

La innovación
en el sector de
la construcción



**Future of Technologies of
Information in the Construction
sector**

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“Processes and ICT” of the European
Construction Technology Platform*



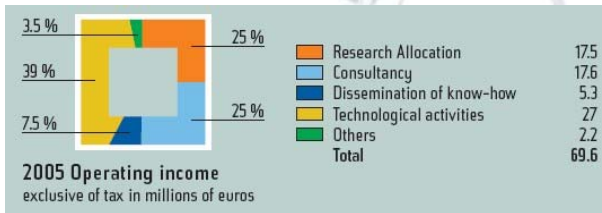
Palacio Euzkainduna
Sala A10

7 de febrero de 2008
de 9:50h a 16:10h



CSTB quick overview

- State-owned research establishment in the construction sector
- Mission: Improvement of comfort and safety in buildings and their environment
- Research, consultancy, quality evaluation, knowledge dissemination
- Active member of ENBRI, Secretary of ECTP
- >800 employees, 50% engineers & researchers
- Paris, Nantes, Grenoble, Sophia-Antipolis
- Income: ~70 MEuros (*in 2005*)
- www.cstb.fr



- Combination of physics and biology & progress in nanotechnologies, behind limitation of semi-conductors improvement
- Development of services accessible over the network through high bandwidth / ADSL - Generalisation of radio connections
- Move towards "ALL-on-IP", including any type of content (video, music, text, telephone, voice, etc.)
- Outburst of devices (including lots of *smart phones*) connected to the network (more than 16billions in 2012?):
 - *Sustainable approach to the network*: less PC & more light clients - reduced energy consumption, easier administration, etc.
- "Technologies hiding technologies", especially hiding to the user the globalised convergence of networks, wired & wireless connections, security technologies, ...
 - *Benefits of technology to the consumer without the complexity*

- Multiplication of sensors & data collectors:
 - data crossing / consolidation, control mechanisms
 - adding real information to virtual data...
- Generalisation of "everyday" intelligent objects & systems, able to adapt themselves to context (e.g. reacting according to events) and usage (evolution of behaviours)
- M2M, O2O: very large number of small interactive objects embedded in devices, systems & machines, all being connected to IS by networks
- All devices connected to the best available network, allowing full access to information & support to easy/quick decision & trade-off
- Generalised ambient access to information:
 - to all databases / applications / IS via any Web browser
 - according to meaning / semantics: the "Semantic Web"...

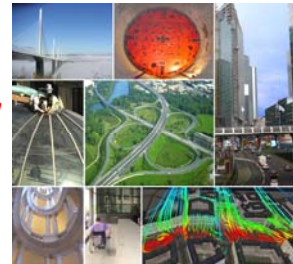
- Simplification of programming models, evolution towards frameworks, increasing use of technologies based on ASD (*Agile Software Development*) and/or on UED (*User Experience Design*)
- A2A, C2C, S2S: flexible & multiple interconnection of Applications / Components / Services, thx to SOA concepts / approach, allowing creation of flexible network of application services that will better stick to business processes within and among organisations
- Revolution of open standards & generalisation of Open Source
- "Social production", based on communities and open systems / frameworks, for improved productivity & future innovation - *1st avatars of this are Open Source factories, blogs, wikis, ...*
- BPM: revisiting current production chains by splitting production in (as most as possible) automated tasks governed by business rules and enhanced cooperation between workers and machines.

- 7 Focus Areas
 - Underground constructions, Cities & Buildings, Quality of life, Materials, Networks, Cultural heritage, Processes & ICT
- 2 Advisory Groups (*Clients & users, SMEs*), >20 National platforms
- A vision for 2030:

In the year 2030, Europe's built environment is designed, built and maintained by a successful knowledge- and demand-driven sector, well known for its ability to satisfy all the needs of its clients and society, providing a high quality of life and demonstrating its long-term responsibility to the mankind's environment
- 7 roadmaps/SRAs + 1 global SRA, JTI (E2B - *Energy Efficient Buildings*), Eurekabuild (*Eureka umbrella on construction*)
- <http://www/ectp/org>

