

# **Value driven processes**

## **for construction and operation of buildings**

Eracobuild transnational program on research and innovation

### *Background*

*Eracobuild is an ERA-net cooperative effort under contract with EC DG Research. Eracobuild started late 2008 and has 34 partners in 21 countries and regions. Within the project, a transnational research and innovation program on Value driven processes (VDP) is to be carried out. The concept of the program was developed within the ERA-net project ERABUILD (FP 6). The work has been transferred to Eracobuild and the Eracobuild VDP Program group is in charge of the continued work.*

### **Content**

1. Program objective	2
1.1 Rationale	2
2. Goals	4
2.1 Actions to reach the goals	4
3. Potential impact	5
3.1 Economy	5
3.2 Environment	6
3.3 Social	6
3.4 Political	6
3.5 European collaboration	6
4. Program thematic content	7
4.1 Definition	8
4.2 Production and operation	8
4.3 Business models	8
4.4 Information management	9
4.5 Overall process	9
5. Program organisation	9
6. Resources and timeline	10
Appendix 1:	
Projects on processes within ERABUILD pilot joint calls	11

## 1 Program objective

The objective of the program is to:

***Increase user, client and society value  
through transforming the way of working.***

### 1.1 Rationale

#### *Relevance*

It is increasingly understood that a transformation of the way the various actors in the construction sector (broadly defined) are working is a key to improved efficiency and reduced cost within the built environment. Innovativity as well as productivity improvement is extremely low and far below what is the case in most other sectors. End users, clients as well as society in general are thus likely to receive gradually less value for the money spent which is hampering the ambitions of society sustainable growth and increased value for individuals.

Here, “Process” describes the procedures by which the construction sector is defining, producing, delivering and operating products and services to end users and clients. It answers the question “how” things are being done rather than “what” is being done. Process issues are playing significant roles in every phase of the activities within the sector as well as within the build environment. Process issues connects to a wide range of disciplines, e.g. urban and rural planning, design, macro economy, micro economy, law, behaviour science, medicine, environment technology, sociology, materials technology, production technology, facility management etc. A process focus is of equal importance for end users/clients, political systems and industry.

#### *Sector focus*

ECTP – European Construction Technology Platform – has “Transformation of the sector” as one of three main headings in its strategic research agenda. The process issues in the ECTP are handled primarily within the designated Focus Area “Processes and ICT” (FA PICT). Process issues are given a high priority also in many national strategies for the built environment.

The multidisciplinary character of the process issue requires input from many disciplines and make research and innovation complex to handle. In addition, the pronounced fragmentation of the actor groups results in a situation where almost no actor alone has the necessary strength and overview to significantly transform the way the sector is working. The agendas of each of the different actor groups are often diverging and sometimes conflicting as market conditions are remodelled and new business structures are emerging.

#### *Political system agenda*

Development of processes is instrumental for an efficient solving of major human, political and economical challenges e.g. land use, urban and rural renewal, climate change,

sustainability, growth, demography changes, accessibility, free movement, scarcity of resources etc. There is also increasing demand for improved safety and security in the built environment as well as for a raise in attractiveness of the sector workplaces.

Users and clients are likely to get best value for their money in an innovative and competitive open market condition. The most important driver is the value created for users and clients, and the development has to be clearly based on user/client needs. The political system is by large the biggest customer in many countries buying 40- 50% of what the sector delivers. This dominant purchasing power is in reality setting the standard. Together with the regulatory role, it gives the political system a pivotal role as well as instruments for the necessary transformation of the way the construction sector is working.

### *Globalisation*

The construction sector has by tradition been very locally focused and based on local traditions, standards and regulatory frameworks. Research efforts and sector actor innovation thus have been focusing on what is locally connected. As a result there has not been a strong tradition of international joint research or development work.

