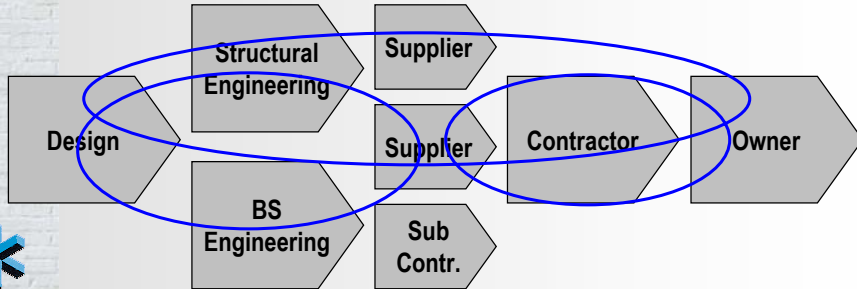
The target is to promote the implementation and use of IT and networks as the enabling technologies to re-engineer the construction process





## Project Principles

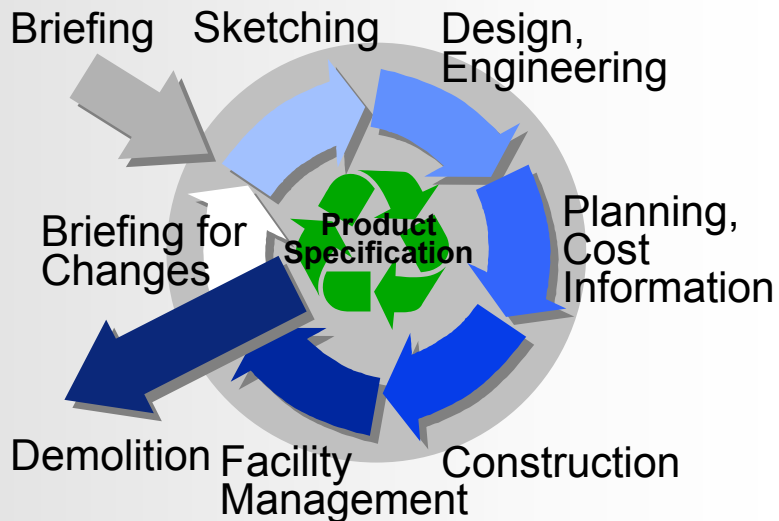
- Develop the construction process and IT solutions simultaneously and promote R&D in networks
  - Projects which include several parts of the value adding chain in construction process
  - No interest in projects for just one domain



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## Information Lifecycle



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## Vera Programme

- **Schedule - six years; 1997 - 2002**

Mid-evaluation started in the beginning of January, results will be published in April

- **Volume**

<i>Original budget</i>	<i>170 million FIM</i>	<i>(42.5 million AUD)</i>
Current estimation	~220 million FIM	(~55 million AUD)
45 % by Tekes	~100 million FIM	(~25 million AUD)
55 % by the industry	~120 million FIM	(~30 million AUD)

- **Current situation**

Research projects: 26 / 14 million FIM (6.5 million AUD)

Industrial projects: 69 / 116 million FIM (29 million AUD)

Total: 95 projects / 130 million FIM (32.5 million AUD)

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



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## Focus and Results of Projects

- **Project focus**

• Wide utilisation of IT in AEC/FM processes	25 %
• Software integration	19 %
• Process re-engineering	19 %
• Quality and productivity improvement	19 %
• Information management over building lifecycle	18 %

- **Project results**

• Commercial products, methods and services	45 %
• New knowledge	35 %
• Experiences from pilot projects	20 %

- **Mid evaluation is now on-going**

- Results will be published in the web in April and also in the Reykjavik CIB-W78 Conference in June
- External evaluator is Professor Matthew Bacon



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# IAI/IFC Activities

Information Networking  
in the Construction Process



## Why are we supporting IFCs ?

- One of the key elements for Vera programme is the information sharing
  - urgent need for a “common software language”
  - currently 42 projects with a connection to IFCs = 44% of the total volume
- IAI started at the right time for us
  - incremental development enables immediate implementation
  - IAI is the most active area on the data definition for construction industry
  - same modelling language with STEP ⇔ some areas can possibly expand to ISO work in the future





## Future Technologies

- First interoperable software generation(s) will be based on data transfer
- Next generations will be based more on data sharing - runtime interoperability
  - middleware
  - model servers
  - data repositories...
- Role of other data formats: SGML / XML ?
  - standardisation must happen both on general and industry level
  - same data structures for different formats