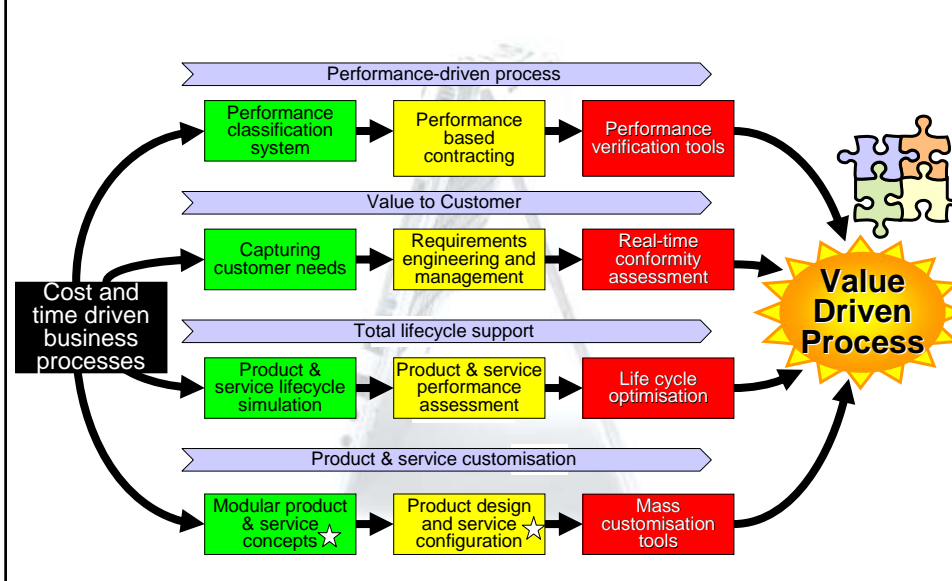
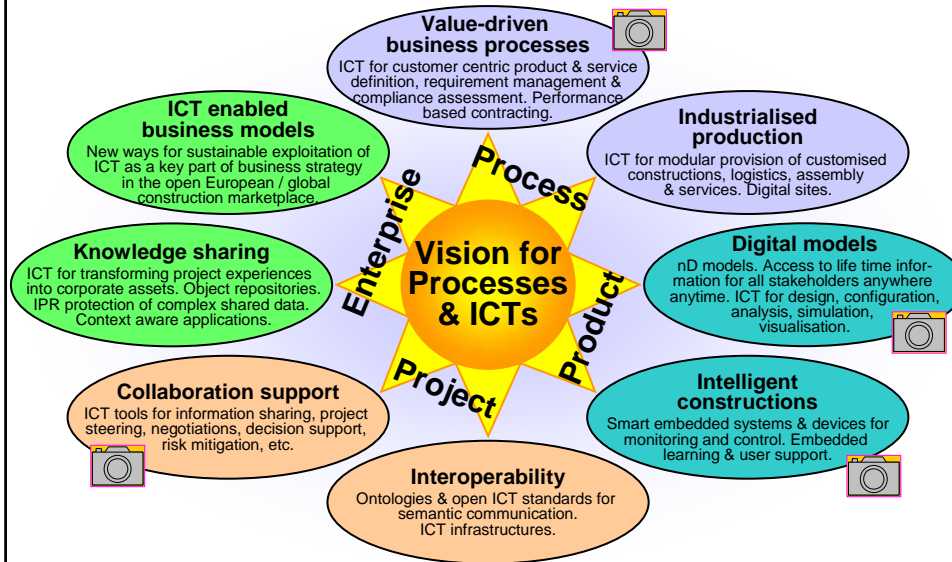


- Meeting Client/User Requirements
 - 1.1. Healthy, Safe and Accessible Indoor Environment for All
 - 1.2. A New Image of Cities
 - 1.3. Efficient Use of Underground City Space
 - 1.4. Mobility and Supply through Efficient Networks
- Becoming Sustainable
 - 2.1. Reduce Resource Consumption (energy, water, materials)
 - 2.2. Reduce Environmental and Man-Made Impacts
 - 2.3. Sustainable Management of Transport and Utilities Networks
 - 2.4. A living cultural heritage for an attractive Europe
 - 2.5. Improve Safety and Security
- Transformation of the Construction Sector
 - *3.1. A New Client-driven, Knowledge-based Construction Process*
 - *3.2. ICT and Automation*
 - 3.3. High Added-value Construction Materials
 - 3.4. Attractive Workplaces