Globalisation is drastically changing the situation for the sector through border free trade of goods and services as well as facilitated utilization of global, easily available knowledge, competence and information. Even if joint research and innovation projects have not been common, the built environment research community has had a tradition of networking internationally sharing ideas and results of studies which to a great extent have been available in the open domain. Globalisation now gives incentives to use the globally available information and develop knowledge and create innovation not only through international networking but also through joint activities.

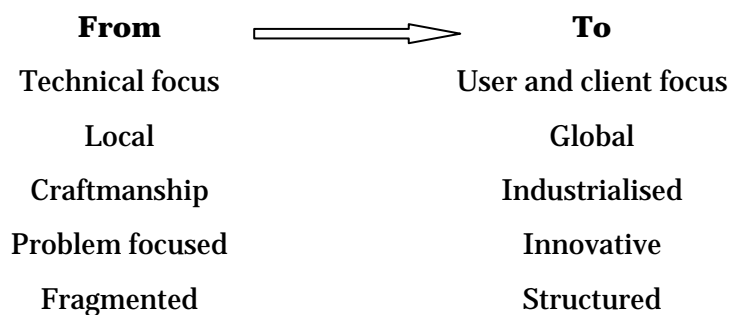
### *Why a transnational program?*

In the long run, no country can give users and clients in the built environment the best value purely through domestic research and innovation work. Free border crossing trade, international harmonised standards and regulations, free movement of capital and expertise is creating a global market for competition and innovation also for built environment actors. This is already evident in the supply of materials, components and systems but also to an increasing degree among designers, engineering firms, contractors, facility managers and property owners.

Globalisation will require research groups as well as sector actors to cooperate closely on the international arena to stay in the forefront and be able to meet global competition. In addition, several society challenges have global implications which require increased cooperation to reach global solutions. Increasing transnational research and innovation is the logical answer.

## 2. Goals

The aim with the *Value driven processes*-program is to contribute to an overall change in the way the built environment is working, e.g. as follows:



The goals in qualitative and quantitative terms can be described broadly as follows:

Reduction of investment cost with 30%  
 Reduction of life cycle cost with 50%  
 Reduction of time of delivery with 50%  
 Significant rise in sustainability index  
 Significant rise in user satisfaction index  
 Significant improvement in working environment

## 2.1 Actions needed to reach the goals

To meet the goals, the program is planned to work through the following activities:

- **Benchmarking and strategy**

A mechanism for foresight, benchmarking and strategy covering the program thematic area. Identify and apply relevant metrics to evaluate program performance. Secure that the program maintains a forefront position globally and that it is utilising available leading knowledge and competence. Cover the innovation process as a whole, i.e. stretching from fundamental research to close to market activities.

- **Clustering**

Structured activities involving leading research groups and leading sector actors from participating countries. Contribute to benchmarking and strategy activities, as given above. Aim at creating inspiring environments where “the best gets better” thus vitalising knowledge generation, innovativity and enhanced competitiveness. The clustering will be carried out in the form of brokerage activities, workshops, study visits etc.

- **Call for proposals**

Regular call for proposals for research and innovation projects carried out through joint calls for proposals. Address projects that approach creating of new knowledge as well as the creating of new products and services. Projects carried out in transnational cooperation ensuring the broadest possible inclusion of scientific excellence as well as frontline expertise from various sector actors. Projects run in a joint organisational framework adopting co-funding arrangement etc. following national practice.

- Invitation for tenders

Commissioning of studies of fact finding character through invitations for tenders. Studies mainly used for obtaining improved decision basis within the program, concerning e.g. contents of calls. They may typically deal with mapping of frontline knowledge and/or competence, global positioning of commonly used local solutions, specific national strategies etc.

- Information and dissemination

Activities involving information exchange, discussion on various theme levels as well as research documentation and dissemination of results. The information and dissemination activity shall aim at a holistic coverage of the innovation process, i.e. report on research, development, standardisation, regulatory framework, market conditions etc. Aspects of intellectual property rights will be addressed securing development of a favourable competitive and innovative climate.