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## Barriers to the Change

- The pre-study for the programme in 1996-1997 showed that the lack of IT skills and know-how in the industry is the major barrier to the wider implementation of IT
  - wide range of education is a necessity, but the problem is that it can not be funded in a technology programme
- The change to data sharing is not only technical - it is even more cultural
  - new work processes
  - true co-operation in projects



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## Effects to the AEC/FM Industry

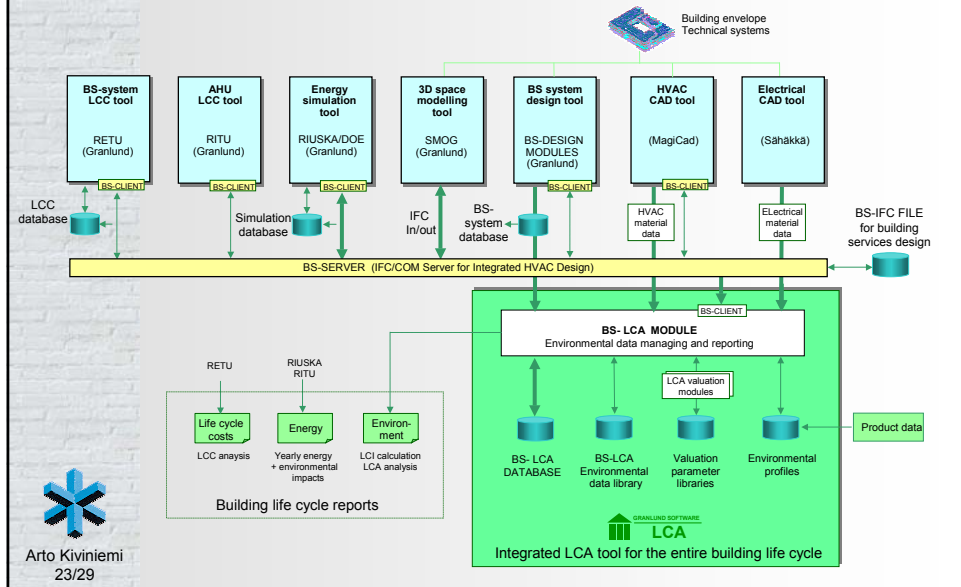
Information Networking  
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## Lifecycle Management

- 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 and LCC tools
  - maintenance simulations
- Better tools for FM/PM
  - better budgeting tools
  - less unused spaces
  - better management for preventive maintenance
  - lower costs for maintenance





**SMOG**  
(Space Modeler of Olof Granlund)

- use of IFC building objects
- based on the DOE simulation engine
- Supports both IFC R1.5.1 and R2.0 through the IFC/COM Server

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## Design and Engineering Processes

- "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
    - the actor who needs a specific view can produce it directly from the data
  - **technical and juridical problems**
- Information will be produced for:
  - decision making and production
  - use and maintenance of buildings



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## Design and Engineering Processes

- Models can contain complex rules for behaviour 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...



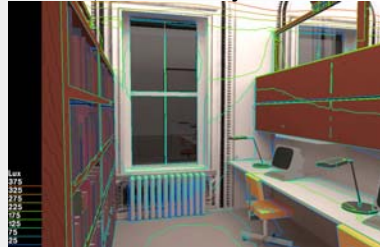
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Viva - a lighting design and simulation tool by Olof Granlund



IFC R2.0 SI-1: Photo Accurate Visualisation, Vladimir Bazjanac/LBNL



- Information as a part of the product:
  - building maintenance database based on as-built information will be delivered as a part of the production
  - product information must be a part of the electronic procurement and commerce
    - electronic product libraries with direct interface to design and procurement software and building data models - XML ?
- Change will not happen if the lowest price is the only selection criteria





# SPADEX Spatial Data Exchange Project

## AIO Group Oy ARXi

- IFC-file Open
- Modifications
- Additions

## Olof Granlund Oy SMOG/RIUSKA

- Spatial data mgt
- Heat loss calc.
- Cooling load calc.

Granlund

- External data base
- Energy simulation

## YIT Corporation COVE

- Production methods
- Alternatives
- Cost estimation

YIT

- External data base
- Production planning

## A-Insinööri Oy ConcreteCad

- Element schedule
- Bill of materials
- Production drawings

## Progman Oy MagiCAD

- Ventilation system modeling
- Material schedule

## VTT ProMoTe

- VR model creation
- Graphical interface to model
- Visualization

SPADEX IFC - FILE



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