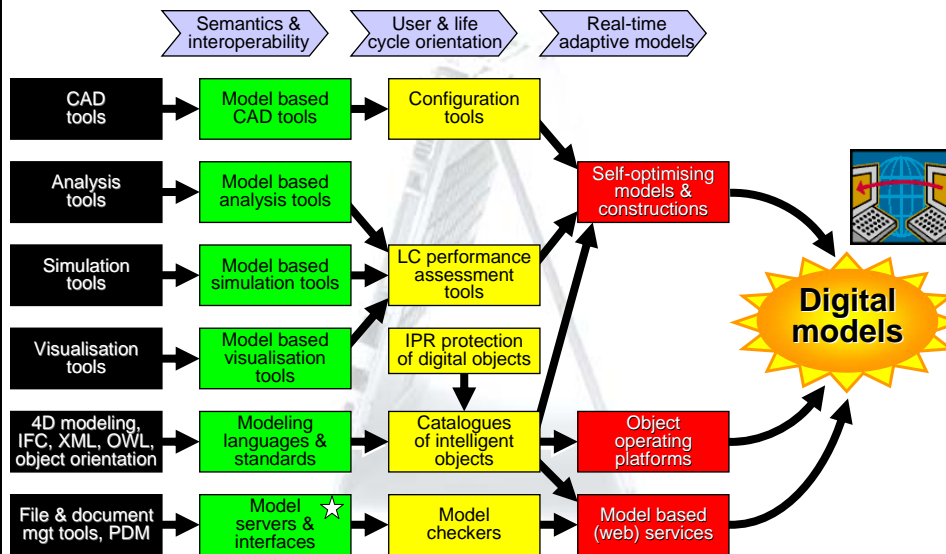
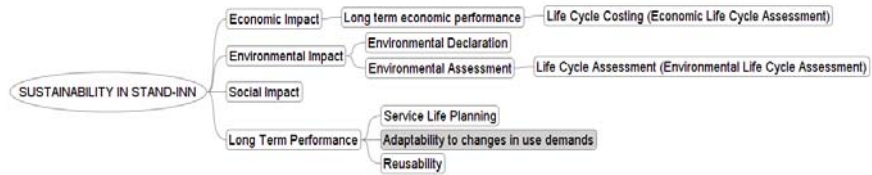


- An horizontal FA, supported by industry actors (ARUP, Bouygues, ACCIONA, Dragados, etc.), ICT key players (software vendors, integrators, etc.) and applied R&D (ENBRI, academia, etc.)
 - Provide common ICT support for the existing focus groups
- Define and develop agenda and action plans for different time-scales:
 - Current problems / current solutions (as-is, refined, specialised) - up to 2010
 - Medium/Long-term problems anticipated in Construction: relevant R&D up to 2020
- Define orientations & program for future industry/research co-operation in ICT
- Increase synergies among national programs and R&D effort in European countries
- Promote R&D in Construction ICT towards European States, the EC, etc.
- http://www.ectp.org/fa_pict.asp
- ERABUILD Project: *Strat-CON* (www.strat-con.org)