- Establishing of an appropriate program management model

Creating of a program management on the program level as well as the theme level ensuring an efficient operation. In addition task forces will be installed for the running of each specific activity, such as calls for proposals, invitation for tenders etc.

### 3. Potential impact

#### 3.1 Economy

The program is foreseen to have a strong impact through improvement of the value for money for users and clients. Recent studies of current construction processes indicate possible cost reductions in the level of 30% for equivalent delivered performance. The improved efficiency – increased productivity – is to be tackled through transformation from technology driven to demand driven specifications, industrialised productions techniques, lean thinking, structured business models, ICT-infrastructure etc.

The potential cost savings clearly underlines the rationale for a strong focus on process improvements by the society as well as the sector. Not only can the cost for the initial delivery be lowered. Enhanced processes also lead to improved performance, higher quality, traceability of materials and components at the operation phase, reduction in the number of defects etc. Considering the size of the built environment economy, it is evident that elimination of waste and increased efficiency will give users and clients significant improved performance and/or save significant amounts of money for alternative consumption.

#### 3.2 Environment

Improved processes lead to more efficient use of resources as well as to less waste. Fewer improved, demountable and changeable components will be used resulting in an improved possibility of controlling environmental impact. Information handling and storage through embedded systems, sensors, control devices, use of building information modelling etc

improves information monitoring and retrieval and thus better control of environmental effects in construction, operation, rehabilitation, deconstruction etc.

### 3.3 Users and clients

One of the strongest and most pressing needs in improving the construction processes is the capturing of end user and client needs and preferences. Social parameters, adoption to demographic changes, accessibility etc are important questions to consider in urban and rural planning processes. Innovation in general has to be user/client driven. A strong positioning by user and clients is important as a driver for change, as well as a strong focus on user and client functional requirements among all actors in the value and supply chain in their innovation work.

An improved understanding and consideration of functions accompanied by verification methods are together with intelligent procurement practices very important in the strife towards giving users/clients better value for their money.

### 3.4 Political

The building market as well as the construction market in general is in most countries closely integrated with the political system through urban, rural, infrastructure etc. planning, taxation, targeted residential housing schemes, construction and operation of schools, hospitals, roads, railways etc. The political system is in most countries by far the largest procurer of construction sector products and services. Considering the large size of the sector, it is easily understood that an increase of the competence in the role of a client can result in substantial savings, highly appreciated by the tax-payers.

Apart from the cost issue, the impact of construction related activities is also closely linked with society challenges in terms of sustainability, growth, social unrest etc. Again the competence of the political system as a procurer is vital.

### 3.5 European collaboration

The gradually stronger ERA-focus, as well as an increased globalisation, is offering the construction sector access to a broad base of knowledge and competence as well as new possibilities for innovation. Access to new channels of supply as well as new markets for own products created by open borders, harmonised standards etc. are developing at a very fast rate. Especially for a former national and even locally based market like construction this change is significant and potentially very important for every actor – both in terms of possibilities and threats.

Penetrating new markets both as a buyer and a seller require increased understanding and access to strategic international alliances. In the search for partners – both among leading research groups and with leading sector actors - participation in international programmes and projects is essential.

The creation of an international market for construction has very strong implications on process issues. International (global) collaboration in questions related to processes is thus very much a key to an increased and improved generation of knowledge and innovation in the construction sector.

