Total LCC – Good for the Construction and Real Estate Cluster – CREC?

Symposium
04 Sep 2003, Helsinki FI

PROCEEDINGS

Olavi Tupamäki
VILLA REAL LTD/SA

Preface

A symposium *"**Total LCC – Good for the Construction and Real Estate Cluster – CREC?**"* was held 04 Sep 2003, Helsinki FI. The symposium was organised by Villa Real Ltd/SA, an engineering and consulting company with advanced knowledge and understanding about sustainable development, sustainable construction in particular.

The symposium was in association with *"Probabilistic approach for predicting life cycle costs and performance of buildings and civil infrastructure – EuroLifeForm"*, a 3.8 MEUR European RTD project partly funded by the European Union.

In the symposium, a cutting edge state-of-the-art and future views of life cycle costing in construction were presented.

This document is a compilation of the nine presentations made, plus an executive summary.

Olavi Tupamäki
CEO, Villa Real Ltd/SA

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LCC – Practical Usage and Future Views:	
Case Study = Intentia HQ, Keilaranta 5 Espoo, FI	
Investor	**50**
D&M Consultant	**53**
Architect	**56**
Building Services	**64**
User	**70**
Pages total	75

Espoo Finland, September 2003

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TOTAL LCC –
GOOD FOR THE CONSTRUCTION AND REAL ESTATE CLUSTER - CREC?

A symposium by invitation for the Finnish CREC.

Date: **04 Sep 2003 Thursday**
Time: 09.00 – 12.30 (+ luncheon)
Place: Hotel Palace 10th floor, Conference Hall

Programme

09.00	**What is Life Cycle Costing – LCC?**	Opening and introduction.	Olavi TUPAMÄKI, CEO	Villa Real Ltd, FI
09.15	**Public Private Partnership in the UK – Experience and Future Views**	Keynote presentation: Generic and Taylor Woodrow's practical experience. Plus a probabilistic (EuroLifeForm) approach to future projects.	Phil BAMFORTH, Professor	Taylor Woodrow Construction Plc, GB
09.45	Q&A		All	
10.00	**EU: Life Cycle Costs in Construction – Guidelines and Recommendations**	Draft report. Soon to be distributed to all member states.	Olavi TUPAMÄKI, CEO (member of the EC Task Group TG4)	Villa Real Ltd, FI
10.15	**What is Total LCC?**	Innovative total approach to LCC.	Olavi TUPAMÄKI, CEO	Villa Real Ltd, FI
10.30	Q&A		All	
10.45	Pause: Coffee & tea	Free discussion	All	
11.00 … 12.15	**LCC – Practical Usage and Future Views: Case Study = Intentia HQ, Keilaranta 5, Espoo**	How to use LCC today, plus future views and expectations.	Members of the EuroLifeForm Finland User Group – FINUG.	
		Investor/Owner	Kim WESTBERG, Real Estate Investment Manager	SAMPO Plc Real Estate Unit
		Design & Manage	Juha SARAKORPI, CEO	Saraco d&m Ltd, FI
		Architecture	Seppo NIEMIOJA, Partner	Innovarch Ltd, FI
		Building Services	Erja REINIKAINEN, Project Manager	Olof Granlund Ltd, FI
		User	Panu LUUKKA, Human Resources Manager	Intentia Ltd, FI
12.15	Q&A		All	
12.30	Closing		Olavi TUPAMÄKI, CEO	Villa Real Ltd, FI
12.30 … 13.30	**Buffet Luncheon**	Free discussion, and an opportunity to discuss with EuroLifeForm partners from six countries.		

Presentations in English (and/or Finnish); presentations will be sent by email to the audience participants.
Audience: Persons from different Finnish CREC organizations plus EuroLifeForm partners

Executive Summary

Audience
Near 50 participants of the Finnish CREC organisations by invitation and EuroLifeForm partners from six countries. Numerous questions and comments were made, and free discussions were lively and useful.

Objective
To give the audience a cutting edge state-of-the-art about the newest development on life cycle costing in construction. In particular, Total LCC and probabilistic approach to costs and performance (EuroLifeForm). Public Private Partnership – PPP, where LCC calculations are a must, was presented as experienced in the UK.

Presentations given

What is Life Cycle Costing – LCC?: Introduction to CREC and sustainable development/construction was first given. Then the following definition derived fro ISO 15686: *Life cycle costing - LCC is a technique which enables comparative cost assessments to be made over a specified period of time, taking into account all relevant economic factors both in terms of initial capital costs and future operational costs. In particular, it is an economic assessment considering all projected relevant cost flows over a period of analysis expressed in monetary value. Where the term uses initial capital letters it can be defined as the present value of the total cost of an asset over the period of analysis.*

Finally, the principal formula for calculating LCC as a Net Present Value - NPV of the accumulated future costs (C) over a specified period of time (t), eg 25 years (N), at an agreed discount rate(s), eg 1% pa (d), dependant on prevailing interest and inflation rates.

$$NPV = \sum_{t=0}^{N} \frac{C_t}{(1+d)^t}$$

Public Private Partnership in the UK – Experience and Future Views: The principles and procedures were explained. Over 300 projects totalling over 15,500 MGBP were listed, and increasing, in the various public domains. This was invaluable information as PPP is largely new to the Finnish players.

The six-nation EuroLifeForm project is to develop a generic model for predicting Life Cycle Costs and Performance, using a risk-based, probabilistic approach to replace deterministic (read: historic singular) values for costs and performance. The final outcome in a software format, applicable to new and existing structures, is good for investors, developers, designers, contractors and users. A long, good and interesting presentation.

EU: Life Cycle Costs in Construction – Guidelines and Recommendations: A new document near to its publishing is going to promote the use of LCC in construction within the EU. Here the influence of the Finnish contributions was great. This document, to be distributed to all member states and candidate countries, should be made public as an important “directive” in the member states, in Finland at least.

What is Total LCC?: The forthcoming Public Procurement Directive, the hottest topic for the whole CREC this very moment in Europe, wants to put LCC and life cycle assessment – LCA together. Today there seems not to be any software or other tools to make this consistently possible, although some multi-criteria decision IT techniques will be studied by this speaker.

To overcome this LCC+LCA problem, this speaker tries to look at it purely mathematically and introduce a fresh approach called Total LCC (first introduced in his book “*Construction Can!*”, 1998).

Total LCC =
1 **Acquisition** (a total of all initial capital costs + related environmental and societal costs) **+**
2 **NPV = Net Present Value of the future** costs of ...
2.1 **Building** (operating + maintenance + repair + refurbishment + disposal - residual value) +
2.2 **Occupation** (occupational LCA factors) +

2.3 **Mobility** (locational LCA factors) +
2.4 **Environment** (environmental LCA factors) +
2.5 **Society** (societal LCA factors)

To put it simply, Total LCC just tries to convert all various LCA impacts to money, after which everything can be calculated mathematically as LCC = NPV of all effective costs. Here it is also important to realise that it is not environmental LCA factors only to count in. And, without economic considerations, there is no future for environmental LCA considerations.

LCC – Practical Usage and Future Views: Case Study = Intentia HQ, Keilaranta 5, Espoo: Good presentations were made by five principal partners in the case study project. They all looked at the project from a different point of view. After a bit scientific earlier presentations, this might have been the most interesting and revealing part of the symposium proving the importance of LCC considerations.

Outcome
The symposium was considered very interesting and successful. Several participants have contacted this writer thereafter to discuss the use and future of LCC.

Future actions
Villa Real plans to arrange another similar symposium late 2004 or early 2005 in Helsinki FI. European events may be considered within the EuroLifeForm project.

Total LCC – Good for the Construction and Real Estate Cluster – CREC?

Symposium
04 Sep 2003, Helsinki FI

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Total LCC ... Programme

- ***What is Life Cycle Costing – LCC ?*** *(Olavi Tupamäki)*
- ***Public Private Partnership in the UK – Experience and Future Views*** *(Phil Bamforth)*
- ***EU: Life Cycle Costs in Construction – Guidelines and Recommendations*** *(Olavi Tupamäki)*
- ***What is Total LCC?*** *(Olavi Tupamäki)*

  (coffee, tea & free discussion)
- ***LCC – Practical Usage and Future Views: Case Study = Intentia HQ, Keilaranta 5, Espoo; investor, planner/designer, user*** *(Kim Westberg, Juha Sarakorpi, Seppo Niemioja, Erja Reinikainen and Panu Luukka)*

  (standing buffet luncheon & free discussion)

Total LCC – Good for the Construction and Real Estate Cluster – CREC?

Symposium
04 Sep 2003, Helsinki FI

What is Life Cycle Costing - LCC?

Olavi Tupamäki
Villa Real Ltd/SA

Villa Real
Bridging the World of Technologies

We offer engineering and consulting services to the international clientele of the Construction and Real Estate Cluster - CREC:

- *On **technological**, **economic** and **sustainability** topics*
- *Soon: Advanced **Total LCC** services for investors, developers, designers, contractors and users, utilising new science and software*

*We publish reports and analyses, available in our **online bookshop***

***Keywords** characterising our experience: International • Strategic • Sustainable • Construction • IT & Robotics • RTD&ID*

*Our **clients** include several leading European contractors, the European Commission, Shimizu Corp., Singapore Ministry of National Development, and numerous Nordic and Finnish CREC organisations*

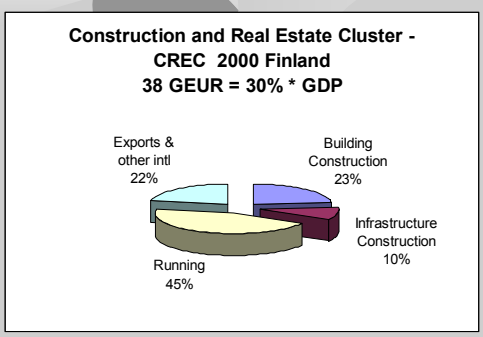
*Our offices are in **Espoo** FI and **Brussels** BE*

For additional information, see www.villareal.fi

Construction and CREC (1)

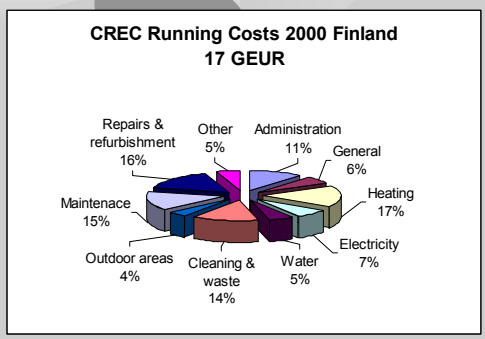
- *In advanced European vocabulary "construction" is considered to cover the entire value chain of develop/own, design, manufacture, construct, recycle a building, infrastructure or other constructed assets.*
- *Today in Finland and elsewhere, a new expression Construction and Real Estate Cluster - CREC has been taken to use to cover all activities directly related to construction and real estate (buildings, infrastructure and other facilities = 60-70% of the national wealth). Compared to the above, CREC covers the whole life of a building, hence additional activities concern running the building, which more often is done by facilities management.*
- *A reason to this approach is the fact that major contractors are moving from plain construction towards taking care of the building/facility for its whole life. Also public-private partnership projects (BOOT, PFI; toll roads & bridges, schools, prisons etc) require this approach. All investors and property developers need this. And **any sustainable construction consideration requires CREC!***

Construction and CREC (2)



*While in Finland construction represents 10% of GDP (or 12% if repairs & refurbishment are counted in), CREC represents 30% of the same GDP. Accordingly, **in the EU construction represents 11% of the total GDP, and CREC nearly 30% of the same GDP!***

Construction and CREC (3)



Here it can be seen that in Finland heating (17%), repairs & refurbishment (16%), maintenance (15%) and cleaning & waste (14%) are the highest cost activities.

What is Sustainable Development? (1)

- *"**Sustainable development is a matter of satisfying the needs of present generations without compromising the ability of future generations to fulfil their own needs**"*

  [Brundtland report, "Our Common Future", 1987]
- *Sustainable development means sustainability not only **ecologically** (= environmentally) and **economically** but also **socially** and **culturally**.*
- *Lately in the EU and UN, an expression "the three pillars of sustainable development" is often used; the pillars are said to concern economic, environmental and social development. For not to forget cultural aspects, they should read **economic**, **environmental** and **societal** (= social, cultural, ethical etc) development.*

What is Sustainable Development? (2)

- *Without of a culture (language, history, religion, arts, common habits, culture general) a nation cannot have any sustainable future! This is **human-diversity** to be preserved just like bio-diversity in general. Globally, according to UNESCO statistics, a half of the spoken languages, ie some 3,000 languages, are facing death. Many of those also in Europe.*
- *As per **Rio 1992**, countries should prepare national strategies on sustainable development in 2002 latest. Only few countries have provided something meaningful (EU: SE, DK, DE, AT, GB) with proper objectives (what, when) and action plan (how, who, financials, monitoring).*
- *As per **Johannesburg 2002**, no definitive objectives were set.*

What is Sustainable Construction?

- *After Kibert's definition 1994, CIB W82 (OT a member) proposed the following definition 1998: **"The creation and responsible management of a healthy built environment based on resource-efficient and ecological principles"**. A later programme document "Agenda 21 on Sustainable Construction" (CIB Report Publication 237, 1999) repeats this definition.*
- *This definition is not satisfactory, as it **leaves out economic and societal issues completely!***
- *By weight, construction activities consume up to 50% of all raw materials used and produce over 40% of waste (yet, mostly recyclable, and reducing rapidly in enlightened countries). Buildings consume 40% of total energy and account for 30% of CO_2 emissions, ➔ environmentally alone, **CREC's sustainability is most important for whole society!***

CIB = International Council for Research and Innovation in Building and Construction

What could be sustainable construction?