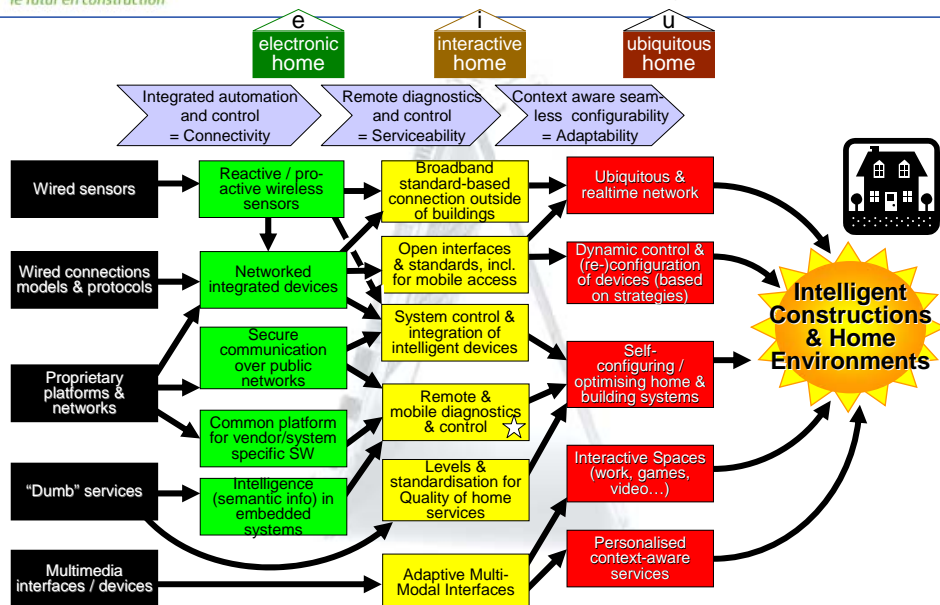
- From “lower cost” to “performance-driven” construction
 - Need for common definition of metrics, indicators (e.g. for sustainability)...
 - Building = no longer a (passive) product, but a service...
- Engineering of customer requirements / Mass customisation
- Follow-up of customer requirements (and actual building performance) all along the building life cycle
- *A sustainable development viewpoint... (e.g. Europe-INNOVA project “Stand-INN”)*

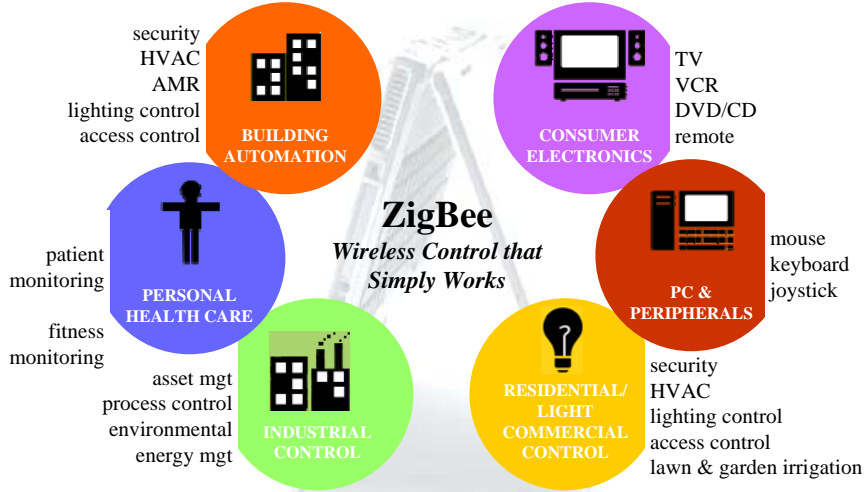


- BIM...
 - 3D visualisation? Architectural digital mock-up? Modelling of building data? 3D Virtual building?...
- ... *more!* → a comprehensive methodology for future industrialised PLM (BLM?) in Construction:
 - Organisation & management of Building Lifecycle
 - From *3D design* to *engineering simulation(s)*, to *realistic visualisation* of product, to *integrated information management* for maintenance & FM...
 - data sharing & synchronisation
 - Support to full process simulation

BIM to be the grounding of frameworks for:

- ✓ Control of models/ life-cycle data, change management, information ownership...
- ✓ Business functions / objects (e.g. risk allocation / management, regulations...)
- ✓ Aggregation of BIMs (IFC, GML, ...)
- ✓ "Intelligent" BIMs (e.g. reification...)