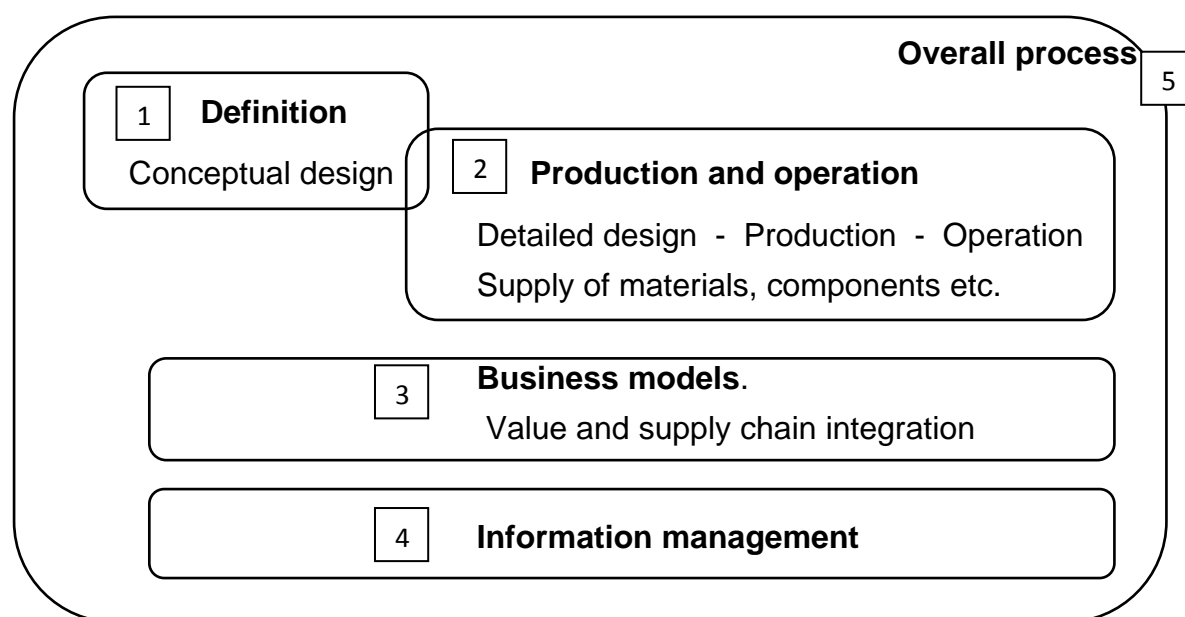
## 4. Program thematic structure

The program “Value driven processes” is aiming both at developing sub-areas within the process area as well as taking a holistic view on the overall processes within the sector. To meet the character of the process questions, a clear multi sector and multidisciplinary approach is required. The scope of the program covers planning, construction and operation of buildings.

The program is proposed to be structured in 5 themes, as given in the figure below. The “horizontal axis” of the figure is roughly mirroring a construction project timeline in a qualitative way. Theme 1 and 2 are the core activities while theme 3 and 4 are important supporting activities. It is strongly believed that process modifications within one theme will very clearly influence other themes. The program has thus been given a rather broad approach including also theme 5 covering the analysis and development of the overall process area.

The themes relates to various knowledge and competence areas mobilising various types of expertise and stakeholders. Within the project ERABUILD, a number of process related pilot joint calls have been carried out. A list of projects from those activities is given in Appendix 1 as an illustration of examples of projects within the different themes.

**Value driven processes**  
Layout of program and its 5 themes



### 4.1 Definition

The definition of the product/service is the first phase of a construction and/or facility management undertaking. It covers idea development, conceptual design, planning and acceptance processes. If the project is envisaged to be attractive, the activity is carried further to the next stage, i.e. production and operation of the product/service.

Examples of subjects in theme 1 of the program:

- Spaces; function and aesthetics
- Capturing of functional performance requirements. Verification methods.
- Key performance indicators
- Area planning, Infrastructure integration
- Service customisation
- Life cycle management
- Constructability and operability
- Sustainability (ecological, economical, social)
- Regulatory framework and standards

Key knowledge areas include architecture, economy, behaviour science, health, sociology, overall spatial planning, environment etc.

#### *4.2 Production and operation*

The activity of producing and operating the product/service is following decisions made in the definition phase. It covers themes like industrialisation, detailed design, choice of materials, components and systems, logistics, assembly, operation, deconstruction, safe and attractive work places.