- *The ways in which built structures are procured and erected, used and operated, maintained and repaired, modernised and rehabilitated, and finally dismantled (and reused) or demolished (and recycled), constitute the complete cycle of sustainable construction activities.*
- *Minimise the use of **materials**, **energy** and **water** and **mobility**. (factor 4/10; NL: factor 20)*
- *Building products should, as far as possible, be **reusable** and materials **recyclable**. Design for **long service life** (and durability) is superior to design for reusability. Reusability is superior to recycling, and recycling is superior to waste disposal.*
- *In sustainable construction, reusability and ease of **changeability** are necessary product properties, in particular for modular products and systems with different service lives.*

What are LCA and LCC?

- *Derived from ISO 14040: In construction, environmental life cycle assessment - **LCA** is for assessing the total **environmental impact** associated with a product's manufacture, use and disposal and with all actions in relation to the construction and use of a building or another constructed facility. LCA does not address economic or societal aspects!*
- *Derived from ISO 15686: Life cycle costing - **LCC** is a technique which enables comparative **cost assessments to be made over a specified period of time**, taking into account all relevant economic factors both in terms of initial capital costs and future operational costs. In particular, it is an economic assessment considering all projected relevant cost flows over a period of analysis expressed in monetary value. Where the term uses initial capital letters it can be defined as **the present value of the total cost of an asset over the period of analysis.***

How to calculate LCC (1)
NPV

- *The **Net Present Value – NPV** procedure reduces a series of cash flows which occur at different times in the future to a single value at one point in time, the present. The technique which makes this transformation possible is called discounting. LCC is calculated as NPV of the accumulated future costs (C) over a specified period of time (t), eg 25 years (N), at an agreed discount rate(s), eg 1% pa (d), dependant on prevailing interest and inflation rates.*

  NPV is calculated according to the following formula, and can be done with MS Excel (up to 29 years easily...).

$$NPV = \sum_{t=0}^{N} \frac{C_t}{(1+d)^t}$$

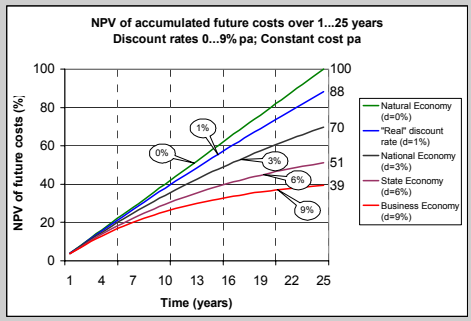
How to calculate LCC (2)
Discount rates

- *NPV can be calculated using nominal costs and discount rate based on projected actual future costs to be paid, including general inflation or deflation, and on projected actual future interest rates. Nominal costs are generally appropriate for preparing financial budgets, where the actual monetary amounts are required to ensure that actual amounts are available for payment at the time when they occur.*
- *NPV can be calculated also using real costs and discount rate, ie present costs (including forecast changes in efficiency and technology, but excluding general inflation or deflation) and real discount rate (d_{real}), which is calculated according to the following formula, where (i) = interest rate and (a) = general inflation (or deflation) rate, all in absolute values pa.*

$$d_{real} = \frac{1+i}{1+a} - 1$$

How to calculate LCC (3)
What rates in what economies?

- *NPV of accumulated future costs depends on the used discount rate. In the following chart I introduce Natural, National, State and Business Economies to describe widely different applicable (nominal) discount rates. Also, I offer 1% pa as a suitable real discount rate.*



Private Finance Initiatives and Public-private partnerships – Experience and future views

Phil Bamforth
Taylor Woodrow

What is a Private Finance Initiative project?

- Private consortiums finance, design, build and manage a project for up to 30 years.
- The building leased by a public authority from the private consortium.
- Funding is paid back with interest over the period of the contract.
- The amount paid depends on the performance of the consortium. The risk lies, therefore, with the private sector.

What is a Public-Private Partnership?

- A PPP is a contractual agreement between a public agency and a for-profit company.
- The skills and assets of each sector (public and private) are shared in delivering a service or facility for the use of the public.
- In addition to sharing resources, each party shares in the risks and rewards potential.

Advantages of PFI / PPP

National Audit Office Report – Feb 2003

- **More predictable costs**

  only 22% of projects exceeded expected cost compared with 73% previously

- **Better delivery**

  Only 24% of projects were delivered late (only 8% by more than 2 months) compared with 70% previously

PFI & PPP contracts in the UK

	Value (£million)	Contracts	Ave. value (£million)
Transport	8,289	58	143
Health	2,501	105	24
Education	1,167	69	17
Prisons	1,379	39	35
Defence	1,868	37	50
GCHQ	330	1	330

At September 2001

Sheffield 'Heart of the City' Civic offices

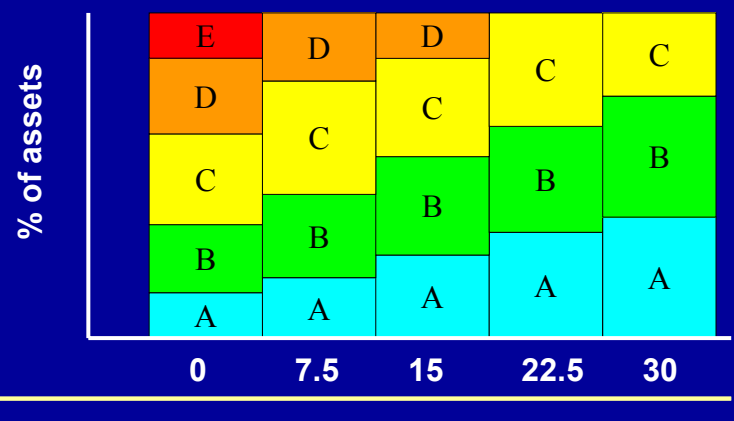
- Phase 1A of the City Council's 'Heart of the City' project.
- £28m construction of new council offices
- 30-year FM commission, designed to keep the building in optimum condition whilst containing operational costs.
- Financed through a mix of PFI, Millennium Commission grants and matching funding from other European sources.
- FM services including strategic lifecycle planning of the building's structure, and the provision of security, cleaning, catering, vending, porterage and horticulture.

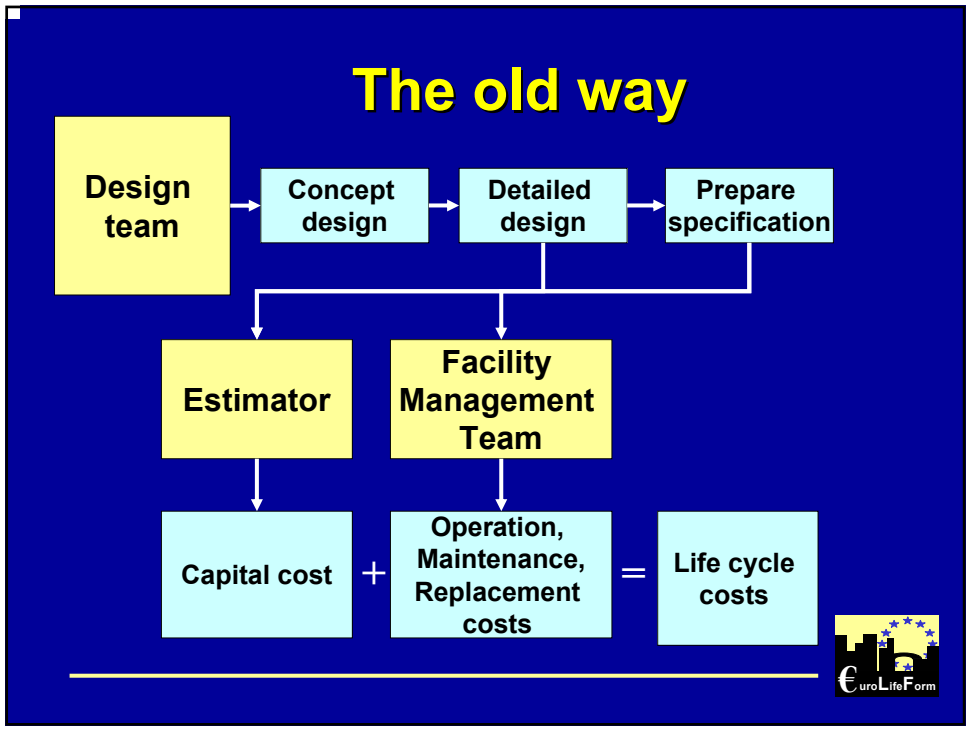
NHS Trust – Bromley Hospital

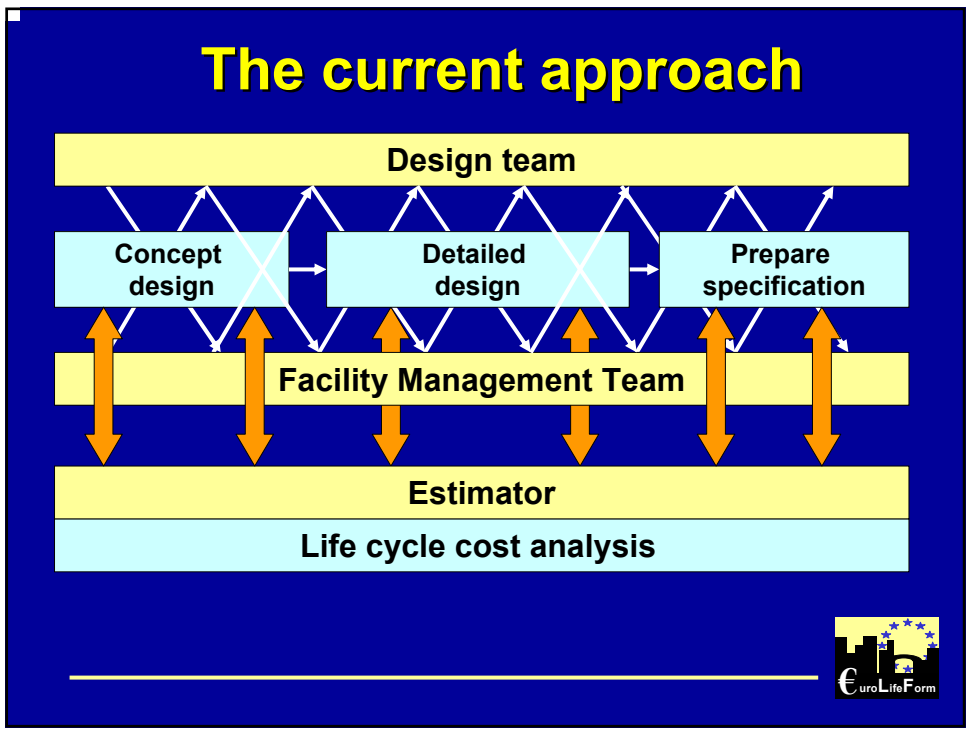
- Integrated build and maintain project (new and existing buildings)
- 30-year FM contract
- TW has re-employed the Trust's maintenance technicians and trained them in sophisticated FM techniques.
- Staff of 22 work alongside support service partners to provide a comprehensive cradle-to-grave solution.
- The process and will lead to a 30 year old building taking on the cost characteristics of a five year old property.

London Underground PPP

- Requirement for agreed programme of upgrading

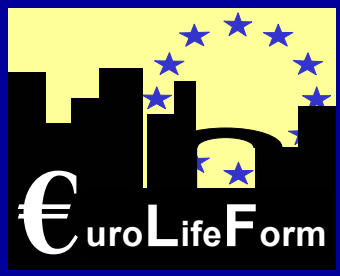



The old way
Design team
Concept design
Detailed design
Prepare specification
Estimator
Facility Management Team
Capital cost
+
Operation, Maintenance, Replacement costs
=
Life cycle costs


The current approach
Design team
Concept design
Detailed design
Prepare specification
Facility Management Team
Estimator
Life cycle cost analysis

EUROLIFEFORM

EUROpean **LIFE** Per**FORM**ance



Probabilistic approach for predicting life cycle costs and performance of buildings and civil infrastructure

OBJECTIVES

- **Development of a generic model for predicting Life Cycle Costs and Performance, LCCP, using a risk-based, probabilistic approach - applicable to new and existing structures**
- **In addition to cost and technical performance, socio-economic and environmental factors will be included.**