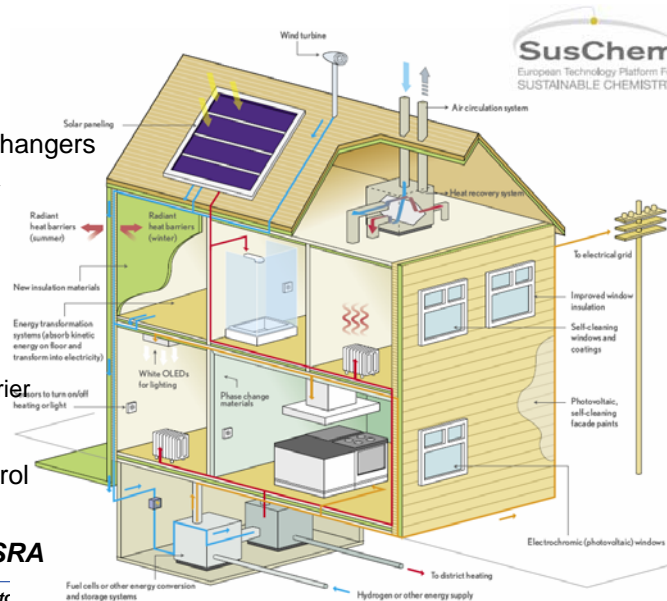




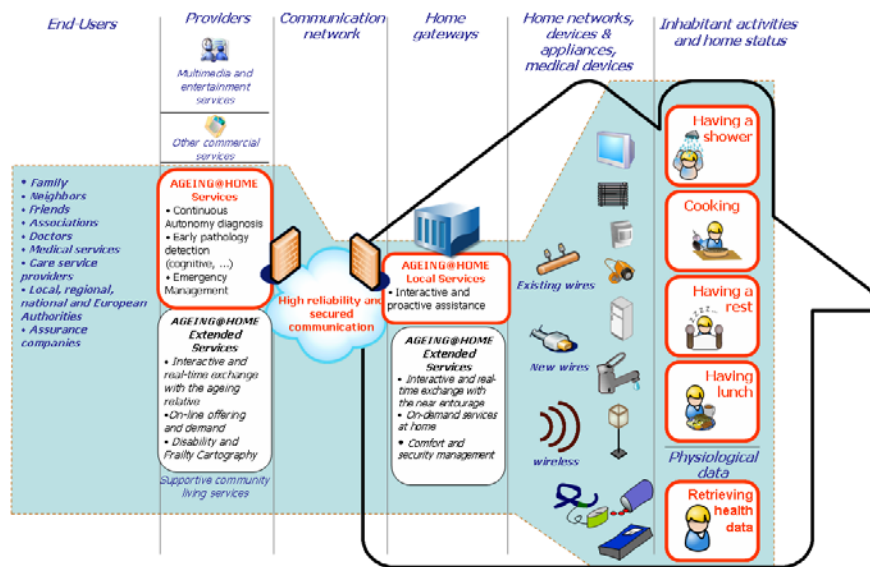
Technologies e.g.

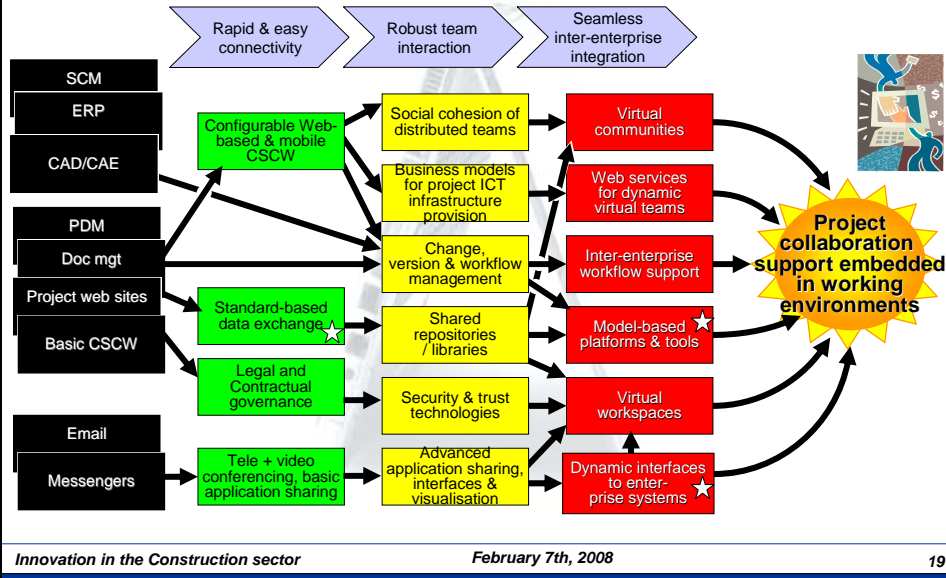
- ❖ Wind turbine
- ❖ Solar panels
- ❖ Fuel cells
- ❖ Heat pumps & exchangers
- ❖ Energy recovery & transformation
- ❖ OLED lighting
- ❖ Sensors
- ❖ New materials:
 - Insulation
 - Phase changing
 - Radiant heat barrier
 - Photovoltaic
 - Electrochromatic
- ❖ Automation & control
- ❖ Feeding into grid