Examples of subjects in theme 2 of the program:

- Integrated design and production
- Industrial production
- Lean thinking
- Working environment
- On-site communication
- Predictable quality
- Multifunctional materials and integrated system solutions

Knowledge areas include design, production technologies, facilities management, materials, installation systems etc.

#### *4.3 Business models*

Rather early in the life of a project it is necessary to start evaluating how the business model for the project should be designed. It involves procurement and partnering policies, value and supply chain integration etc.

Examples of subjects in theme 3 of the program:

- Business models
- Collaborative environment
- Value and supply chain integration
- Barriers and facilitators
- Legislation, contracts
- Procurement procedures
- e-Business
- Handling of IPR
- Specialisation, branding, franchising...
- New services
- Compliance assessment and verification

Knowledge areas cover micro economy, law, contract issues, project organisation and management etc.



#### 4.4 Information management

In the early stage of the construction project it is relevant to formulate an information management policy for the project to secure interoperability along the value and supply chains. ICT-tools are also important in the early phases of a project for visualisations as a basis for decision making, sales activities etc.

Examples of subjects in theme 4 of the program:

- Interoperability along the value chain
- Building information modelling, nD-modelling
- Open standards
- Information delivery manuals
- Information retrieval over service life
- Sensing, monitoring and controlling
- Site logistics and assembly

Knowledge areas include information and communication technologies, information system solutions etc.

#### 4.5 Overall process

A build environment project seen over its entire lifetime is extremely complex and far reaching. A holistic view on process issues involved will increase the possibilities to reach a favourable value increase, low life cycle cost, minimum of environmental impact etc. Important aspects here will be interoperability of information, accessibility to information, use of agreed functional standards, interchangeable and replaceable materials, components and systems etc.

Examples of subjects in theme 5 of the program:

- Mass customisation
- ICT and business models
- Environmental impact management
- Life cycle values
- Process simulation and optimisation
- Widely accepted functional performance standards
- Incentives, steering mechanisms to reach specific goals

The knowledge base requires multi discipline awareness as well as multi stakeholder inclusion.

## 5. Program operation

Referring to the objective and goals, the mode of operation of the program will be based on the following key aspects:

- Sector relevance
- Scientific quality
- Involvement of stakeholders
- International cooperation
- Single projects integrated in program structure

Each project within the programme should be of a sufficient size and duration to create a basis for international collaboration as well as for catching interest for establishment of a stakeholder project steering group. This, together with the number of participating partners, have to be taken account of when designing the scope and volume of projects proposed.

The management of the program is planned to be organised as follows:

- VDP-Program group  
Representatives of Eracobuild program owners and program taking an interest in the program. Decisions on calls, evaluations, funding etc.
- VDP- Call Task force  
Specific working group for a specific call. Representatives of Eracobuild program owners and program managers from countries participating in a specific call.
- Coordinator  
Reporting to WP 3. Operational leadership for the programme.
- VDP - Advisory committee  
Stakeholder representatives with external chair. Strategy, evaluation and monitoring.

## 6. Resources and timeline

The program is estimated to run within Eracobuild for the full duration of its activity. After the closure of Eracobuild, the ambition is that a sufficiently strong cluster of partners has been established to take the program further within instruments when available.

The finances necessary for the administrative handling of the program is - to a certain degree – secured through the EC-funding. For financing of projects within the program, funding from national program owners, as well as co-funding from sector actors (following separate national rules), is needed. To secure a strong sector actor interest in co-funding projects, a procedure to secure intellectual property rights for in house developments has to be in place.

It is foreseen that various activities, as described in 2.1 above, will be planned and executed by the VDP Program group and the VDP-Call task forces in close cooperation within Eracobuild work package 3 as well as with other relevant WPs. The call for proposals activity will take place at regular intervals, at least once a year. Other activities, such as studies, workshops etc. will be scheduled ad hoc as the program develops.