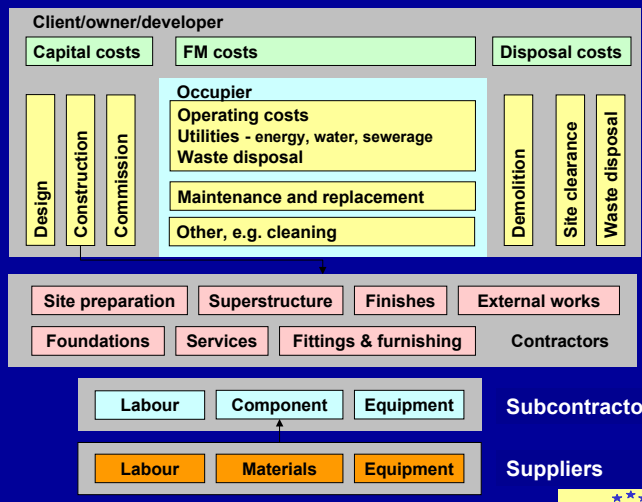
Cost breakdown structure

High level costs for the investor/developer

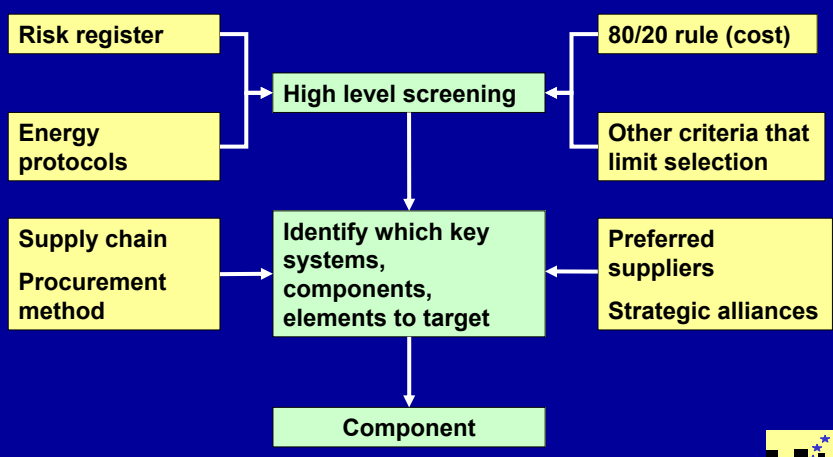
Budget costs for tender assessment

Detailed costs for construction and operation

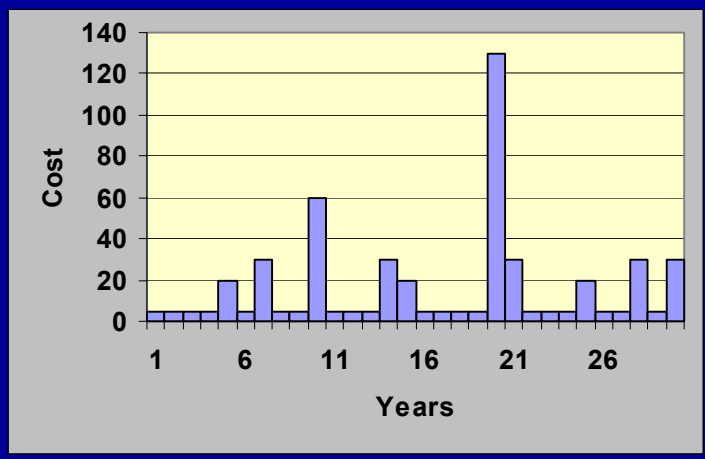
Cost breakdown for tenders



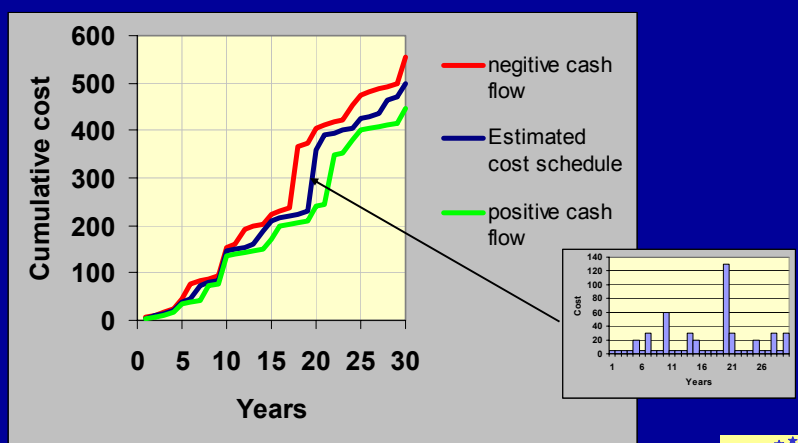
High level screening



Estimated LCC

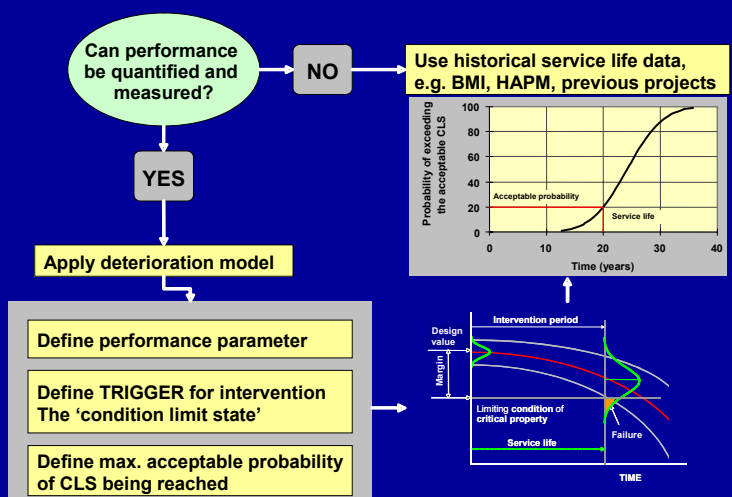


Minimising financial risk



Predicted interventions

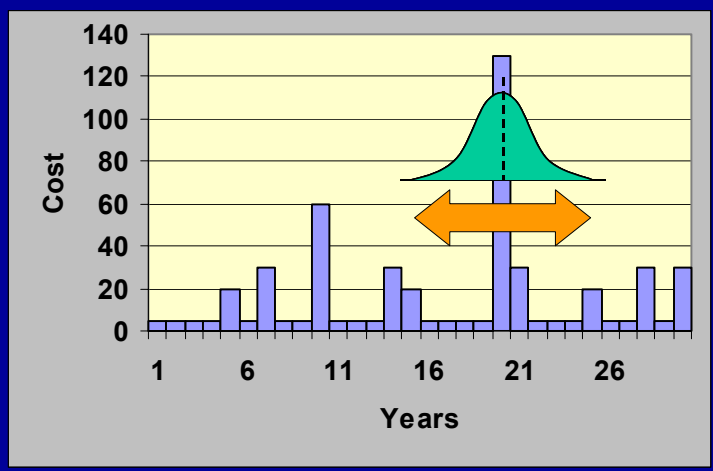
Predicting service life



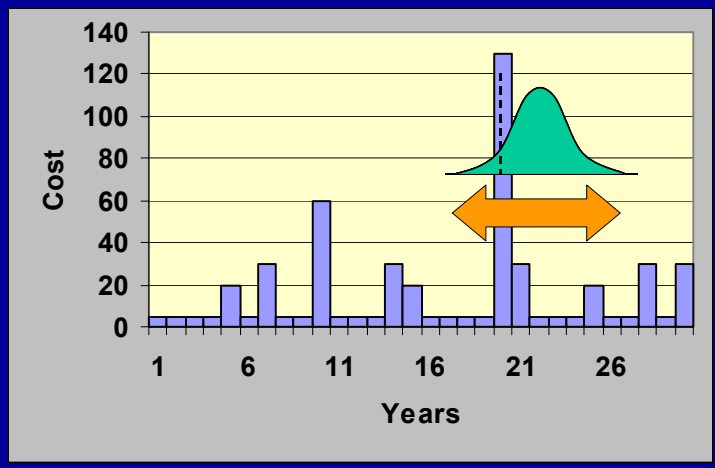
What does a value of service life really mean? IS IT…..

- Minimum value
- Typical value
- Maximum value
- Duty level
- Value representing acceptably low risk of loss of serviceability
- …and why are service lives almost always multiples of 5?

Estimated LCC



Estimated LCC



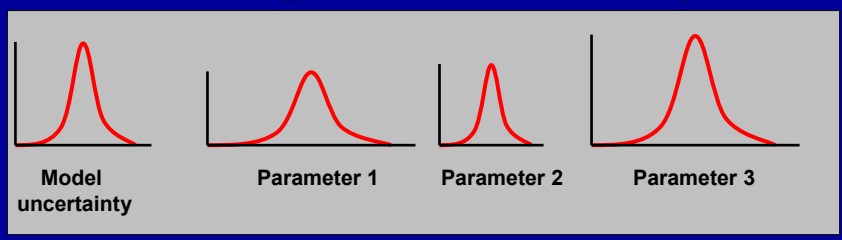
Qualification of SL values

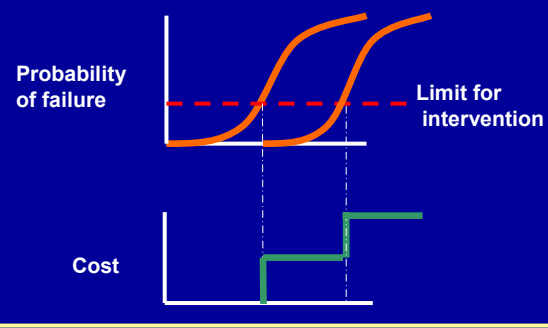
- Operating conditions
- Exposure conditions
- Condition limit state
- Maintenance regime
- Deterioration mechanisms
- Likelihood of failure

What information do we need for predictive modelling LCC?

- Definition of function
- Identify the critical performance factors
- Understand the degradation mechanisms
- Define maintenance requirements and their costs
- Predict when interventions are needed
- Define the cost of the intervention - at present day value

Predicting replacement cycles

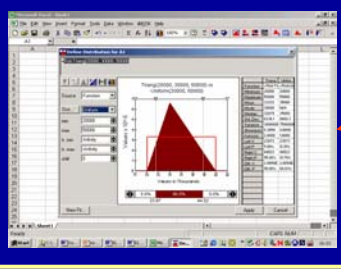


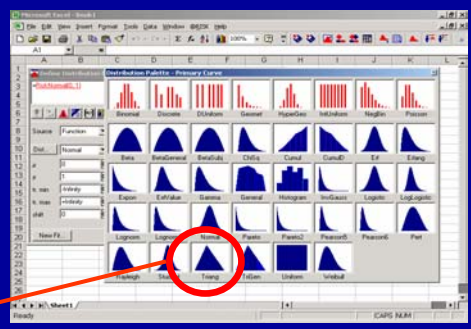


Modelling uncertainty using @RISK

Establish source and nature of the uncertainty

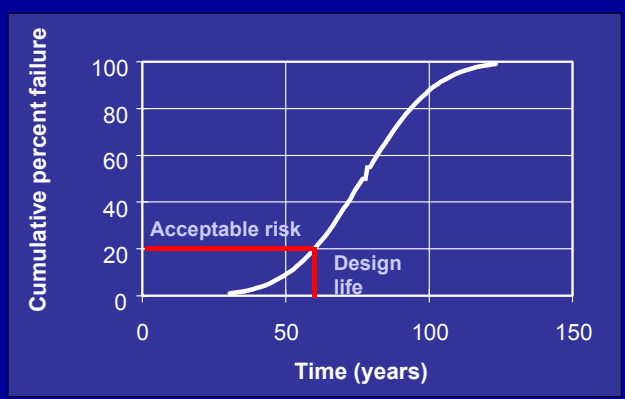
Explicitly represent uncertainty using a suitable probability distribution



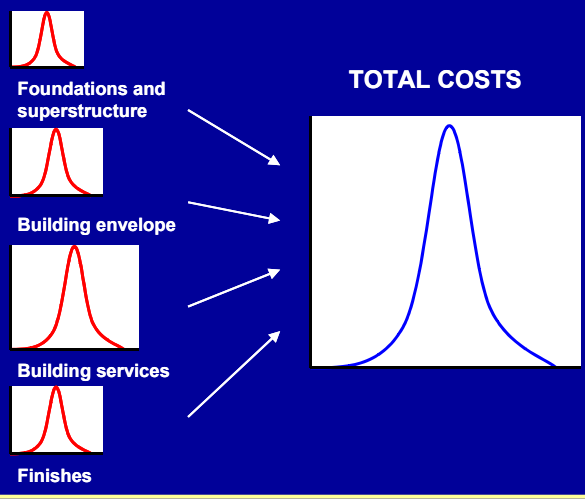


Service life

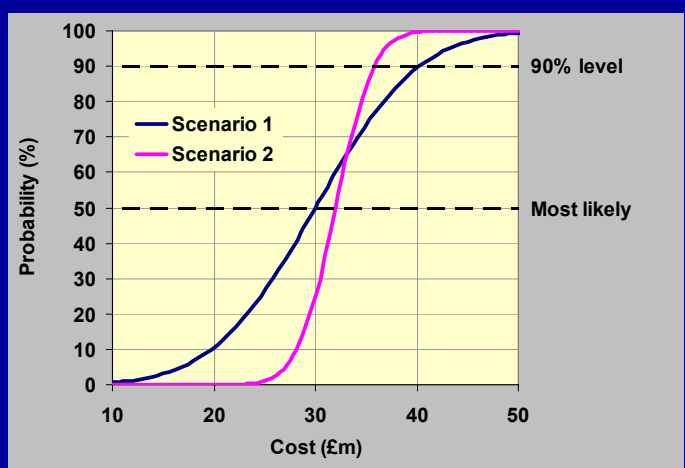
The time to reach an unacceptable probability of exceeding a particular serviceability limit state



Probabilistic approach for predicting life cycle costs and performance



Managing financial risk



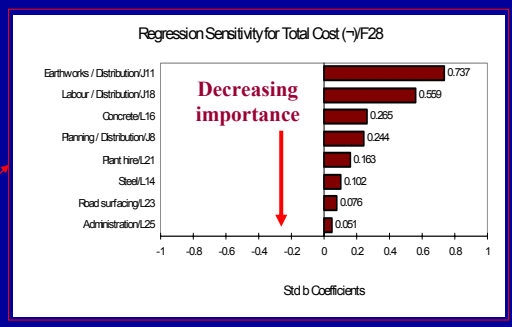
Reducing Variability

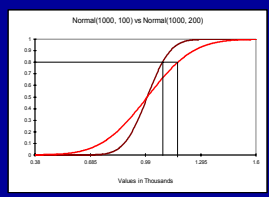
High uncertainty in total cost (red line). How do we reduce uncertainty?