Source: **SUSCHEM SRA**



- ❖ Dynamic building **simulation** provides information to select the best technical solutions (in terms of optimal energetic behaviour of the building)
 - ➔ A common data model is necessary:
 - To avoid the huge amount of work required to input simulation data
 - To foster interoperability between simulation tools, building code related tools and dimensioning tools and to lead to optimisation.
- ❖ The next generation tools will consist in the development of a global solution for evaluation and design, which integrates various aspects of energy, air quality and comfort, environmental, socio-economic, etc...
 - ➔ Need for an integrated multi-disciplinary approach





- Focus is *INFORMATION*:
 - From where does it come/go, *what does it mean*, who can/can't read it, how to use it & optimise its value...
 - Provide it as required, everywhere, at any time...
 - ➔ *Objective will be more & more to ensure value & quality of information, and not only quality of tools that manipulate it...*
- Information to be the pillar of (Business) Process reengineering
 - Specialisation → *work division*
 - Re-engineer activities of people manipulating data by dividing any process in well-defined decomposed tasks
 - Automation → *work industrialisation*
 - ... of many decomposed tasks (e.g. business rules)
 - Collaboration / externalisation → *work connection*
 - (community-based) collaborative workspaces & BPO (*Business Process Outsourcing*)



- **Digital Models**
 - Digital models are the key enablers for integrating, managing, and sharing multidisciplinary views and perspectives of the built environment's lifecycle information.
- **ICT for Energy Efficiency & Sustainability**
 - Delivery and use of sustainable and energy-efficient facilities through ICT-based informed decision-making (both human and automated)
- **Knowledge Sharing & Collaboration Support**
 - Seamless and instant access to the right information/knowledge at the right time and in any place
- **Intelligent Constructions**
 - Ubiquitous B2P (B=Building, P=People)
- **Interoperability**
 - Information sharing without concern of the creating system; Interoperability independent of source, life cycle stage and type; Information to be securely accessible and interpretable across the life of the asset
- **Network Demand Management**
 - Customer aware and informed of status at all times and receives on-time delivery; supplier aware of customer and project demands and potential barriers as soon as they arise; environmental requirements included in all future transactions
- **Value Driven Business & Process Models**
 - What You Feel Is What You Get

- Need for future tangible (Industry-oriented) R&D & Innovation
 - evaluation efforts to better identify (& convince about) the potential benefits of ICT for the future improvement of the Construction sector
- A shift of focus in construction ICT
 - from technology to process,
 - as a necessary step to take in order to support a future industrialisation of the sector using advanced ICT
- Modelling as the cornerstone to cross the bridge from pioneering technology to mainstream adoption – in terms of:
 - technical modelling like IFC/IFC/IDM and BIM generalisation;
 - knowledge modelling through taxonomies & ontologies;
 - organisational modelling
- ICT as an enabler for:
 - enhanced automation, integration and communication in the Construction value chain
 - *with customer-driven design, manufacturing and build*
 - Industrialisation
 - through continuous development of existing processes and products;
 - stressing new forms of cooperation, e.g. partnering and integration of supply chains;
 - with an increased use of industrially produced systems and components.

- Strat-CON: <http://www.strat-con.org>
 - *mailto: {matti.hannus/sami.kazi} @vtt.fi, alain.zarli@cstb.fr*
- ECTP: <http://www.ectp.org>
 - Access to ECTP/FA7
 - Access to EurekaBuild
- ERABUILD: <http://www.erabuild.net>
- FIATECH: <http://www.fiatech.org>
- CIB: <http://www.cibworld.nl>
- Stand-Inn: <http://standards.eu-innova.org>

Thank you for your attention!