The call for proposals is planned to follow a two-stage regime. This shall allow for a first stage with proposals on strategic project ideas and consortium partnership being formulated followed – after evaluation - by a second stage with detailed project applications.

## Projects funded within ERABUILD joint pilot calls.

Transnational projects within the area of “Value driven processes” from ERABUILD pilot call activities. Structuring of projects according to themes planned for the Eracobuild program “Value driven processes”. Identification: CfP – Call for Proposal. CFT – Call for Tender.

### 1. Definition of product/service

- **Construction and real estate – developing indicators for transparency.**  
Project coordinator: SBI - Danish Building Research Institute, Denmark. Partners from Denmark, Finland, Norway and Sweden. Funding from DK, FI, NICE, SE. (CfP 3)
- **User-oriented benchmarking for usability and sustainable performance of real estate.**  
Project coordinator: HUT - Helsinki University of Technology, Finland. Partners from Finland, Norway and Sweden. Funding from FI, NICE and SE. CfP 3.
- **The voice of customers in the construction process – new market oriented procedures to capture consumer needs in construction.**  
Project coordinator: KTH - Royal Inst. of Technology, Sweden. Partners from Sweden and Finland. Funding from FI and SE. CfP 3.

### 2. Production and delivery of product/service

- **Architectural quality, user requirements and mass customization in industrial building systems**  
Project coordinator: Royal Danish Academy of fine arts, Denmark. Partners from Denmark and Sweden. Funding from FR and SE. CfP 2.
- **Developing values and delivering customer value in an industrial context.**  
Project coordinator: Lund University, Sweden. Partners from Denmark and Sweden. Funding from DK and SE. CfP 2.
- **Industrial processes supported by on open virtual building environment.**  
Project coordinator: Eurostep AB, Sweden. Partners from Finland and Sweden. Funding from FI and SE. CfP 2.
- **Review of the current state of Radio Frequency Identification (RFID) Technology, its use and potential future use in Construction**  
Project leader: DTI - Danish Technological Institute, Denmark. Funding from DK, FI, SE and UK. CFT 1.

### 3. Business models

- **New industrialization in supply – balancing project configuration and long term stability through partnership.**

Project coordinator: Chalmers Univ. of Technology, Sweden. Partners from Denmark, Finland, France and Sweden. Funding from DK, FI, FR and SE. CfP 2.

### 4. Information management

- **Integrated supply chain information system.**

Project coordinator: Chalmers Univ. of Technology, Sweden. Partners from Finland and Sweden. Funding from FI and SE. CfP1.

- **Evaluation of benefits of ICT for the industrialisation of project and product processes in the construction industry.**

Project coordinator: Lund University, Sweden. Partners from France and Sweden. Funding from FR and SE. CfP1.

- **ICT for whole life optimization of residential buildings.**

Project coordinator: Lund University, Sweden. Partners from Finland and Sweden. Funding from FI and SE. CfP 1.

- **Stratcon. Strategic actions for realising the vision of ICT.**

Project coordinator: VTT – Technical Research Institute , Finland. Partners from Austria, Finland and France. Funding from AU, FI and FR. CfP 1.

- **Managing information in construction**

Project coordinator: DTI - Danish Technological Institute , Denmark. Partners from Austria, Denmark, Finland, France and Sweden. Funding from AU, DK, FI, FR and SE. CfP 2.

- **Integration of building specific information model into industrial building process .**

Project coordinator: Skanska OY, Finland. Partners from Finland and Sweden. Funding from FI and SE. CfP 2.

- **Review of the development and implementation of IFC compatible BIM.**

Project leader: SINTEF, Norway. Funding from Denmark, Finland, The Netherlands, Norway and Sweden. CfT 2.

### 5. The overall process

No joint pilot calls specifically targeting the holistic process were launched in ERABUILD.