Identify which factors are important through sensitivity analysis

Focus efforts to reduce variability in most critical items

Lower uncertainty (brown line)





BS ISO 15686 factorial method

ESL = RSL x A x B x C x D x E x F x G

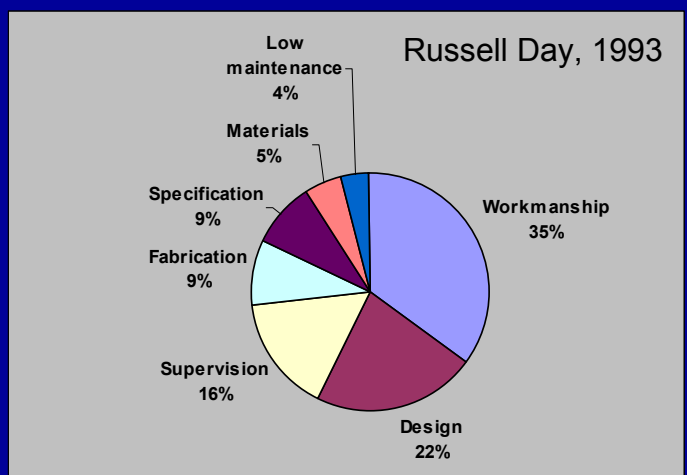
Installed quality
A = Quality of components
B = Design level
C = Work execution level
Environment
D = Indoor environment
E = Outdoor environment
Operation and maintenance
F = In-use conditions
G = Maintenance level

BS ISO 15686 factorial method

ESL = RSL x A x B x C x D x E x F x G

All factors = 0.95	ESL = 0.7
All factors = 1.00	ESL = 1.0
All factors = 1.05	ESL = 1.4

Causes of failure of CW systems

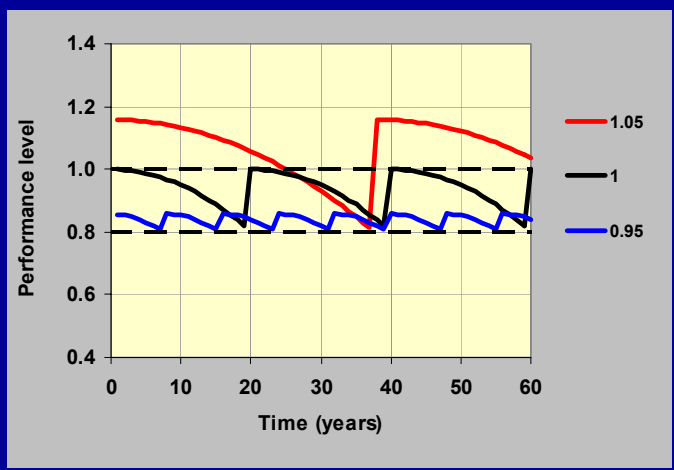


Proposed revision to BS ISO 15686 factorial method

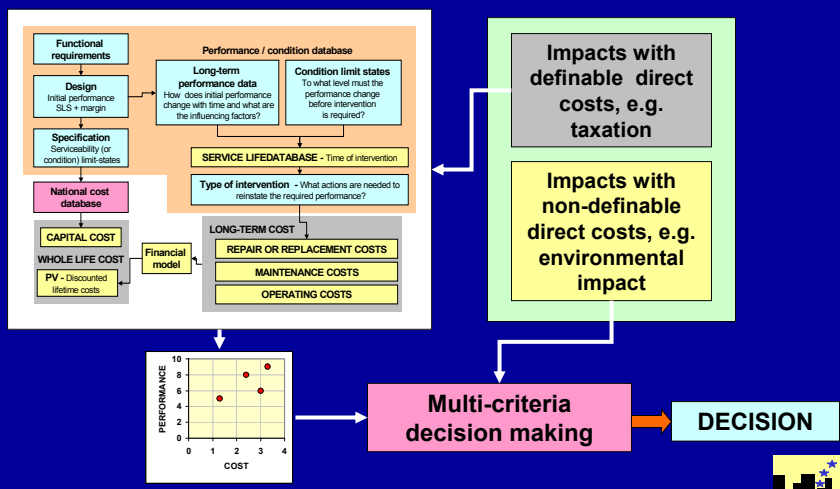
P_t = Performance at time t
T = Target performance at t = 0
a, b = coefficients related to specific component

$$P_t = T\left[A.B.C - \frac{1}{b}\left(\frac{t}{A.B.C.D.E.F.G}\right)^a\right]$$

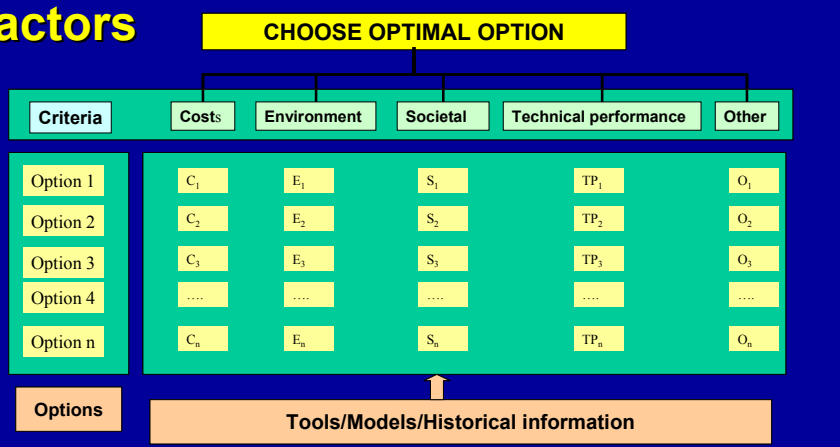
Revised to ISO 15686 predictions



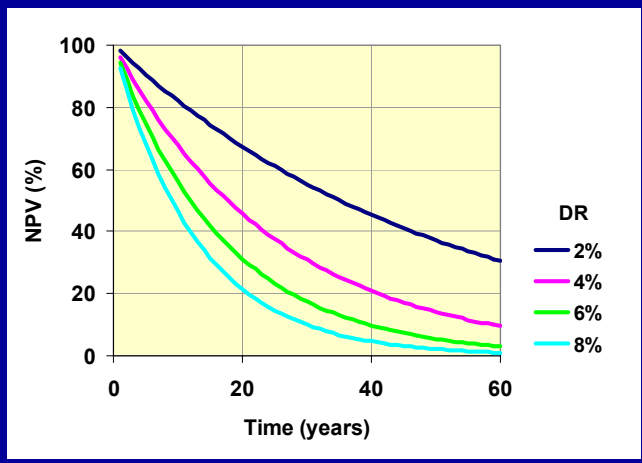
Environment & Socio-economic Issues



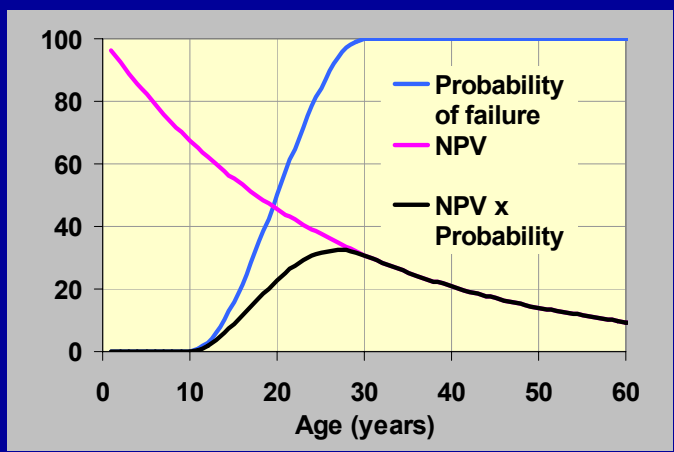
Integrating Cost, Performance, Environment And Socio-economic Factors

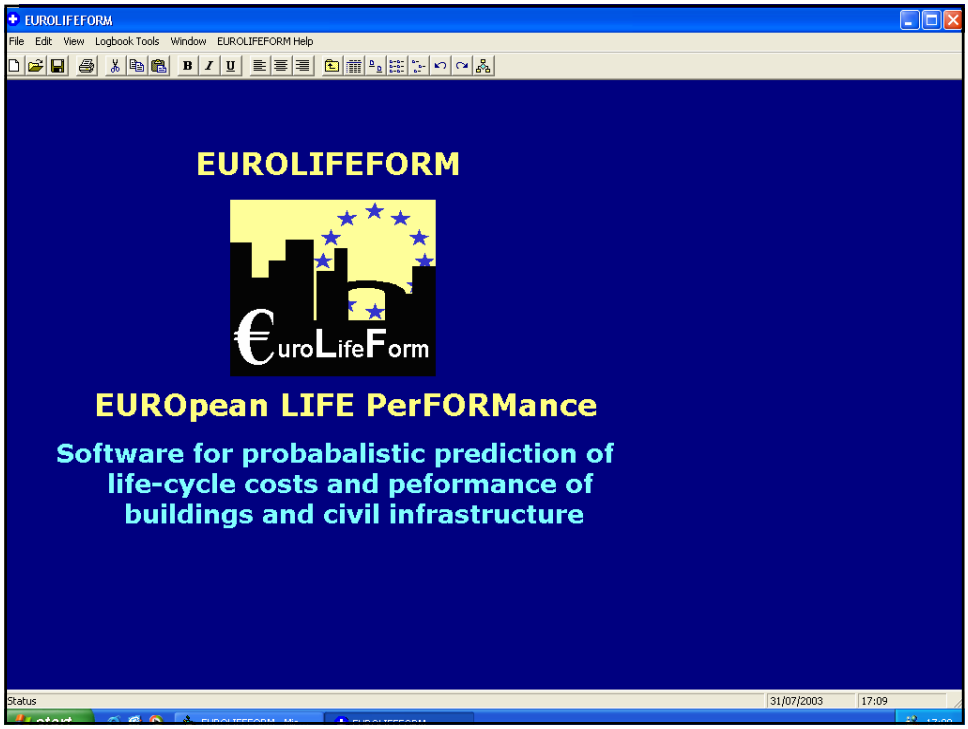


Net Present Value

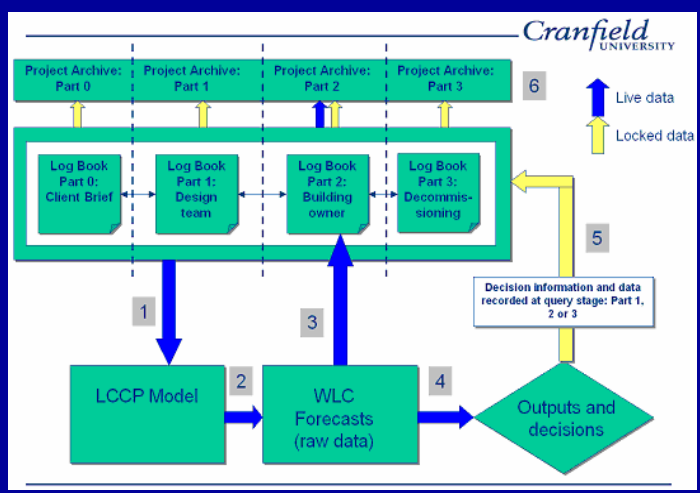


Probability x NPV = financial risk

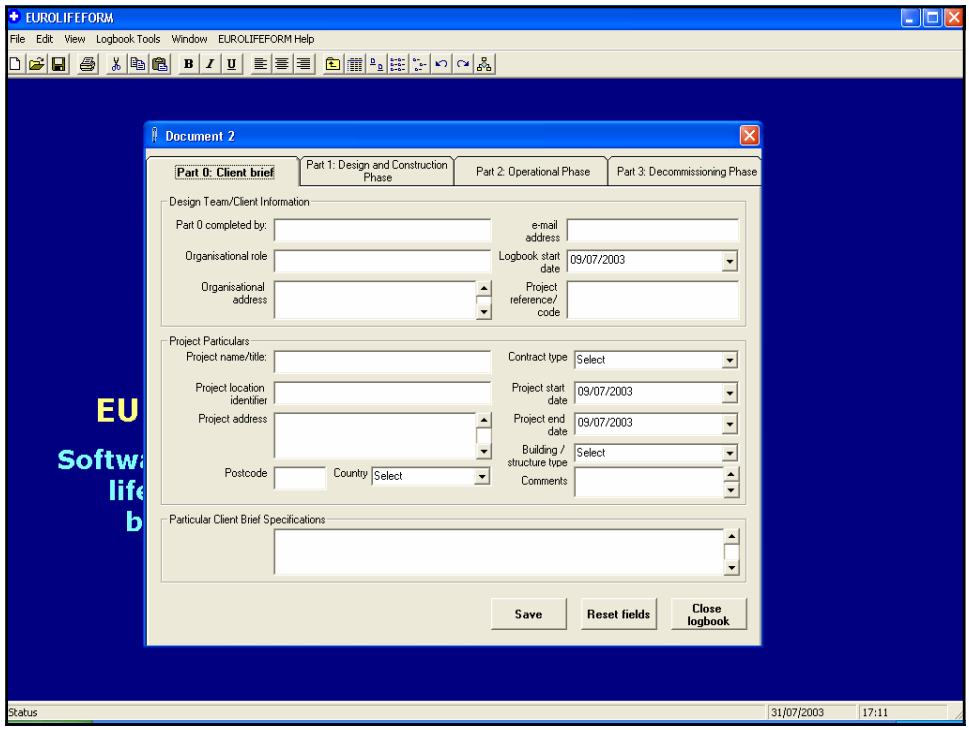


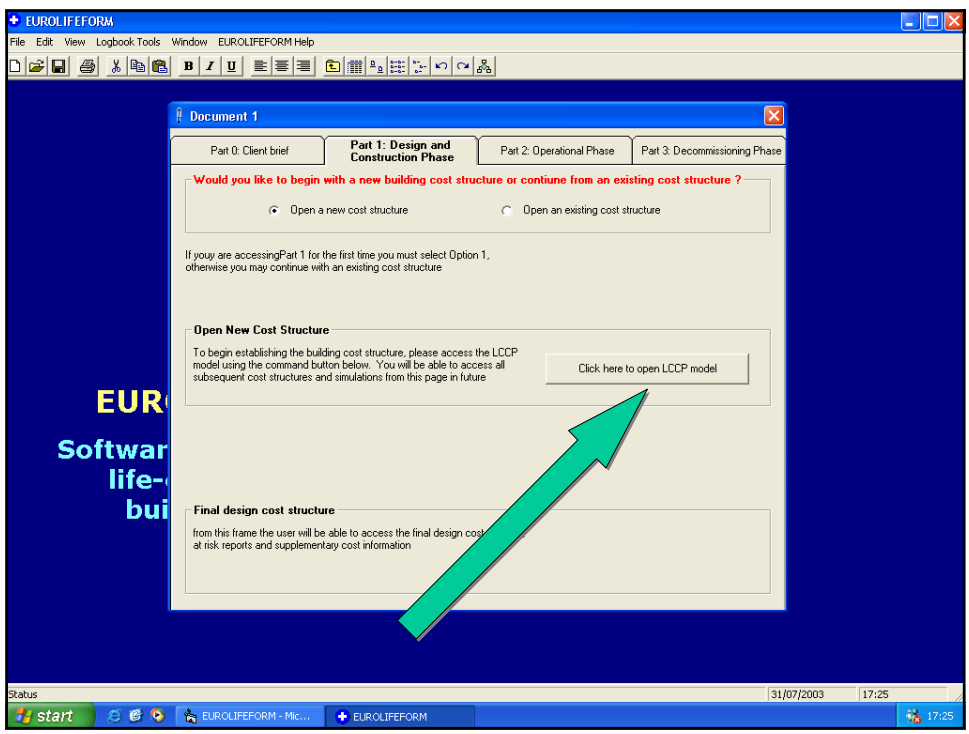


The decision process



€uroLifeForm


EUROLIFEFORM
File Edit View Logbook Tools Window EUROLIFEFORM Help
Document 2
Part 0: Client brief
Part 1: Design and Construction Phase
Part 2: Operational Phase
Part 3: Decommissioning Phase
Design Team/Client Information
Part 0 completed by:
e-mail address
Organisational role
Logbook start date
09/07/2003
Organisational address
Project reference/ code
Project Particulars
Project name/title:
Contract type
Select
Project location identifier
Project start date
09/07/2003
Project address
Project end date
09/07/2003
Building / structure type
Select
Postcode
Country
Select
Comments
Particular Client Brief Specifications
Save
Reset fields
Close logbook
Status
31/07/2003
17:11


EUROLIFEFORM
File Edit View Logbook Tools Window EUROLIFEFORM Help
Document 1
Part 0: Client brief
Part 1: Design and Construction Phase
Part 2: Operational Phase
Part 3: Decommissioning Phase
Would you like to begin with a new building cost structure or contiune from an existing cost structure ?
Open a new cost structure
Open an existing cost structure
If youy are accessingPart 1 for the first time you must select Option 1, otherwise you may continue with an existing cost structure
Open New Cost Structure
To begin establishing the building cost structure, please access the LCCP model using the command button below. You will be able to access all subsequent cost structures and simulations from this page in future
Click here to open LCCP model
Final design cost structure
from this frame the user will be able to access the final design cost
at risk reports and supplementary cost information
Status
31/07/2003
17:25
start
EUROLIFEFORM - Mic...
EUROLIFEFORM
17:25

Client Brief Stage - Project Details

LIFE CYCLE COST PERFORMANCE MODEL - CLIENT BRIEF STAGE

PROJECT DESCRIPTION: Example1

Study period: 25 years

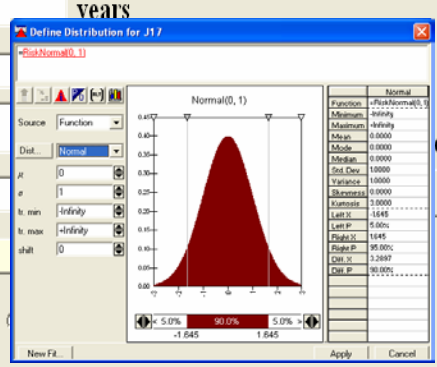
Construction period: 3

Nominal discount rate: 0.06

Inflation rate: MIN. 0.02

Real discount rate: 0.03

Consider revenues: Yes



<<Previous | Quit | Save | Save as... | Next >>

Client Brief Stage - Input and Output

LIFE CYCLE COST PERFORMANCE MODEL - CLIENT BRIEF STAGE

PROJECT LIFE CYCLE COSTS

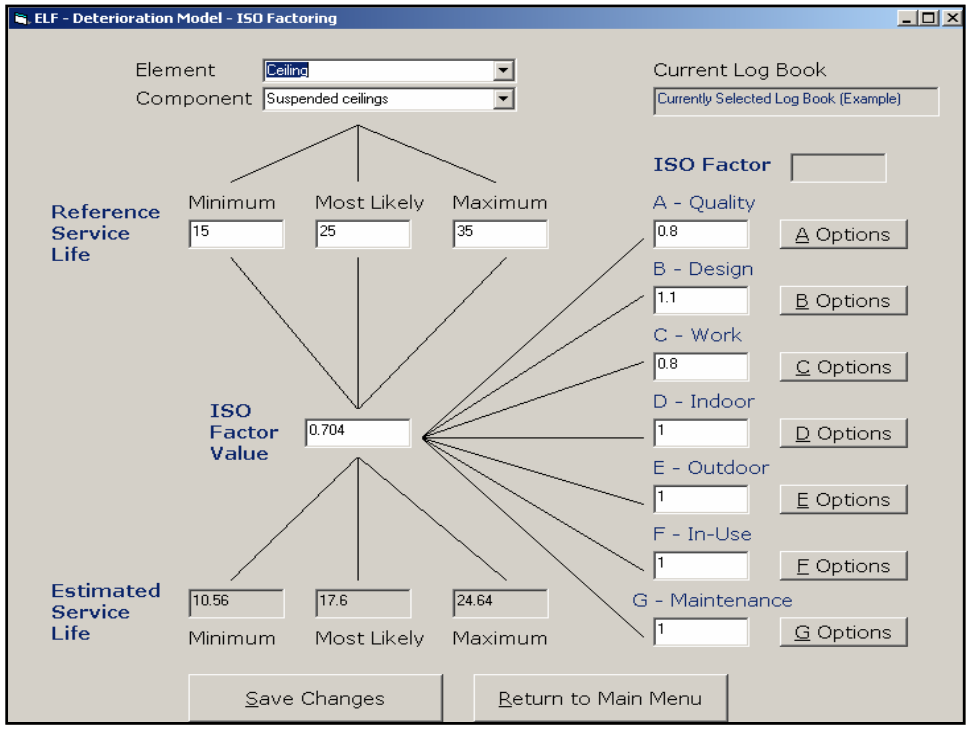
	No of units	Description of unit	Cost per unit Min	Max	Most likely	Own distribution	Expected present value	% of LCC	% of Capital Cost
							607,998.63		
Capital Cost	100	m2 of the structure	10	30	20	Define function	20,000.00	3.29%	
Facility Management Cost							587,950.76	96.70%	2939.75%
- Operation (per year)	100	m2 of the structure	10	30	20	Define function	40,380.97	6.64%	201.90%
- Maintenance (per year)	100	m2 of the structure	10	30	20	Define function	22,753.41	3.74%	113.77%
- Capital Replacement							492,560.73	81.01%	2462.80%
PV Percentage on Capital Cost	○								
Annual Percentage on Capital Cost	◉		10	30	20	Define function			
- Other FM Costs (per year)	100	m2 of the structure	10	30	20	Define function	32,255.65	5.31%	161.28%
Costs at End of Study Period			10	30	20	Define function	14.10	0.00%	0.07%
Management Costs			10	30	20	Define function	13.95	0.00%	0.07%
Overhead Costs			10	30	20	Define function	19.82	0.00%	0.10%

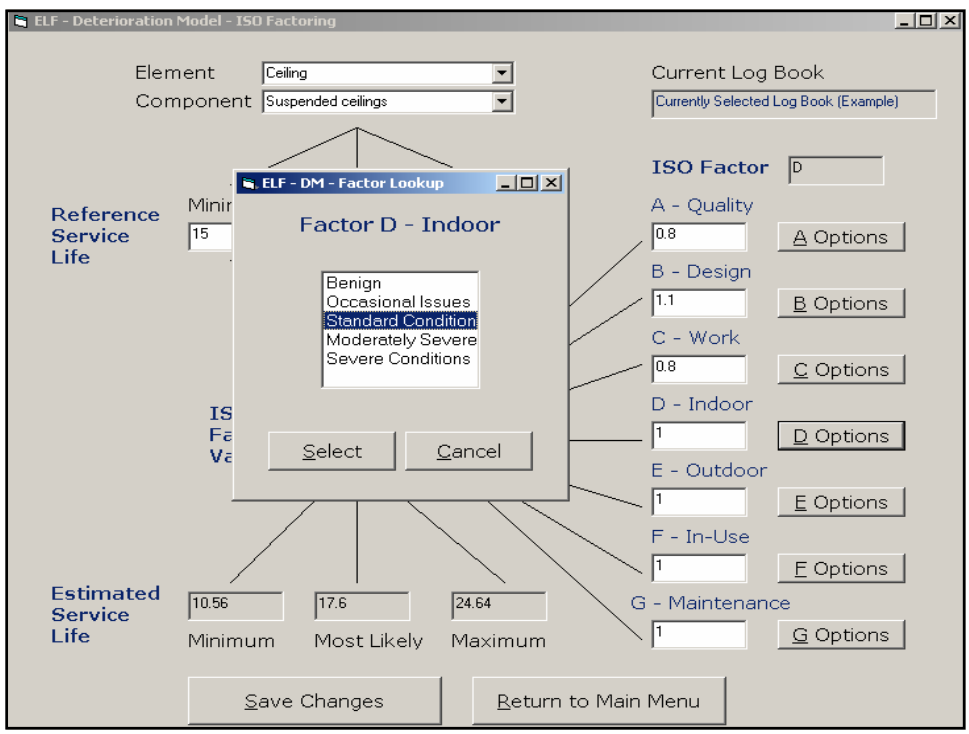
PROJECT CASH FLOW

	Min	Max	Most likely	
Cash Flow in Present Value				Define function

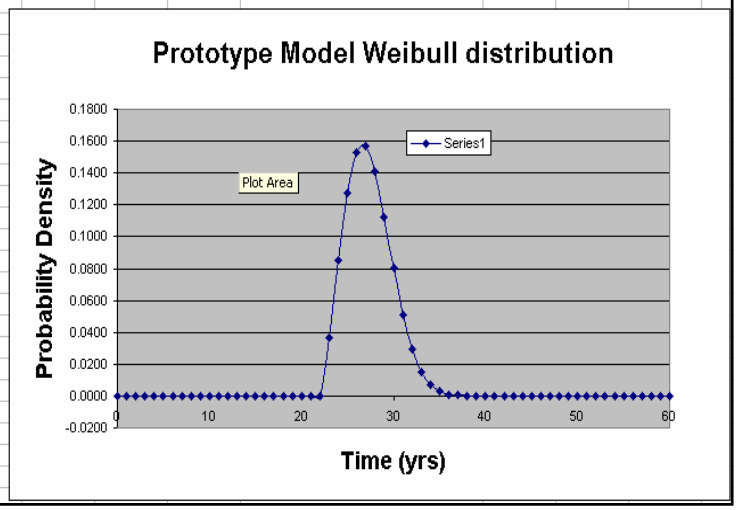
NET PRESENT VALUE

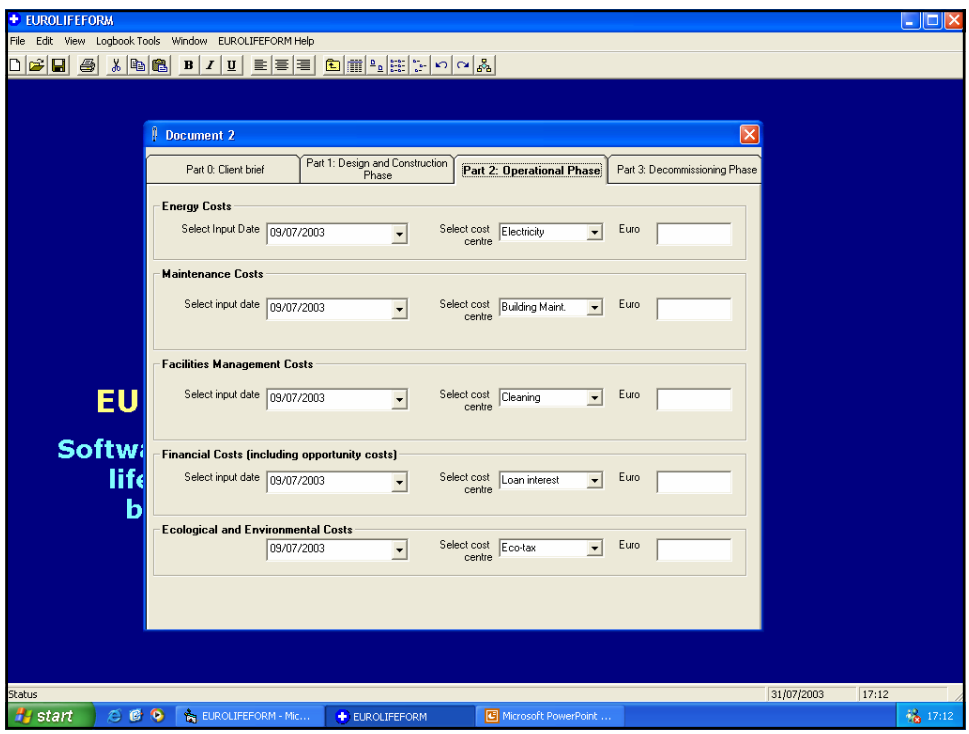
<< Previous | Quit | Save | Save as... | Analysis...


ELF - Deterioration Model - ISO Factoring
Element
Ceiling
Component
Suspended ceilings
Current Log Book
Currently Selected Log Book (Example)
ISO Factor
Reference Service Life
Minimum
Most Likely
Maximum
15
25
35
A - Quality
0.8
A Options
B - Design
1.1
B Options
C - Work
0.8
C Options
ISO Factor Value
0.704
D - Indoor
1
D Options
E - Outdoor
1
E Options
F - In-Use
1
F Options
G - Maintenance
1
G Options
Estimated Service Life
10.56
17.6
24.64
Minimum
Most Likely
Maximum
Save Changes
Return to Main Menu


ELF - Deterioration Model - ISO Factoring
Element
Ceiling
Component
Suspended ceilings
Current Log Book
Currently Selected Log Book (Example)
ELF - DM - Factor Lookup
Factor D - Indoor
Benign
Occasional Issues
Standard Condition
Moderately Severe
Severe Conditions
Select
Cancel
ISO Factor
D
Reference Service Life
15
A - Quality
0.8
A Options
B - Design
1.1
B Options
C - Work
0.8
C Options
D - Indoor
1
D Options
E - Outdoor
1
E Options
F - In-Use
1
F Options
G - Maintenance
1
G Options
Estimated Service Life
10.56
17.6
24.64
Minimum
Most Likely
Maximum
Save Changes
Return to Main Menu

	A	B	C	D	E	F	G	H	I	J
1	Eurolifeform Prototype Model									
2						1	Early failure, constant with wear out	0.1		
3	**Min**	**MostLikely**	**Max**							
4	22	28	40							
5										
6	Mu	Sigma	Lambda			23				
7	22	6	2.3			2.3				
8			1.759169							





Benefits

- Improved predictability of the cost and performance of an asset.
- Quantification of uncertainties using a risk-based approach
- More transparent and better-informed decision making.
- A safer environment with reduced waste through avoidance of over design or costly repairs.

Total LCC – Good for the Construction and Real Estate Cluster – CREC?

Symposium
04 Sep 2003, Helsinki FI

EU: Life Cycle Costs in Construction – Guidelines and Recommendations

Olavi Tupamäki
Villa Real Ltd/SA

Life Cycle Costs in Construction – EU Guidelines and Recommendations (1)

Background

- *In the Communication from the European Commission "**The Competitiveness of the Construction Industry**" dated 04.11.1997, sixty-five recommendations for action were included. At the meeting on 31.05.1999, the Tripartite Working Group (consisting of representatives of the member states, Commission and industry) agreed an abbreviated list of priorities, including "Sustainable Construction".*
- *Three Task Groups (TG) were subsequently set up under the auspices of the Working Group sustainable Construction. TG1: "Environmentally Friendly Construction Materials", TG2: "Energy Efficiency on Buildings", TG3: "Construction and Demolition Waste Management".*
- *Following the completion of the individual reports of these TGs, a "General Report" on sustainable construction was also drawn up and agreed entitled "**An Agenda for Sustainable Construction in Europe**". This was circulated to the member states.*

These reports are available on the European Commission's website: http://europa.eu.int/comm/enterprise/construction/index.htm

Life Cycle Costs in Construction – EU Guidelines and Recommendations (2)

- *The "General Report" contains a number of recommendations, one of which proposed that a fourth TG be set up to draft a paper on Life Cycle Costs in construction and to make recommendations on how these might be integrated into European policy making.*
- *Consequently TG4 was established to "**Draw up recommendations and guidelines on Life Cycle Costs of construction aimed at improving the sustainability of the built environment**".*
- *In this work three members present in this symposium, ie Matti J Virtanen (Ministry of Environment, FI), Mike Clift (Building Research Establishment – BRE, GB) and this speaker have been active members.*
- *After two years work the report is just to be finished and shall be circulated to the member states. The latest version dated 12 Aug 2003 is the basis of the following extracts.*

Life Cycle Costs in Construction – EU Guidelines and Recommendations (3)

Recommendations

1. ***Adopt a common European Methodology for assessing Life Cycle Costs (LCC) in construction (!)***
2. ***Encourage data collection for benchmarks, to support best practice and maintenance manuals***
3. ***Public procurement and contract award incorporating LCC (!)***
4. ***Life cycle cost(ing) indicators should be displayed in buildings open to public***
5. ***Life cycle cost(ing) should be carried out at the early design stage of a project***
6. ***Fiscal measures to encourage the use of LCC***
7. ***Develop guidance and fact sheets***

Life Cycle Costs in Construction – EU Guidelines and Recommendations (4)

Guidelines (for assessing/calculation)

- *The Present Value – PV procedure reduces a series of cash flows which occur at different times in the future to a single value at one point in time, the present. The technique, which makes this transformation possible, is called discounting.*
- *PV can be calculated using nominal costs and discount rate based on projected actual future costs to be paid, including general inflation or deflation, and on projected actual future interest rates. Nominal costs are generally appropriate for preparing financial budgets, where the actual monetary amounts are required to ensure that actual amounts are available for payment at the time when they occur. PV (or NPV) is calculated according to the following formula.*

$$PV = \sum_{t=0}^{N} \frac{C_t}{(1+d)^t}$$

Life Cycle Costs in Construction – EU Guidelines and Recommendations (5)

- *PV can be calculated also using real costs and discount rate, ie present costs (including forecast changes in efficiency and technology, but excluding general inflation or deflation) and real discount rate (d_{real}), which is calculated according to the following formula, where (i) = interest rate and (a) = general inflation (or deflation) rate, all in absolute values pa, eg 2% =0.02.*

$$d_{real} = \frac{1+i}{1+a} - 1$$

Life Cycle Costs in Construction – EU Guidelines and Recommendations (6)

- *The present value of future costs reduces rapidly over time, as illustrated in the following chart for different discount rates. This makes capital investment for better long-term performance unattractive to a developer in monetary terms.*

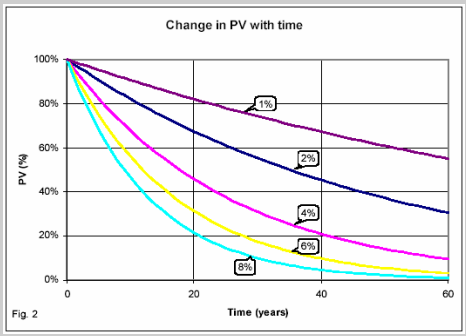


Fig. 2

Life Cycle Costs in Construction – EU Guidelines and Recommendations (7)

- *Buildings have long service lives. Because of difficulties to predict inflation in long term it is recommendable to use real costs (without inflation) and the real discount rate. Over a long period of time, the real discount rate is usually 0 - 2% pa only. At low discount rates long-term future costs and savings are immediately meaningful, as can be seen in the graphics above. Thus investment for a better future would looks more rewarding.*
- *It may be claimed that future LCC costs may increase due to higher energy prices and new environmental and other regulatory requirements.*
- *For LCC to become widely accepted, concerns about uncertainties in forecasting must be overcome. This concerns particularly the costs and performance of a building, products and systems. A related European RTD project **EuroLifeForm** is to advance a probabilistic approach on LCC in construction. This is explained in more detail in Appendix 7.3.*

Life Cycle Costs in Construction – EU Guidelines and Recommendations (8)

Finland in the document

- *As already seen, the document contains (literally) the same message and LCC assessment methods as described earlier today. Also, the document contains a 4-page appendix describing my personal contribution.*
- *In addition, another appendix provided by Chiel Boonstra of DHV Building and Environment, NL, describes in length the LC Test project conducted in 2001-02 by the Polytechnic College of Kuopio, Finland. The project was part of the Finnish governmental program BUILDEN and jointly financed by the Ministry of Trade and Industry, Ministry of Environment, the Technology development centre TEKES and the energy information centre MOTIVA.*
- *And the ongoing **EuroLifeForm** project is described in another appendix.*

Total LCC – Good for the Construction and Real Estate Cluster – CREC?

Symposium
04 Sep 2003, Helsinki FI

What is Total LCC?

Olavi Tupamäki
Villa Real Ltd/SA

Can LCC and LCA be put together? (1)

- *LCC gives you figures in money for any present and future costs as required.*
- *LCA may be used to create regulatory requirements, offer incentives and determine rating/scoring systems to help decision-making. LCA does not give you any figure in money.*
- *Eg, in the case of tenders, considering construction cost as usual plus LCC calculations together with LCA scoring, you should be able to calculate LCC + LCA ie a* ***total = money + points!*** *No existing related software gives you any proper consistent solution to this equation.*
- *Thus, my initial conclusion is no,* ***LCC and LCA cannot be put together****.*

Can LCC and LCA be put together? (2)

- *In the following table some related software tools, mainly for LCA assessment (3 last ones for LCC), are listed.*

Name of software	Country of origin
BREEAM	UK
ENVEST	UK
ECO-QUANTUM	NL
GREENCALC	NL
ECO-PRO	DE
LEGOE	DE
EQUER	FR
OGIP	CH
Økoprofil	NO
BEAT 2000	DK
Ekometri	FI
Ekoarvio	FI
LEED	US
BEES	US
ATHENA	CA
GBTool	(24 X NN)
Kiinteistötieto	FI
Årskostnadsanalyse	NO
Kostenreferentiemodel	NL

Can LCC and LCA be put together? (3)

- *It is my intention to study the above equation on a case study project in Finland (Intentia HQ, Keilaranta 5, 02150 Espoo, a newly completed office building for adaptable rental use, 10,000 m2 floor area) using the newest software: LCA software **GPTool 1.82** + generic multi-criteria decision making software **Logical Decisions 5.1**. [Now there appears a big problem as the iiSBE organisation (Ottawa CA) in charge of the development of GPTool has run to financial problems. Perhaps another tool must be selected eventually.]*
- *Additional prospective studies:*
  - *A proposed methodology that permits contract award to the Economically Most Advantageous Tender – **EMAT**, developed by a task group working for the EC DG Enterprise's agenda on the Competitiveness of the Construction Industry, and published in July 2001.*
  - ***PromisE**, environmental rating method, developed by Motiva FI, now in a test use.*

Can LCC and LCA be put together? (4)

- *In addition, the forthcoming Public Procurement Directive, the hottest topic for the whole CREC this very moment, needs multi-criteria Decision IT Techniques!*
- *In a meeting of **Forum in the European Parliament for Construction – FOCOPE** 03 Dec 2002 I discussed with the Commission Speaker Pamela BRUMTER (Head of Unit & real expert) about how really the decision making be coherently and consistently done (eg in the proposed controversial electronic auction), where the public client would have a quotation (capital costs or LCC) in money and other scorings in points (eg for environmental LCA factor, quality, delivery time etc). She said that a suitable software capable for multi-criteria decision making must be developed. Now it so happens that as part of my ongoing research on Total LCC, I am going to study the suitability of the newest software on this particular problem, as said earlier.*

Total LCC (1)

To overcome this LCC+LCA problem, I try to look at it purely mathematically and introduce a fresh approach, which I call Total LCC (see "Construction Can", 1998):

Total LCC =

1 ***Acquisition*** *(a total of all initial capital costs + related environmental and societal costs)* **+**

2 ***NPV = Net Present Value of the future costs of ...***

2.1 ***Building*** *(operating + maintenance + repair + refurbishment + disposal - residual value) +*

2.2 ***Occupation*** *(occupational LCA factors) +*

2.3 ***Mobility*** *(locational LCA factors) +*

2.4 ***Environment*** *(environmental LCA factors) +*

2.5 ***Society*** *(societal LCA factors)*

Total LCC (2)

To put it simply, Total LCC just tries to convert all various LCA impacts to money, after which everything can be calculated mathematically as LCC = NPV of all effective costs.

- ***NPV = Net Present Value*** *of the accumulated future costs over a specified period of time, as described earlier. Period is determined as per the planned/ongoing activity and can be whatever.*

- ***Building*** *(operating + maintenance + repair + refurbishment + disposal - residual value) refers to the future costs of all the different operating and administrative activities necessary to run the building or other constructed facility.*

  The above-mentioned principal activities are as defined in ISO 15686. In the NPV formula, there are costs caused by these activities. This is also true for other factors below, of course.

Total LCC (3)

- ***Occupational*** *factors refer to health, comfort, productivity, safety and security of the building (eg office). It is here important to realise the relationship of different accumulated costs for an office building with eg 30-year ownership:*

  1 : 5 : 200

  1 = acquisition

  5 = building operating and maintenance (see 2.1 above)

  200 = business operating costs ➔ here the biggest benefits are easiest to achieve thru better comfort and productivity ➔ good indoor environment/climate/air

  Here a lot of RTD and societal studies are expected.

Total LCC (4)

- ***Mobility***, *hence locational factors refer to the location of a (industrial, commercial, office, school etc) building.*

  We should calculate LCC not for the building alone but also its location in relation to incoming material and outgoing product flows as well as to employees' commuting or school children's daily transport.

Total LCC (5)

- ***Environmental*** *factors refer to different environmental impacts that various materials and actions have; environmental profiles.*

  Environmental factors are, however, hard to come by and need a lot of RTD at European and international levels to define their features and properties and to give them generally accepted values. Here LCA studies give a good starting point.

- ***Societal*** *factors finally need to be taken into account. This area is very little covered so far.*

  Yet, for the CREC industries, cultural and other societal phenomena are necessary every-day considerations (eg concerning a new road through a village) .

Total LCC (6)

- *It is important to realise that it is not environmental LCA factors only to count in. And, without economic considerations, there is no future for environmental LCA considerations.*
- *The rate of return available through LCC considerations today is lower than that offered by alternative long-term investment: as annual return; stock market 25% (-90% for .coms <= risk), 15% business ROI/ROC (risk), 6% bonds, 3% bank account.*
- *It may be claimed that future LCC costs will be increasing due to higher energy prices and new environmental and other regulatory requirements.*
- *This development will rise the calculated return and may* ***enable market-driven LCC considerations****.*

Total LCC (7)

- *Where are we today:*
  - *Acquisition capital costs govern!*
  - *LCC is up and coming; today mainly for future energy costs only.*
  - *The rest must be done!*
- *This Total LCC approach I intend to study further theoretically and on two case studies, a newly completed office building Finland (mentioned earlier) and possibly a PFI project executed by Taylor Woodrow, GB.*
- *And the EuroLifeForm probabilistic approach could be attached to all impacts and their costs, delivering a Total LCCP (using @Risk 4.5 and Monte Carlo simulation). Not easy!*
- *I am confident that* ***eventually the Total LCC/LCCP will be taken to use in the EU****. Yet, it will take some time.*

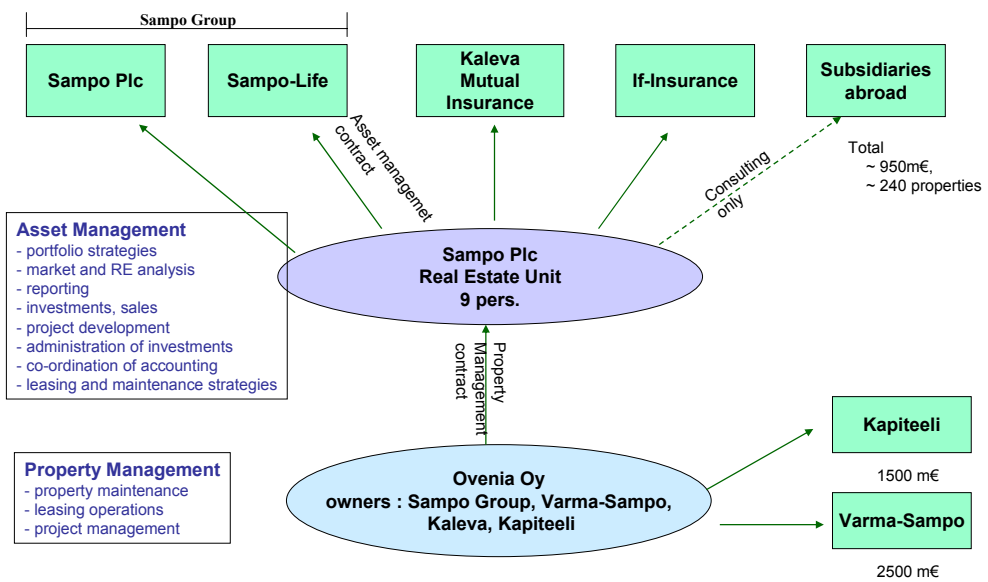
LCC - Investors point of view

ELF-symposium “Total LCC”
Helsinki 4.9.2003

Kim Westberg

Real Estate Investment Manager / Sampo Plc

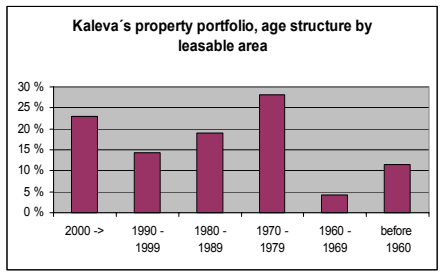
Sampo Group, Real Estate Management services



Kaleva mutual insurance - the owner of the Intentia building

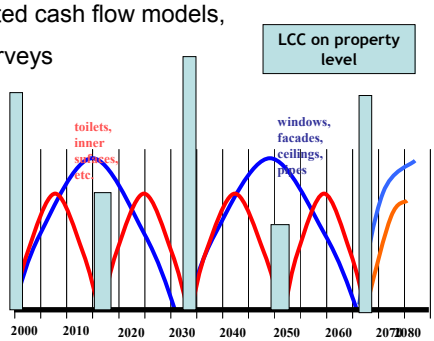
- Finland´s oldest life insurance company, founded in 1874
- Investment portfolio altogether 1.300 milj.€: bonds and loans 59 %, equities 29 %, real estate 12 % (31.12.2002)

- Kaleva´s property portfolio (31.12.2002):
  - Market value 155 milj.€
  - 24 properties
  - 85 % located in the capital area
  - 70 % office and retail
  - NOI on standing investments 7,5 % (2002)



Managing LCC on property level

- Managing LCC = managing negative cash flows, preferable in a way were required investments improve future cash flows
- LCC on the property level have a huge annual volatility but they are fortunately well predictable, at least costs related to the technical part
- Investment decisions are based on discounted cash flow models, upcoming LCC-costs based on technical surveys
- The predictability of LCC is the crucial issue
- Risks and difficulties, life cycles of:
  - lease agreements and tenant improvements
  - development and attractiveness of the surrounding area
  - preferable office lay-outs

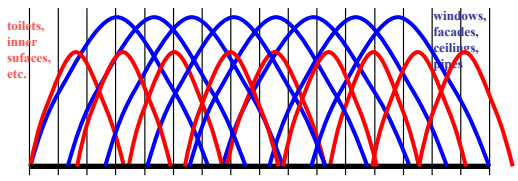


Source: Dividum Oy, Pekka Salakka

LCC on the porfolio level

- Managing LCC = managing the portfolio structure
- With the help of efficient portfolio diversification huge property-level annual deviations turn into a fairly stable cost level
- The portfolio age structure is crucial, an even level of LCC is achieved when properties in the portfolio represent different stages on their life cycle
- The tool to success is an active portfolio management

LCC - portfolio annual cost level



Source: Dividum Oy, Pekka Salakka

saraco

LCC in Project Development

•Saraco's LCE approach

ELF Symposium 'Total LCC'

Helsinki, September 4, 2003

Juha Sarakorpi

Partner, M.Arch.

DESIGN&MANAGE

saraco

Saraco in a Nutshell

Operations

- project management services
- project development, D&M-service
- expert services in PM, design, real estate and facility management

Clients

- corporations, organisations
- property owners
- users / tenants

Major Projects

- Intentia, Microsoft in Espoo (investor Sampo Group)
- Kone, Telia Finland in Helsinki (investors Sampo and Ilmarinen)
- Thermo Labsystems in Vantaa (investor Tapiola)
- Nokia projects in Finland, Germany etc. (subcons. to Evata Finland)

D&M

DESIGN&MANAGE

saraco

LCE approach

LCE = Life Cycle Economy

LCE ≠ LCC

LCE > LCC

In LCE approach, cost always goes along with income / value / benefit.

D&M

DESIGN&MANAGE

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Fundamentals for LCE in Saraco

Saraco's Mission Statement

It is our mission

- to add economical value for our clients,
- to develop functional, operational, image-related and environmental benefits for our clients,
- to help our clients in developing long-term competitive advantage, through our expert services in project development and management.

Saraco's LCE Policy Includes

1. long-term economical approach
2. ecological approach

D&M

DESIGN&MANAGE

saraco

Economy: Cost & Income

Management of Costs

- optimization of investment: based on future vision of the area and location, positioning the object in real estate market
- value engineering: comprehensive management of design solutions
- NPV of future costs over a certain period (users lease term / owners investment cycle)
- sensitivity analysis

Optimization of Income Potential

+ owner's lease income potential: location, efficiency, image, flexibility…
+ owner's appreciation potential: location, architecture, durability, flexibility / convertibility…
+ capability to support user's core business: flexibility, technology, cost…

D&M

DESIGN&MANAGE

saraco

Ecology: Focus on Long Lifecycle & Energy

Long Lifespan

1. Design for convertibility, to enable various future use: general dimensioning, floor-to-floor, windows, modules, lay-out, staircases…
2. Design for flexibility, to enable cost-effective tenant modifications: partitions, ceilings and floorings, mechanical and electrical systems…
3. Design for durability and ease of maintenance, to reduce annual costs: envelope, structural frame, foundations…

➢ These result in reduced use of raw materials and reduced energy in manufacturing of materials.

Energy

1. Optimize overall energy consumption, but don't deteriorate functionality, and don't increase investment unproportionally.
2. Avoid excessive cooling: smart HVAC-systems, energy-efficient architecture…
3. Favor: location with public transportation, energy-saving lighting, effective heat-recovery, BMS.

➢ These result in saving energy.

D&M

DESIGN&MANAGE

ELF Symposium
TOTAL LCC

Helsinki 2003-09-04
Innovarch Architects
Seppo Niemioja, M.Architect

Innovarch Architects

We concentrate on the architectural design of public and commercial buildings. Our goal is to create high quality environment by the means of modern architecture.

In our operations we emphasize on customer focus, and take advantage of the latest, the most efficient tools. Our customer base is typically long-term and stable.

Established 1973
Staff 30
Member of Association of Finnish Architect's Offices

Focus areas:
Shopping centres
Offices
Hotels
Public buildings
Industrial buildings
Specialized buildings

(More info: www.innovarch.fi)

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PRISMA, ESPOO

OFFICE AND HYPERMARKET

2002

VIIKKI, LATOKARTANO

OFFICE AND COMMERCIAL BUILDING

2002

CITY OF KUOPIO

OFFICE AND COMMERCIAL BUILDING

2002

KAUPPAKESKUS MYYRMANNI, VANTAA

SHOPPING CENTRE 1994

Koy RATAVARTIJANKATU 3, HELSINKI

OFFICE AND COMMERCIAL BUILDING 1991

TALLINN HARBOUR, ESTONIA

INTERNATIONAL COMPETITION 2002

CASE STUDY, INTENTIA HQ

- **The case study project is an Office Building for adaptable rental use situated at Keilaranta 5, 02150 Espoo, the prime location in the Helsinki capital area Finland. Its principal features are the following:**

- **Title: INTENTIA HQ**
- **Floor area: 10,000m2**
- **total asset 15,497 kEUR**
- **taken to use Jan 2002**
- **user: Intentia Ltd. Intentia is a leading supplier of e-collaboration applications and integrated e-business solutions. The company employs 3,300 persons in 19 countries and is headquartered in Sweden. Intentia Ltd is a subsidiary in Finland employing over 100 persons. This building is used as their headquarter**

SHORT HISTORY OF THE INTENTIA HQ

- Intentia bought the building site from the Espoo town, 2000
- Project development Saraco DM, 2000-2002
- Agreement with Keskinäinen Vakuutusyhtiö Kaleva, the owner of the building (real estate investment)
- Design phase and construction 2000-2001
- Intentia moving in beging of 2002

THE ROLE OF INNOVARCH

- Representing the managing director Kurt-Erik Roos as an building and design expert

THE MAIN TARGETS OF INTENTIA HQ

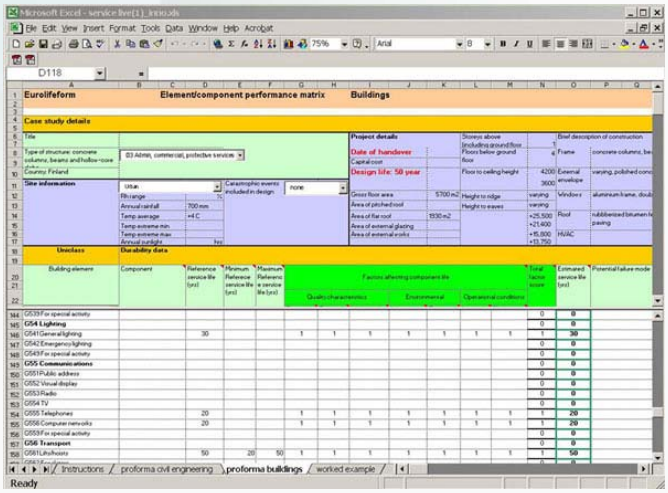
- High quality ”Intentia” architecture
- High quality working environments
- High quality meeting and congress rooms
- High quality natural materials (Life Cycle Cost)
- High quality indoor environment, climate, air
- Reasonable annual costs

INTENTIA AND EUROLIFEFORM

In the case study Intentia we collected data with Saraco DM, costs, used materials and Building components of the Intentia HQ using a Life Cycle Cost program (service life.xls Excel and builder.mdb Access databases) which is compatible with the Uniclass classification system. This has service life data covering a wide range of typical elements of buildings.

By using a life cycle cost model the building owner can evaluate how choices of materials, design and maintenance strategy will influence the total cost. In the case of Intentia it is possible to do that as feedback.

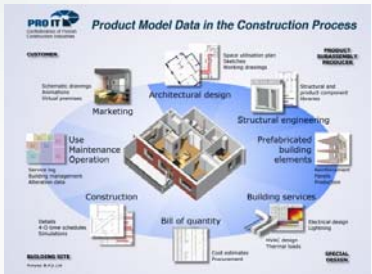
SERVICE LIFE TABLE



SHORT INFO OF THE PRO IT

INTRODUCTION

The objective of the broad-based Pro IT development project, initiated by the Confederation of Finnish Construction Industries RT, is to define a national data management approach and guidelines for the construction process, based on product modelling.



More information:
Ilkka Romo
Confederation of Finnish Construction Industries RT
tel. +358 9 1299 260
ilkka.romo@rakennusteollisuusrt.fi

More info: www.rakennusteollisuusrt.fi

ELF symposium Total LCC 04.09.2003

LCC: practical usage and future views

Olof Granlund Oy
Erja Reinikainen

Granlund in a nutshell

Activities

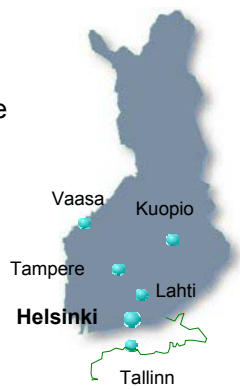
- Building services design
- Facilities management consulting
- Design and facilities management software

Offices

- Headquarters: Helsinki
- Subsidiaries: Finland (4 offices), Estonia

Figures

- Founded 1960
- Personnel 290
- Export % 15



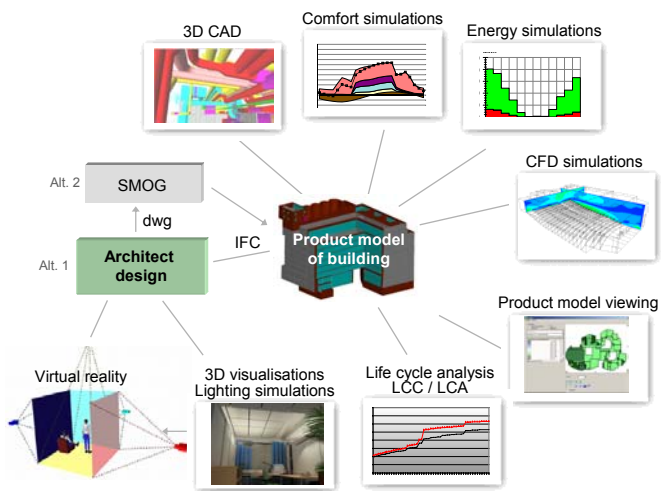
Trend-setter

Our company puts great emphasis on continuous and extensive development and internationalisation

integrated design process

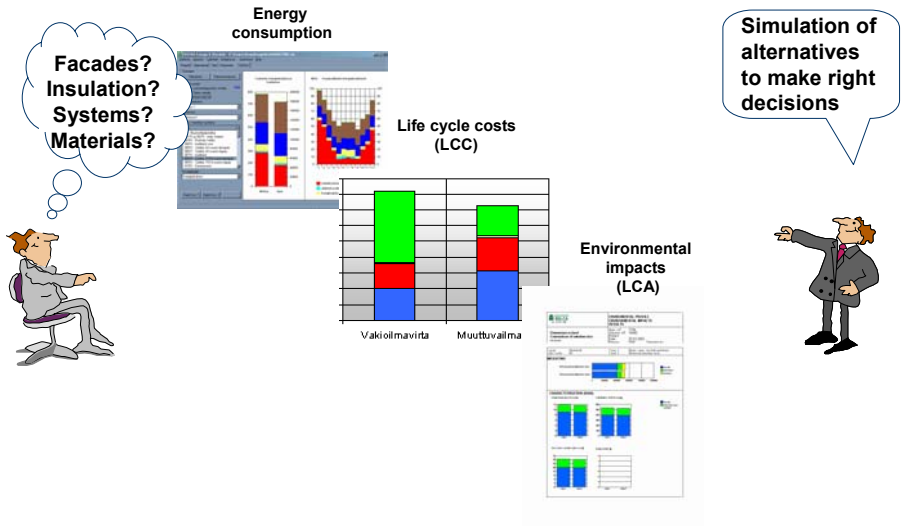
- software interoperability
- product model technology
- tools for design and facilities management
- information management over the full building life cycle
- energy efficiency
- environmental awareness
- sustainable development.

Integrated tools for design



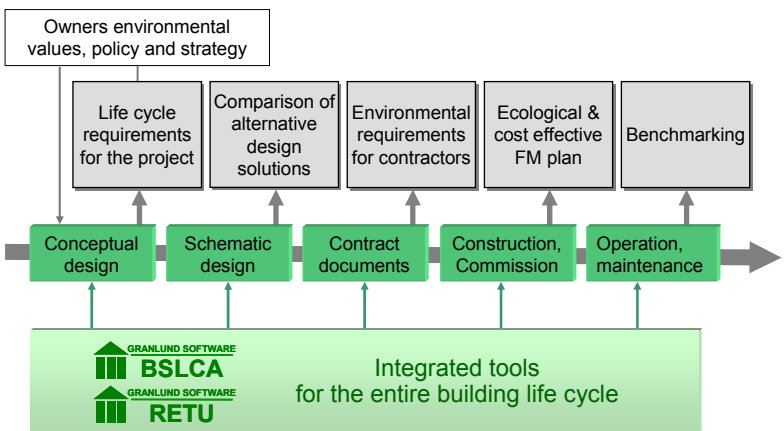
Life cycle consulting

GRANLUND



Management of life cycle impacts

GRANLUND

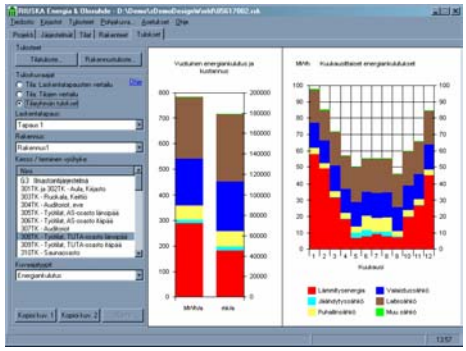


Energy calculation tool

GRANLUND

Energy consumption of buildings and systems

- Comparisons of windows, facades, technical systems, indoor air quality,…
- Target energy consumption for FM

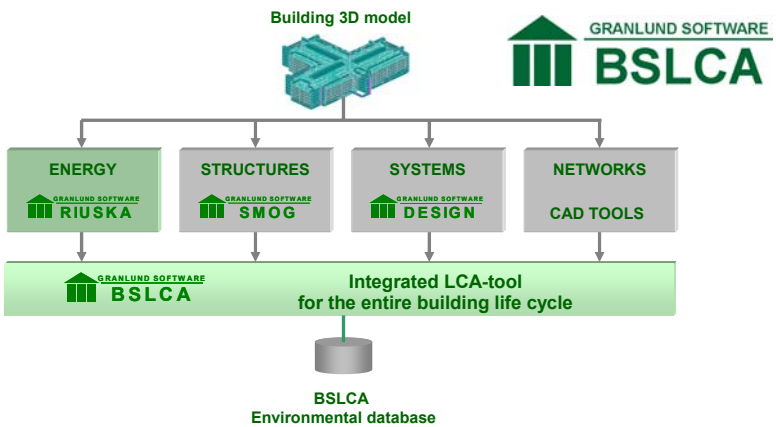


GRANLUND SOFTWARE
RIUSKA

LCA tool

GRANLUND

- material inventory automatically
- building envelope and systems LCA
- comparisons on different levels



LCC tool

Life cycle cost analysis complements investment cost analysis in comparisons of design alternatives and cost sensitivity over the life cycle.

GRANLUND SOFTWARE
RETU

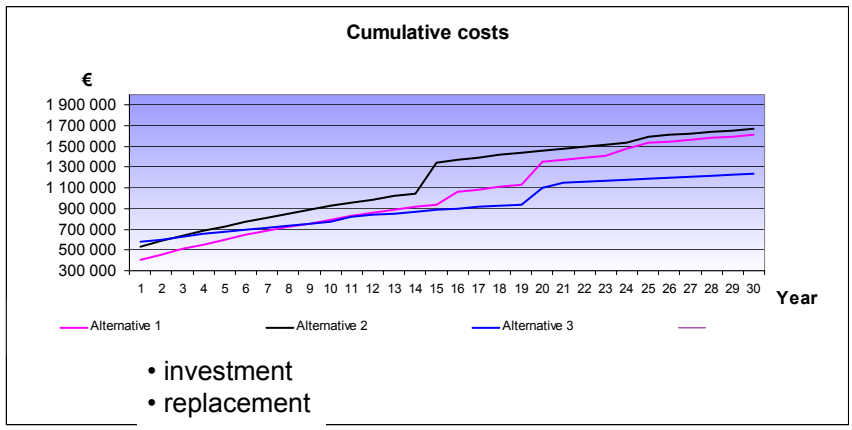
- Life cycle cost analysis of BS systems
- Budgeting, system comparisons
- Flexibility studies, verification of design
- Link to BS design database
- Granlund's cost data libraries

LCA-example: window size

Materials, embodied energy

Energy

LCC-example: system alternatives



- investment
- replacement
- energy
- maintenance
- filters

Occupational factors of LCC and Keilaranta 5 - User aspect

Panu Luukka
Human Resources Manager
panu.luukka@intentia.fi

Our Business Card

intentia
pursuing perfection

Customers: 3,500
Employees: 3,325
Established: Some 40 countries
Net Revenue: EUR 437 million

- Scandinavia's largest software company
- Europe's second largest company in our industry
- Fifth largest in the world in our industry

Vendevägen 89
SE-182 15 Danderyd, Sweden tel +46 8 5552 5000, fax +46 8 5552 5999, www.intentia.com

Intentia Oy

- Established in 1996
- Turnover 13 MEUR (2001)
- 105 employees
- HQ in Espoo, offices also in Tampere, Turku and Tallin
- Selection of customers: AGA, Canon, Finnair, KCI Konecranes, KWH Pipe, Olvi, Metsä Tissue, Saarioinen, Tamro MedLab and YIT.

Intentia Headquarter – Keilaranta 5

- **70 employees**
- **1- 50 customers**
- **Restaurant Intentia**
- **→ 80 "lunchers"**
- **3 office floors**

Occupational factors of LCC

- **Occupational** factors refer to health, comfort, productivity, safety and security of the building (eg office)
- Accumulated costs for an office building with 30-year ownership:
- **1 : 5 : 200**
- 1 = acquisition
- 5 = building operating and maintenance
- 200 = business operating costs ➔ here the biggest benefits are easiest to achieve thru better comfort and productivity ➔ good indoor environment/climate/air

Why occupational factors matter for Intentia Oy?

- About 65 per cent of Intentia Oy's turnover comes from consulting
- **And it's our people who make it happen!**

Occupational factors (Productivity)

- *Open-place office vs. room per capita?* A poll among our employees was conducted → They chose closed room office instead of an open-place office
- Several Team meeting rooms for ad-hoc meetings
- 80 per cent of office furniture were renewed (new models were chosen by our employees)
- Good ergonomics of office rooms
- Quality aspect in all purchases (telephones, computers, etc.)
- In data communication infrastructure we invested in technology of the future
- Customer aspect – Exclusive and functional premises for customer meetings

Occupational factors (Comfort, safety, security)

- Functional, ergonomic and cosy office rooms for everyone (adjustable cooling system and ventilation window in every room)
- Renewed “hi-tech” furniture in most of the office rooms
- Easily accessible “meeting places” for get-togethers
- Restaurant Intentia – High quality restaurant in our building
- Warm garage for employees cars
- Gym with saunas in the top floor of the building
- Modern monitoring system for crucial facility factors (temperature, air conditioning, etc)
- Occupational safety and possible risks are actively monitored
- Hi-tech and user friendly security systems
- Cultural factors → Premises reflect Intentia’s values

Occupational factors (Location and mobility)

- Keilaranta is the hi tech -center of Finland. Nokia's, HP's, Microsoft's, Radiolinja's headquarters are located in Keilaranta. Also Helsinki University of Technology is located nearby
- Keilaranta is environmentally and "culturally" significant
- Keilaranta has also societal value for Espoo City. It's the front of the city, which claims to be the Hitech-center of Finland
- It's easy to get to Keilaranta...
  - if you live in Espoo (i.e. western part of Helsinki metropolitan area)
  - if you own a car
- **...otherwise it takes time and patience!**
- Keilaranta is a excellent location if we look at it from marketing point of a view.
- From mobility's point of a view public transportation's models must be reconsidered (Metro)

Keilaranta 5 for the customers

- Functional – Everything needed easily attainable
- Accessible – Once you've been there you remember where it is
- Concrete – Intentia is something and looks something
- Independent – Intentia has a place of it's "own"
- Quality – From decoration to catering everything is high quality
- Style – If it looks good, it can't harm your image!

Our Relationship Foundation

- Delivering real value
- Eliminating risk
- Sharing our customers' objectives
- Long term

pursuing the perfect partnership

"Intentia's mission is to pursue the perfect partnership– delivering real value, eliminating risk and sharing our customers' objectives for their long-term transformation to collaborative business models."

Björn Algkvist
President and CEO